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Review

What progress has been made in the understanding and treatment of degenerative lumbosacral stenosis in dogs during the past 30 years?

Nick D. Jeffery [a,*], Andrew Barker [a], Tom Harcourt-Brown [b]

[a] Department of Veterinary Clinical Sciences, College of Veterinary Medicine, Iowa State University, Ames, IA 50011, USA
[b] Langford Veterinary Services, School of Clinical Veterinary Sciences, University of Bristol, Langford House, Langford, Bristol BS40 5DU, UK

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ABSTRACT

An association between degenerative changes in the lumbosacral region of the vertebral column and clinical signs of pain and pelvic limb dysfunction has long been recognized in dogs and has become known as degenerative lumbosacral stenosis syndrome. Over the past two decades, methods of imaging this condition have advanced greatly, but definitive criteria for a reliable diagnosis using physical examination, imaging and electrodiagnostics remain elusive. Available treatment options have changed little over more than 30 years but, more importantly, there is a lack of comparative studies and little progress has been made in providing evidence-based recommendations for the treatment of affected dogs. This review provides an overview of the changes in diagnosis, understanding and treatment of lumbosacral disease in dogs over the past 30 years. Approaches to address the unanswered questions regarding treatment choice are also proposed.

Introduction

Just over 30 years ago, Denny et al. (1982) suggested that recommendations about management of lumbosacral disease could only be made after surgical and non-surgical management had been directly compared. Despite numerous published studies on this condition, there is persistent uncertainty regarding diagnosis and treatment, and progress in decision-making for affected dogs has been limited.

Degenerative lumbosacral stenosis (DLSS) causes difficulties because of inconsistency in clinical signs and diagnostic criteria, plus a lack of reliable data with which to guide choice of therapy (Indrieri, 1988; Wheeler, 1992; De Risio et al., 2001; Worth et al., 2009; Meij and Bergknut, 2010). DLSS bears considerable similarities to human degenerative lumbar spinal disease, since both affect the cauda equina and may cause limb pain (lameness), back pain and/or neurologic deficits. It is estimated that ~85% of human patients with isolated low back pain (admittedly a subset of lumbar spinal patients) cannot be given a precise patho-anatomic diagnosis (Deyo and Weinstein, 2001) and there is no reason to suppose that the diagnosis rate in veterinary medicine is any higher.

Defining the condition

DLSS can be defined as an acquired condition in which clinical signs are initiated by degenerative changes and nerve compression caused by one or more of the following structures: annulus of the L7 intervertebral disc, interarcuate ligament, sacral lamina and synovial joint capsules. Compression or inflammation of the cauda equina within the vertebral canal, or the L7 nerves passing through the foramina, is usually thought to be responsible for the clinical signs, although pain may also originate from many adjacent structures.

Overt neurologic signs of cauda equina dysfunction can be associated with DLSS. However, more commonly, affected dogs are presented for poorly defined pelvic limb problems, such as reluctance to rise from recumbency or to climb stairs, or may exhibit apparent pain during physical examination or spontaneously (Meij and Bergknut, 2010). The poorly defined nature of DLSS means that it may easily be overlooked or, conversely, can easily be over-diagnosed, because of similarities of clinical signs with orthopedic or generalized peripheral nerve diseases. Most frequently, the clinical signs may be attributed to hip dysplasia or degenerative joint disease of the hips, stifles or hocks; traumatic injury to the iliopsoas muscle can also cause similar clinical signs (Breur and Blevins, 1997). It is, of course, possible for an individual dog to have both limb and spinal disease.

Case identification

Definite identification of DLSS cases that have neurologic deficits is usually straightforward, because the neurologic examination, supported by electrodiagnostics if required, clearly indicates the site of the lesion. The diagnostic problem remains for animals in which there is evidence from the owner's history, or from phys-

* Corresponding author. Tel.: +1 515 291 1396.
E-mail address: njeffery@iastate.edu (N.D. Jeffery).

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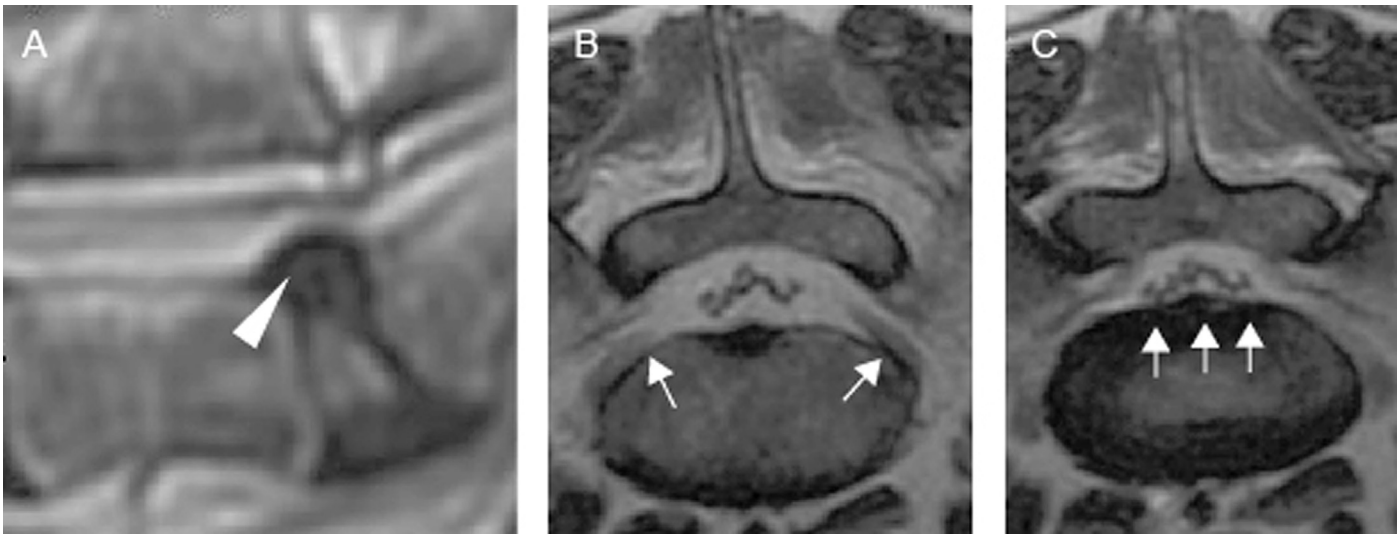

