Geriatric Wobblers' and Physiotherapy Management

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Caudal cervical spondylomyelopathy (CSM) is the more correct term for Wobblers' Disease in quadrupeds. Disc-associated cervical spondylomyelopathy is the most common cause of cervical spondylomyelopathy in dogs. In this scenario, one or more disc protrusions, usually impacting C4 – T2, can result in spinal cord compression, and may be exacerbated by ligamentous hypertrophy of the ligamentum flavum on the floor of the spinal canal. While several large and giant breed dogs can be affected, there is a higher than average representation of Doberman Pinschers. This paper will discuss relevant anatomy, traditional veterinary management, and physiotherapy options for conservative management of Wobbler dogs.

Facet Joints in the Canine Cervical Spine

Breit & Kunzel (2002) described four variations of caudal facet shapes in the canine cervical spine (C3 – C7); plane, concave, convex and sigmoid. There is an increased incidence of curved facets at the caudal cervical spine, with large male dogs being most prone to development of concave caudal articular surfaces. Convex and sigmoid facet shapes are an indication of axial rotation ability. The facet joints change shape from plane to curved within the first year of life, at some point after 8 weeks of age. This was taken to be a response to biomechanical stimuli acting on the immature facet joints. Generally, the cervical facet joints are oriented horizontally, which the authors claim to be consistent with a weight-bearing function. Interestingly, in large breeds, the presence of concave caudal facets at C7 was inversely related to the presence of caudal costal fovea (and hence the articulation of rib 1). This study concluded that large breeds are more prone to axial rotation and high degrees of concavity are considered to be risk factors for the development of relative or absolute stenosis of the vertebral foramen and may contribute to misalignment, instability and degenerative changes in the synovial joints and discs.(Breit & Kunzel 2002) The same author reviewed facet shapes of C3 – C7 from the perspective of side bending and flexion-extension in large breeds, small breeds and Dachshunds.(Breit & Kunzel 2004) Large canine breeds tended towards having higher ranges of motion in flexion-extension and lateral bending compared to Dachshunds and small breeds. In small breeds, the ROM in lateral bending was maximal at C3/4, and for large breeds and Dachshunds, the maximum ROM for lateral bending was at C5/6. In all groups of breeds, maximum flexion-extension ROM was noted at C6/7. Because stresses on the annulus are maximal with lateral bending (Voo et al 1997), the risk of disc degeneration hence is higher in large breeds and increases descending down the cervical spine.(Breit & Kunzel 2004)

The Caudal Cervical Spinal Canal

Breit and Kunzel (2001) found that relative to body size, midsagittal and interpedicular diameters of the cranial and caudal aspects of cervical vertebral foramina (C3 – C7) were found to be significantly larger in small breeds than in large breeds and Dachshunds, and also larger in Dachshunds than in large breeds. This condition increases the risk for spinal cord compression resulting from relative stenosis of the cervical vertebral foramina, especially in large dogs, and this is also exacerbated by the typical shape of the vertebral foramina (i.e. dorsoventrally flattened cranially and bilaterally narrowed caudally). The cervical enlargement of the spinal cord (C6 – T1 segments) extends from the middle of the vertebral body of C5 – C7, with a maximum at C6. Thus lesions at C5 – C7 may be more significant as the larger cross-sectional areal of the spinal cord may be impacted. The mean midsagittal vertebral foramen diameter was maximal at C6 in large breeds. In Dobermans, Great Danes, and Rottweilers, it is located more caudally at C7. The cervical spines of Doberman Pinschers were examined by magnetic resonance imaging by da Costa et al (2006a) to determine the pathogenesis of cervical spondylomyelopathy. The incidence of intervertebral disc degeneration and foraminal stenosis in clinically normal Doberman Pinschers was high; implicating that cervical spinal cord compression may be present without concurrent clinical signs. However the CSM-affected dogs had more severe stenosis that was present throughout the cervical portion of the vertebral column. In neutral and traction positions, the intervertebral discs of CSM-affected dogs were wider (an increase in cranio-caudal distance) than those of clinically normal dogs but the amount of disc distraction was similar between groups. A combination of factors (i.e. a relatively stenotic vertebral canal and wider intervertebral discs) distinguished CSM-affected dogs from clinically normal dogs and appears to be a key feature in the pathogenesis of CSM. The intervertebral disc protrusion or extrusion, with or without other associated changes, appeared to be the cause of clinical signs in most CSM-affected Dobermans in this study.

Clinical Features of Wobblers & Neuro-anatomy Rationale

Clinical signs of CSM may hinge on the concept of 'dynamic lesions'. Essentially, a dynamic lesion is one that worsens or improves with different positions of the cervical spine (White 1988). Extension of the neck can create an 'in-folding' of the ligamentum flavum, annulus fibrosus and posterior dura which can reduce the area of the vertebral canal, while simultaneously increasing the area of the spinal cord (daCosta 2010). Thus is makes sense that many dogs will present with a 'head-down' posture. Neck pain or hyperesthesia may also be found (inconsistently however), and may relate to acuity or nerve root involvement.

