Asymmetric lumbosacral transitional vertebra and subsequent disc protrusion in a cocker spaniel

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Abstract — A 10-year-old cocker spaniel bitch presented with severe lumbosacral pain and acute onset left pelvic limb lameness. A diagnosis of asymmetric lumbosacral transitional vertebra with disc protrusion at L6-L7 was made by computed tomography. The cauda equina and left L6 nerve root were surgically decompressed with a dorsal laminectomy and lateral foraminotomy, which led to rapid resolution of the clinical signs.

Introduction

Lumbosacral disease is characterized by lumbosacral pain, radiculopathy, varying degrees of pelvic limb paresis and urinary or fecal incontinence. Transitional vertebrae are a congenital anomaly seen in 0% to 22% of dogs, depending on the breed (1); they predispose the dogs to lumbosacral disease at an early age (2). Traditionally, lumbosacral disease and foraminal stenosis are treated surgically with a dorsal and medial approach to the lumbosacral intervertebral foramen. Recently, a lateral approach to the foramen has been described. This has given excellent results for L7 nerve root compressive lesions (3). The benefits of this approach are the improved visualization of the foramen and preservation of the articular facets (3).

Case description

A 10-year-old, female, spayed, cocker spaniel of 9 kg body weight (BW) was referred to the Calgary Animal Referral and Emergency Centre for acute onset non-weight-bearing left pelvic limb lameness and urinary or fecal incontinence. The left pelvic limb remained in full flexion at all times. The owner reported that the dog experienced pain in the hindquarters during assisted standing and that the dog was unable to posture for urination or defecation. She had been leaking urine in her bed since the onset of clinical signs. No previous history of lameness or back pain was noted and she had been in otherwise good general health.

On presentation the dog had vital parameters within normal limits. On abdominal palpation her bladder was large and soft and urine was expressed with only gentle palpation.

An orthopedic examination was performed. A marked pain response was noted on extension of the right coxofemoral joint and on tail jack. The left pelvic limb could not be manipulated or extended without a marked pain response. No other orthopedic abnormalities were demonstrated.

Neurologic examination revealed normal right pelvic limb proprioception with a standard paw positioning response. The left pelvic limb’s proprioception was not determined due to full flexion. The right patellar reflex was normal and the left side was increased. Withdrawal reflex was normal on the right pelvic limb and judged to be decreased on the left, although the full flexion made assessment difficult. The cranial tibial response and common peroneal reflexes were normal on the right and decreased on the left. The perineal reflex was decreased bilaterally. Thoracic limb reflexes were normal and there were no cranial nerve deficits. Based on the neurologic examination the lesion was localized to L6-S3 with a left-sided nerve root signature.

Orthogonal radiographs made of the pelvis and lumbosacral spine at the referring clinic revealed 13 thoracic vertebrae, 6 normal lumbar vertebrae, and a sacralized or transitional L7 with fusion of the right transverse process and partial fusion of the left to the respective wings of the ilium (Figure 1). Spondylosis deformans was noted at the L3/L4, L5/L6 and L6/L7 intervertebral disc spaces (IVDS).
The dog underwent general anesthesia for computed tomography (CT) imaging of her lumbosacral spine using a single slice helical machine (GE CTI). The dog was initially positioned in dorsal recumbency with the coxofemoral joints in flexion. Three-millimeter and 1-mm wide contiguous slices were acquired in the transverse plane from L4 to S3. Soft tissue and bone algorithms were applied to all sequences. The study was then repeated over the lumbosacral region in 1-mm contiguous slices with the coxofemoral joints in extension. The CT confirmed asymmetrical sacralization of L7 as seen by partial right-sided fusion of L7/S1. The L7 vertebral body was torqued 15 degrees to the right in the transverse plane (Figure 2).

One millimeter thick transverse images of the L6/L7 IVDS in a soft tissue window revealed soft tissue proliferation and obliteration of epidural and foraminal fat within the entrance and exit points of the left foramen (Figure 3), and mixed mineral soft tissue density occupying 50% of the ventral vertebral canal, consistent with a disc protrusion causing compression. Reformattion of the CT images in the dorsal and sagittal planes was performed over the lumbosacral region. Mineralized soft tissue and mineral-dense material was seen extending into the ventral vertebral canal and left foramen at L6-7, better defined in sagittal planes, and was consistent with a mainly left lateralized disc protrusion (Figure 4).

The following day the patient was prepared for surgery and premedicated with hydromorphone (hydromorphone hydrochloride; Sandoz, Quebec City, Quebec), 0.2 mg/kg BW, midazolam (Pharmaceutical Partners of Canada, Richmond Hill, Ontario), 0.2 mg/kg BW, and glycopyrollate (Sandoz), 0.01 mg/kg BW, IM. She was then induced with intravenous ketamine hydrochloride (Ketalan; Bimeda, MTC Animal Health, Cambridge, Ontario), 10 mg/kg BW, and diazepam (Sandoz) (2 mg/kg BW) mixture to effect and was maintained on inhalant isoflurane. Cefazolin (Novopharm, Toronto, Ontario), 22 mg/kg BW, IV was given peri-operatively as a prophylactic antibiotic.

