The neurological examination is an important step in identifying if a patient’s problem is neurological (versus medical or orthopedic) and where in the nervous system the problem is located. This is a necessary process that allows you to consider the differential diseases that may underlie the problems and formulate a diagnostic plan.

The neurological examination can be broken down into several sections, which should be followed in a logical order. Performing the evaluation in the same pattern each time enables clinicians to quickly go through the steps without skipping major areas of examination. The first part of the examination begins with the history. It is important to find out when the problem occurred, how it first presented, how it has progressed, and any treatments along with the responses to the treatments. The next step is the general physical examination, as neurological disease may be one symptom in a larger medical problem (such as seizures resulting from liver failure). It is also important to assess a patient’s general health, as many of the neurological diagnostic tests will require general anesthesia. The first part of the examination is the neurological exam. This, too, should be divided into sections: Mentation, Posture and Gait, Cranial Nerves, Proprioception, Spinal Reflexes, and Sensory/Pain Perception.

MENTATION can initially be assessed while taking the history. You should observe how the patient interacts with the owner and the environment. Abnormal mentation may be described as dull or depressed, disoriented, stuporous, or comatose.

It is important to clarify what is meant by each term used to describe mentation:

- **Depression**: Lethargy with decreased activity but normal mental status
- **Obtundation**: Dull mentation with decreased consciousness and response to mild stimulus
- **Stupor**: Decreased consciousness and response only to noxious stimulus
- **Coma**: Unconscious and no response to even noxious stimulus
- **Decerebrate rigidity**: Extensor rigidity of all limbs; secondary to severe cortical/midbrain lesion; patient usually comatose
- **Decerebellate rigidity**: Extensor rigidity of the thoracic limbs with flexion of pelvic limbs and dorsal extension of the head; associated with acute cerebellar lesions including herniation

The animal’s POSTURE AND GAIT can be assessed while the patient is walking into an exam room, or outside before the animal is handled physically.

Some of the more commonly used terms that you should be familiar with are listed below:

- **Ataxia**: Incoordination during voluntary movement. Typically described as “cerebellar,” “vestibular,” or “proprioceptive” in nature.
  - Cerebellar ataxia = abnormal rate, range, or force of movement with intact strength
  - Vestibular ataxia = loss of balance; animal often lists or falls to one side
  - Proprioceptive ataxia = decreased awareness of limb position and often results in scuffing of toes, crossing of limbs, and standing on the dorsum of paws
- **Paresis**: Weakness; loss of power of voluntary movement
- **Plegia**: Paralysis; complete loss of voluntary movement
- **Mono-**: One limb affected
- **Hemi-**: Both limbs on one side of the body affected
- **Para-**: Both pelvic limbs affected
- **Tetra-**: All four limbs affected

CRANIAL NERVE EVALUATION. There are 12 cranial nerves and several tests that are used to evaluate the function of each nerve. In general, it is easier to remember the tests rather than list all 12 nerves and try to test them sequentially.
**Facial symmetry:** The trigeminal nerve’s maxillary branch innervates the muscles of mastication, and severe atrophy of the temporalis and masseter muscles, or a “dropped jaw” from weakness may be seen with injury to this nerve. The facial nerve innervates muscles of facial expression, and facial nerve paralysis can lead to drooping of the lip or eyelid on the affected side.

**Facial sensation:** The trigeminal nerve is responsible for facial sensation, and all branches (eyelids, lips, jaw) should be evaluated for response to touch. This SENSATION is separate from facial expressive muscle evaluation.

**Facial expression:** The facial nerve innervates the muscles that move the muzzle and eyelids. Pinching the lip near the canine tooth should produce a “snarl” response. Touching the lateral and medial canthus of the eye should result in a blink (the palpebral reflex).

**Ocular position:** Loss of the oculomotor nerve input to skeletal muscles of the eye causes ventrolateral strabismus. The pupil will appear to look down and out to the side of the head (“down and out”). Loss of the trochlear nerve to the dorsal oblique muscle of the eye causes a dorsomedial rotation of the pupil that is difficult to see in dogs (round pupils). This is a rare problem, but can be noted in cats (oblong pupil) or with retinal vessel examination in dogs. The pupil will appear to rotate so the top is turned away from the bridge of the nose. Loss of abducent innervation to the lateral rectus muscle can cause medial deviation of the eye. This will make a patient look “cross-eyed.”

