

## APPROACH TO PATIENTS WITH SPINAL PROBLEMS

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The neurologic examination is the most important tool in the diagnostic evaluation of patients with spinal disease. The neurologic examination allows lesion localization, which is key for a successful neurologic work up. The main components are evaluation of mental status and behavior, gait and posture, postural reactions, cranial nerves, spinal reflexes, palpation, and pain perception. It is very important to be aware that older dogs frequently have concurrent orthopedic and neurologic diseases.

Before handling the patient, let the patient have the run of the examination room, if ambulatory, and observe the patient's reaction to the surroundings.

### Gait and posture evaluation

Ataxia, paresis, and paralysis are clinical signs commonly seen in various diseases of the brain, spine, and peripheral nerves. The main difference between ataxia and paresis is that ataxia affects coordination without affecting strength, while paresis affects only strength. These clinical signs provide fundamental information for lesion localization. There are three types of ataxia, namely *proprioceptive*, *cerebellar*, and *vestibular*.

Vestibular ataxia is the easiest to recognize. Vestibular ataxia is characterized predominantly by a head tilt. Usually the side of the head tilt indicates the side of the lesion.

Cerebellar ataxia is characterized by dysmetria (inability to control the rate and range of stepping movements), which is usually manifested by hypermetria (exaggerated step). It is normally easier to recognize a hypermetric gait in the thoracic limbs.

Proprioceptive ataxia is the type primarily related to spinal cord diseases. This ataxia can be differentiated from vestibular and cerebellar ataxias by the absence of head involvement. Clinical signs seen with proprioceptive ataxia are truncal sway (wobbliness) and abnormal limb stance and gait such as circumduction, abduction, or adduction with the limbs crossing with each other as the animal walks. Some animals also display a delay in initiating the protraction phase of the gait with a slight hyperflexion of the limb and a longer stride than normal.

Paresis means partial loss of motor function, which is usually manifested as weakness. Paralysis (plegia) refers to the complete loss of motor function. The terms *plegia* or *paresis* can be used in association with a prefix to specify which limb(s) are involved. Tetra-, para-, hemi-, or mono-paresis/-plegia refers to involvement of all four limbs, pelvic limbs, ipsilateral limbs, or a single limb, respectively. It is important to make the distinction between ambulatory and non-ambulatory paresis and plegia. A "down" dog can have non-ambulatory paraparesis and if appropriate treatment is established, dogs with paresis will typically recover faster than those with paralysis (plegia). Paresis and proprioceptive ataxia are common signs in patients with spinal cord diseases. The more severe the spinal cord involvement, the weaker the patient becomes, until the point of paralysis.

### Postural reactions

Postural reactions test the same neurologic pathways involved in gait, namely the proprioceptive and motor systems. Their main value is detecting subtle deficits or inconspicuous asymmetry that may not be obvious during the observation of gait. Postural reactions are also

useful in discriminating between orthopedic and neurologic disorders. Frequently it is only necessary to perform two postural reaction tests, proprioceptive positioning and hopping. It is very important to properly support the patients weight to detect proprioceptive deficits.

### **Spinal reflexes**

Spinal reflexes assess the integrity of the sensory and motor components of the reflex arc and the influence of descending UMN motor pathways. Several reflexes have been reported but many are very unreliable. The following spinal reflexes are consistently observed in most dogs and cats and should always be tested: muscle tone, patellar, flexor, perineal and cutaneous trunci reflexes. Lesion localization can be effectively achieved performing only these reflexes.

It is important to only perform tests that can be perceived as uncomfortable to the patient last, as it is important to have their cooperation to properly perform testing of spinal reflexes. It is recommended to start with assessment of muscle tone, proceed with myotatic reflexes next (patellar reflex), and leave the flexor (withdrawal) reflexes last. It is also recommended to begin testing the pelvic limbs before testing the thoracic limbs. The perineal reflex and cutaneous trunci reflex are the last reflexes tested.

### **Palpation and sensory evaluation**

Light palpation helps detect swelling or atrophy. Light palpation is also useful to evaluate the vertebral column for areas of luxation or crepitus. Deep palpation and manipulation detect painful regions. If crying, whimpering, or muscle tensing occur on palpation, more vigorous maneuvers, such as manipulation, are unnecessary and may be dangerous in patients with unstable fractures or luxations.

It is important, especially in nonambulatory patients, to determine whether or not noxious stimuli applied to the limbs are traversing the damaged segment of spinal cord to reach the brain for conscious perception. The presence or absence of deep pain perception is important in assessing prognosis for recovery. It is critical not to confuse reflex withdrawal with conscious perception. As a rule of thumb, perform this test watching the head of the patient for reaction. As long as the patient does not have a LMN injury, a flexor reflex will always be present. The key point is to see a conscious behavioral response involving head movement or vocalization.

The task of performing a neurological examination can be very intimidating. An important concept to keep in mind is that it is more important to perform fewer tests with correct technique, than several tests with a sloppy technique.

Once the neurologic examination is completed, the next step is to localize the lesion to either the brain, spinal cord or peripheral nerves. In the spinal cord, lesions are typically localized to 4 main spinal cord segments: C1-5, C6-T2, T3-L3 (the most frequently affected site), and L4-S3.

### **Differential Diagnosis**

When approaching a case with spinal problems, the simplest approach, once the lesion is localized, is to consider differential diagnoses using the acronym lists based on pathophysiologic mechanisms. These acronyms are called either VITAMIN-D or DAMNIT-V and are very useful and practical ways to approach neurological diseases.

When using this acronym, it is useful to consider the signalment and history to develop appropriate differential diagnoses for the patient. For example, even though intervertebral disc disease is the most common spinal disease of dogs, it is not a reasonable differential diagnosis for a 6-month old dog with chronic paraparesis. Some generalities should be considered when

using the VITAMIN-D acronym. Young dogs are more likely to have congenital or inflammatory conditions. Acute presentations are usually caused by vascular or traumatic conditions. Chronic presentations are usually seen with degenerative or neoplastic processes. Another way to approach patients with spinal diseases is to develop a list of diseases that are known to affect specific spinal regions. This is useful because although many diseases affect several spinal regions (e.g. intervertebral disc disease, discospondylitis, fibrocartilagenous embolic myelopathy), many are region specific (e.g. atlantoaxial instability, cervical spondylomyelopathy, degenerative myelopathy in the earlier phases).

Once the list of differential diagnoses is prepared for the patient, the most probable causes should be ruled-in or ruled-out based on appropriate diagnostic tests. It is recommended to always perform survey radiographs (always obtaining orthogonal views). If nothing is found on radiographs, then magnetic resonance imaging, computed tomography, myelography or cerebrospinal fluid should be used to rule-in or out the differential diagnoses.