At surgery, a dorsal approach was made to L6/L7. A dorsal laminectomy was performed preserving the articular facets. This confirmed the presence of a broad-based left lateralized bulging disc impinging on the cauda equina within the spinal canal and causing compression of the L6 ventral spinal nerve root on exiting the spinal canal. The bulging annulus fibrosis of the L6/L7 disc was excised with sharp dissection using a #11 scalpel blade using a standard technique from within the spinal canal. The multifidus lumborum muscle was elevated and retracted laterally to expose the L6-L7 foramen. Once the L6 nerve root was dissected free of local soft tissue, a left-sided lateral foraminotomy was performed using a pneumatic high-speed surgical burr as described by Gödde and Steffen (3). Following the foraminotomy, the nerve root was tractioned caudally few millimeters demonstrating decompression. An autogenous fat graft was placed over the laminectomy site and the surgical site was closed in the standard manner. Analgesia was provided with a morphine (morphine sulfate; Sandoz), 1 mg/kg/h, lidocaine (lidocaine hydrochloride; Ayerst Vet Lab, Guelph, Ontario), 20 μg/kg/min and ketamine (1 mg/kg/min) continuous rate infusion and meloxicam (Metacam; Boehringer Ingelheim, Burlington, Ontario), 0.1 mg/kg, SID with hydromorphone (0.1 mg/kg) given intravenously for breakthrough pain. Three days postoperatively the left pelvic limb lameness had resolved and the lumbosacral pain was much improved. Kennel confinement and meloxicam oral therapy were continued at home and at re-examination, 2 wk postoperatively, the dog was ambulatory and non-painful with no neurologic deficits. At 6 mo and 1 y post-operatively the dog did not have any return of her presenting clinical signs.
Lumbosacral disease is a relatively common diagnosis for large breed dogs, especially German shepherd dogs, exhibiting back pain and neurologic dysfunction (1–4). Although many factors can contribute, in 1 study of 92 dogs with lumbosacral disease 15 dogs had lumbosacral transitional vertebra (LTV). Dogs with LTV are 8 times more likely to develop lumbosacral disease and often develop this earlier in life especially if the transitional vertebra is asymmetrical (2,5). The incidence of LTV in the general dog population is 3.5% (6) and although there is no gender predilection, male dogs are more likely to develop lumbosacral disease secondary to LTV (2,5). Cocker spaniels are a relatively uncommon breed to have lumbosacral transitional vertebrae though 1 study reports an incidence of up to 4.3%, and concluded that LTV, outside of the German shepherd, is not as commonly linked to cauda equine syndrome (1).

Asymmetric LTV are more likely to have rotation and the vertebra is usually rotated in the sagittal plane towards the side with the shorter sacroiliac attachment with disc protrusion tending to be contralateral (1). The lumbosacral transitional vertebra is classified based on the radiological appearance of the transverse processes. Type 1, or lumbar type, indicates no sacroiliac fusion; type 2, or intermediate, indicates partial fusion but with the tip of the process free; and type 3, or sacral, indicates complete fusion. Most asymmetric LTV are type 1/2 or type 2/1 (1). The dog in our case is unusual compared with other reported cases in that her LTV was type 2/3 (left/right), she was female, a small/medium breed dog, she was clinical for her condition and clinical signs did not appear until later in life.

Lumbosacral transitional vertebrae can predispose to abnormal lumbosacral motion, which can cause sclerosis of the LS endplate, osteophyte formation on the articular facets, hypertrophy of the interarcuate ligament of the annular facet joint capsule, and bulging of the dorsal annulus (5). The lesion causing the clinical signs of lumbosacral disease is always between the last normal lumbar vertebra and the LTV (2). Disc bulging has been reported in clinically normal dogs encompassing up to 43% of the lumbosacral spinal canal (7). When imaged with computed tomography, lumbosacral disease classically demonstrates loss of epidural fat, increased epidural soft tissue opacity, intervertebral disc margin bulging, spondylosis, and thecal sac displacement (4) as seen in this case.

Lumbosacral disease is generally treated surgically when lumbosacral pain is unresponsive to conservative management or neurological deficits are present (8). Generally, surgical decompression of the lumbosacral area is achieved by dorsal laminectomy, with or without annulectomy. Facetectomy with a dorsal or medial extension to the lumbosacral intervertebral foramen has been recommended if foraminal stenosis is noted (3). Lateral foraminotomy has been recently described to give easier access to the nerve root while maintaining stability, and in our opinion, has potential for less iatrogenic damage to the cauda equina (3). Decompressive surgery for lumbosacral disease generally carries a good to excellent prognosis (3,5,8) though urinary or fecal incontinence is a negative prognostic indicator (8). In the present case, surgical decompression was performed using a dorsal laminectomy and the newly described lateral approach foraminotomy (3). Because of the LTV in this patient, the L6 nerve root could be approached in the same manner as described for the L7 foraminotomy.

This case report describes an unusual case in that female cocker spaniels uncommonly have asymmetric LTV especially
with subsequent acute onset lumbosacral disease with L6 radiculopathy later in life. Although an atypical presentation, surgical decompressive therapy was elected and resulted in an excellent outcome.

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**References**