Fig. 1. Sagittal (A) and transverse (B, C) T2-weighted magnetic resonance imaging (MRI) scans of the lumbosacral junction of a dog without clinical signs of DLSS. Despite the apparent protrusion of the L7 annulus into the vertebral canal (arrowhead) on the mid-sagittal scan (A), there is no discernible compression of the L7 nerves (arrow) within the foramina (B), or of the cauda equina within the vertebral canal at the level of the L7 intervertebral disc (arrows indicate dorsal annulus).

ical examination, that there may be pain around the lumbosacral region. Currently, definitive diagnosis of such cases relies mainly on imaging studies, which can demonstrate the impingement of abnormal (degenerate) material on the cauda equina and L7 nerves. However, this does not rule out the possibility of disease elsewhere in the pelvic limbs, nor does it necessarily mean that the apparent compression is definitely causing lameness or pain.

Progress in imaging

The major problem in diagnosis during the 1980s was in reliably identifying compressive material within the vertebral canal or foramina. Diagnosis depended upon clinical signs, history and 'dynamic' and contrast radiographs. However, many cases of DLSS were radiographically normal (Indrieri, 1988) and, conversely, degenerative changes in this region were also frequently observed in clinically normal animals (Morgan et al., 1967; Wright, 1980).

Contrast radiology studies used to evaluate the lumbosacral region included myelography, intraosseous vertebral venography, discography and epidurography, but were recognized to have severe limitations (Hathcock et al., 1988). Epidurography, in particular, was reported to have widely differing sensitivity and specificity in different studies (Hathcock et al., 1988; Selcer et al., 1988).

The 1990s brought great advances through availability of advanced imaging and procedures for evaluation of the lumbosacral region in dogs were soon described (Jones et al., 1994). The cross-sectional imaging capability associated with computed tomography (CT) provides superior soft tissue and bone detail compared to radiographs and contrast radiography (Ramirez and Thrall, 1998). Magnetic resonance imaging (MRI) was similarly reported to accurately identify degenerative lesions in the lumbosacral region (de Haan et al., 1993; Adams et al., 1995) and was considered to be superior to CT for identification of changes to soft tissue (Ramirez and Thrall, 1998).

In the period since 2000, the limitations of advanced imaging in achieving secure diagnosis began to be appreciated. The major difficulty is the persistent inability to differentiate between abnormalities and normal anatomic variation, especially since there is a high prevalence of degenerative changes in the lumbosacral region of apparently normal older animals (Jones and Inzana, 2000; Amort et al., 2012) (Figs. 1 and 2). Mayhew et al. (2002) summarized the problem and demonstrated that the apparent severity of cauda equina compression does not correlate with the severity of clinical signs.

Progress in treatment options

Non-surgical therapy

Non-surgical therapy generally consists of oral analgesic or anti-inflammatory drugs to provide symptomatic relief of pain combined with short-term exercise restriction. A similar approach is used as a first-line treatment for the majority of human patients that present for back pain. For many human and canine patients, such treatment, combined with time, appears effective, although in human beings there is doubt about the efficacy of these drug therapies alone (Roelofs et al., 2008; Johnson et al., 2011). Frequently, mild neurologic deficits also resolve with time, perhaps because of resolution of inflammation. It is probable that a large proportion of dogs affected by DLSS are successfully treated in general practice using systemic non-steroidal anti-inflammatory drugs (NSAIDs), often perhaps without a specific diagnosis having been made.

An alternative non-surgical approach, using local injection of long-acting corticosteroids, has been used to treat both human beings and dogs with persistent low back pain and/or mild neurologic deficits. This treatment has not been used extensively in dogs, but a recent publication reported a success rate not distinctly different from surgical approaches: 79% of treated dogs were reported to improve clinically and 53% were considered to be cured by their owners (Janssens et al., 2009).

Non-surgical therapy has the advantage that it can be instituted without a specific diagnosis and can be used in general practice. Similarly, preliminary non-surgical therapy can aid in 'screening' dogs so that only those that fail need to undergo extensive diagnostic tests and surgery. On the other hand, because non-surgical therapy can be given without a specific diagnosis, there is an increased risk of indiscriminate and inappropriate treatment, and treated animals may be exposed to the detrimental effects of corticosteroids. There is also doubt about the ability of drug therapy to control severe pain or neurologic signs, because such cases are infrequently treated in this way. In human medicine, although there is evidence that the prognosis for severe acute cauda equina com-