Proprioceptive ataxia is seen in most dogs with CSM. With lesions affecting the caudal cervical spine, it is common to witness obvious pelvic limb ataxia with milder abnormalities in the thoracic limbs. Thoracic limb signs may range from barely noticeable to short-strided or spastic (pseudo-hypermetria – "floating" gait). Forelimb lameness may be present if nerve root encroachment is also present. Pelvic limb gait is often wide-based, uncoordinated, long-strided, and may demonstrate a sway or scuffing / dragging of rear toes. The relative increase in severity of ataxia of the pelvis limbs as compared to the forelimbs stems from the location of the spinocerebellar tracts within the cervical spinal cord. The dorsal and ventral spinocerebellar tracts, which provide proprioceptive input to the rear limbs, are more superficial as compared to the rostral spinocerebellar tract, which supplies proprioception to the forelimbs. Subsequently hind end ataxia will tend to be seen prior to and more severely than forelimb ataxia. It is also possible to see forelimb lower motor neuron signs as well due to and dependent upon compression of the spinal cord motor bodies and/or nerve roots that supply the forelimbs.

Diagnostics

Manual assessment for CSM incorporates the taking of a history, gait analysis, a neurological examination, palpation of the cervical spine, and active range of motion. Diagnostic imaging for diagnosis of CSM can include may include radiographs, myelography, CT scanning or MRI. It is not within the scope of this discussion to delve into these diagnostics any further.

Surgical or Medical Interventions for the Cervical Spine

Both medical and surgical treatment of CSM are able to improve the clinical conditions of the animal and slow the progression of clinical signs and MRI abnormalities (da Costa & Parent 2007). One study compared the outcome of dogs treated medically and surgically and found that 54% of dogs treated medically improved and 27% were unchanged in a long-term follow-up (da Costa et al 2008). Therefore, the clinical signs of CSM are either improved or stable in 81% of dogs managed medically, and notable was the fact that the owner's impression of quality of life was similar between the two groups (surgically or medically-managed). The median survival time for dogs with CSM treated surgically (36 months) was identical to median survival times for dogs treated medically (da Costa et al 2006a). Medical management may consist of corticosteroids (in particular dexamethasone) or NSAIDs (not to be used concurrently with steroids). It is believed that medical management may slow the progression of spinal changes associated with the disease or allow for remyelination of the spinal cord (da Costa 2010). Additionally, some dogs with CSM may have concurrent hypothyroidism (8 out of 12 in one study), which when treated with thyroid medication, can improve function dramatically in a short period of time (da Costa et al 2006b).

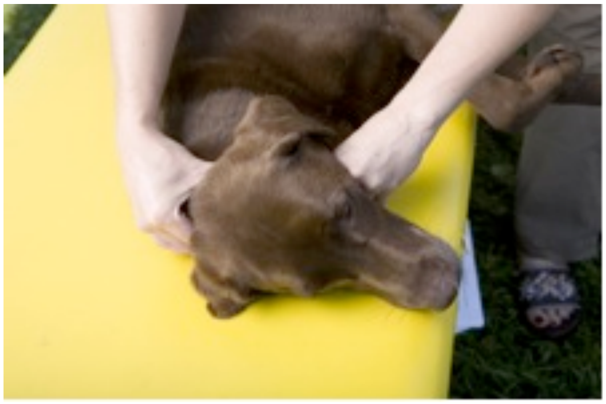
Surgery on the other hand may yield a higher success rate (up to 80%) (da Costa 2010). Surgical options tend to be aimed at decompressing the spinal cord, and may include dorsal laminectomy, dorsal laminoplasty, ventral slot, inverted cone slot, and hemilaminectomy (daCosta 2010). Indirect decompressive techniques include bone grafts of several types, pins (smooth, threaded) or screws and polymethyl methacrylate (PMMA), interbody screws, washers, metallic spacers, metallic plates, plastic plates, k-wire spacer, Harrington rods, interbody PMMA plug, and fusion cage. All of these techniques have been combined either with discectomy or with partial or complete ventral slots (daCosta 2010). Intervertebral disc fenestration has also been used, and more recently, motion-preserving techniques, using disc arthroplasty or artificial disc replacement, have been proposed (daCosta 2010). Decompression by means of a ventral slot procedure however may hasten the development of additional areas of spinal cord compression and lesions in dogs. Ventral slot decompression increases the range of motion of the operated segment, which could cause clinical instability (Koehler et al 2005). As well, catastrophic neurologic injury can occur if an internal fixation and arthrodesis procedure inadvertently excludes an adjacent unstable segment (Whitehill et al 1987).

Physiotherapy Management

At the Canine Fitness Centre we have been fortunate to successfully manage several dogs affected with CSM for several years / the remainder of their lifetime. We feel that it is important to advocate for appropriate pharmaceutical prescription (i.e. corticosteroids OR NSAIDS + and adjunctive pain medication), however, the treatments described next will focus on physiotherapeutic interventions.

