

FUNDAMENTAL OF NEUROLOGIC EXAMINATION NEUROLOGIC EXAMINATION MADE EASY!

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The neurologic examination is the most important tool in the diagnostic evaluation of patients with neurologic 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.

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. Mental status should be evaluated both in terms of level and content of consciousness. Abnormal behavior is identified by comparing the patient's behavior to expected behavior for animals of a similar breed and age.

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. Proprioceptive ataxia is a phenomenon of the spinal cord's white matter, reflecting a dysfunction of the sensory tracts carrying unconscious proprioception (dorsal, ventral, and cranial spinocerebellar tracts, as well as the cuneocerebellar tract). 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.

Cranial nerves

There are 12 pairs of cranial nerves, but not all of them are tested. We use reflexes and reactions to assess the most important functions of the cranial nerves.

The menace response evaluates the ipsilateral optic and facial cranial nerves, as well as the ipsilateral cerebellum (ipsilateral) and the contralateral forebrain (thalamocortex). The pupillary light reflex tests the sensory function of the optic nerve and the parasympathetic function of the oculomotor nerve. Both eyes need to be tested and the direct and consensual reflexes are evaluated. The vestibulo-ocular or oculocephalic reflex evaluated the sensory function of the vestibulocochlear nerve, and the motor function of cranial nerves III, IV, and VI (oculomotor, trochlear and abducent, respectively). The position of the eyes is also evaluated for nystagmus or strabismus. The trigeminal nerve is tested with the palpebral reflex (sensory function of the trigeminal nerve and motor function of facial nerve), palpation of the masticatory muscles (motor function of the trigeminal nerve), and nasal sensation, that tests the sensory function as well as the thalamocortical response to the noxious stimulus. Cranial nerve VII (facial nerve) is evaluated by assessing the muscles of facial expression looking for evidence of asymmetry (“droopy” facial expression). The facial nerve is also tested in the menace response and palpebral reflex. The vestibulocochlear nerve is evaluated by looking at the posture of the head, a head tilt is a consistent sign of vestibular disease.

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.