The physiotherapy treatments prescribed centre around traction & gentle mobilizations to enhance blood flow in and around the cervical spine and discal herniation/extrusion area. In humans, it has been found that exposure of herniated disc material in the cervical spine to the vascular environment of the epidural space contributes to its resorption and/or regression. Large extruded discs have wider exposure to resorption mechanisms and tend to regress more rapidly. The response to early therapeutic intervention in cases where there is a large extruded disc is therefore more favourable (Constantoyannis et al 2002; Malanga & Nadler 1999) . This is a technique that we prescribe as part of the home program for the owner to do with the dog. Detailed instruction must be given.

Utilizing human and animal research, mobilizations have been shown to aid in pain relief for spinal or joint conditions. The neurophysiological effects of mobilizations are reportedly a reduction in acute pain and inhibition of reflex muscle contractions (Zusman 1986; Katavich 1998; Björnsdóttir & Kumar 1997; Zelle et al 2005). The achievement of neurophysiological effects requires repetitive (oscillatory) or sustained manual stimulation which results in a hysteresis effect. The hysteresis effect involves inhibition of low threshold mechanoreceptors (group I & II), inhibition of high threshold nociceptors (group III & IV), both of which result in a reduction of intra-articular pressure and peripheral afferent discharge (Zusman 1986; Katavich 1998; Conroy & Hayes 1998; Sterling et al 2001). Mobilization technique selection for disc lesions in humans tends to incorporate rotational components (Maitland et al 2005). The positive effects with this technique may be due to the oblique orientation of the annular rings of the disc, and a gentle stretching effect that rotation would impart at on these structures.



Neck traction in lateral recumbency. Note the hand under the chin just stabilizes – but does not push. Relaxation is imperative.

Neck traction in sternal recumbency. Note the dog needs to relax his head down to the floor / bed in order for the traction to be effective.

We also utilize laser therapy for its effectiveness with spinal pain. Chow et al (2009) performed a meta-analysis of the existing research and reported the optimal dosages that yield favourable results for pain relief. She reported that the data from the reviewed trials suggested that positive effects were immediate and could be maintained for up to 3 months after treatment ended. As well, post-operative low power laser irradiation enhances axonal sprouting and spinal cord repair, improves recovery after injury, and when applied directly to the spinal cord can improve recovery of the corresponding injured peripheral nerve (Rochkind et al 2001; Byrnes et al 2005; Rochkind et al 2002).

Electro-acupuncture may also be beneficial in Wobbler dogs (Sumano et al 2000), and has been reported to be effected in IVDD cases in the thoraco-lumber region (Joaquim et al 2010). Another study reported only a 50% improvement in dogs with Wobbler syndrome (Joaquim and Luna 2010), therefore we tend to use it judiciously at the Canine Fitness Centre for these cases, if at all.

At the Canine Fitness Centre, all treatments for dogs with neurologic injuries are done on a pulsed electromagnetic field mat. While literature on this modality is sparse, at least one paper has found that exposure to pulsed magnetic field enhances motor recovery in cats after spinal cord injury. (Crow et al 2003) We have also found microcurrent stimulation to be useful for patients with pain. We find this choice to be justified by the Tan et al (2006) study that found that microcurrent delivered via ear clips (alternately known as cranial electrotherapy stimulation) was shown to significantly decrease daily pain intensity for persons with chronic pain secondary to a spinal cord injury.

Gentle, non-harmful, easy exercise is imperative to healing and re-establishment of neural pathways. Once the animal is no longer painful or minimally painful and has safe motor functioning, then a walking program should commence. Owners are advised to discontinue use of a neck collar in favour of a body harness to control their animal. Walking may be done on land if able, or in a water treadmill if the limbs are weak and buoyancy would be of benefit. When safe to do so, animals can next begin co-ordination retraining to help build balance and proprioceptive function. Tasks such as walking through weave poles, over obstacles, balancing on a raised plank of wood, backing up, and sideways walking may be incorporated into an exercise regimen to stimulate coordination training when in the dog is no longer acute and has progressed into a recovery stage.

From a long-term perspective, we have seen numerous dogs with presumed caudal cervical spondylomyelopathy with a) neck pain, b) neurological deficits, c) both. We have managed to keep these dogs comfortable and functional for several years after initial referral and presentation for symptoms. Often times, owners are shown how to manage their dogs with traction, and to return for treatment sessions as necessary if symptoms flare over the years. These dogs can be very rewarding to treat conservatively.

Conclusion
Physiotherapy management should be a part of recovery or longer-term management for all dogs with cervical spondylomyelopathy. This paper has attempted to give suggestions for a broader selection of conservative treatment options based on evidence within the literature as well as clinical findings in a busy canine rehabilitation practice. Further research is needed to validate the physiotherapeutic suggestions presented.

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