**Ocular nystagmus:** Physiological nystagmus (“doll’s eye” or rapid eye movement) can be observed when turning the head from side to side. The pupils will appear to flicker, and the fast phase should be in the direction of the head turn. Any loss of this normal movement should be noted. Any spontaneous nystagmus which occurs despite the head being at rest is abnormal and should be noted. Vertical nystagmus, where the pupils move up and down, implies a central nervous system location of the vestibular lesion. Horizontal (side to side) and rotary may be seen with peripheral or central vestibular disease. Also observe the patient for development of nystagmus when elevating the head, or positioning the patient on its back.

**Menace response:** Not a true reflex but a learned response, this test evaluates vision (optic nerve), cerebrum, cerebellum, and the facial nerve. It may not be present in animals less than 12 weeks old.

**Pupillary light reflex:** Shining light in one eye and assessing the papillary constriction in both eyes evaluates the retina, optic nerve, brainstem pathways, and parasympathetic fibers of the oculomotor nerve.

**Gag reflex:** A finger or metal gag instrument (safer) is placed at the base of the tongue/throat and the animal is evaluated for the ability to gag/swallow (vagus and glossopharyngeal nerves). The symmetry of the tongue and the ability to move it (hypoglossal nerve) are also evaluated. Use caution in animals with potential for rabies exposure or questionable vaccination history.

**PROPRIOCEPTION.** These tests evaluate the awareness of position of the body independent of vision. Paw placing tests (on the floor or against a table with small dogs) and hopping are the primary evaluators of this system. Animals with severe muscular weakness may also have difficulty with these tests despite intact proprioception, so strength should be evaluated separately from these tests.

**SPINAL REFLEXES.** Reflexes do not involve conscious awareness of the stimulation. Rather, they are an evaluation of peripheral nerve function and local spinal cord segments. Segmental spinal reflexes are graded on a scale of 0–4. 0 is used to describe an absent reflex, 1 indicates a reflex that is present but markedly decreased from normal, 2 indicates a normal reflex, 3 indicates hyperreflexia, and 4 indicates that clonic activity (continual repetitive response to a mild stimulus) is noted.

**Pelvic limb:**
- Patellar reflex: Evaluates the femoral nerve (L4-6)
- Cranial tibial reflex: Evaluates the peroneal nerve (L6-S1)
- Gastrocnemius reflex: Evaluates the tibial nerve (L7-S1)
- Flexor withdrawal: Evaluates the sciatic nerve (L6-S1)

**Thoracic limb:**
- Biceps reflex: Evaluates the musculocutaneous nerve (C6-C8)
- Triceps reflex: Evaluates the radial nerve (C7-T2)
- Extensor Carpi Radialis reflex: Evaluates the radial nerve (C7-T2)
- Flexor withdrawal: Evaluates multiple nerves (musculocutaneous, axillary, radial, median, ulnar)

Other reflexes evaluated include the perineal reflex and cutaneous trunci reflex. The perineal reflex involves stimulation of the anus or perianal region. The normal response (from pudendal and caudal nerves) is contraction of
the anal sphincter. Anal sphincter tone can also be assessed while taking a patient’s rectal temperature. The cutaneous trunci reflex involves pinching the skin in the paralumbar and parathoracic region (T1-L4) with fingernails or hemostats to elicit a bilateral skin twitch.

**SENSORY/PAIN PERCEPTION.** Palpation is used to evaluate conscious awareness of sensation. Palpation of each vertebral segment of the spine, as well as the lumbosacral junction and tail base, can be used to look for pain from disc disease, joint inflammation, bone or joint infection, disc infection, bone fractures, neoplasia, or meningitis. Movement of the head and neck in the normal vertical and horizontal range of motion can elicit pain from cervical lesions that may not be elicited with direct palpation.

Superficial and deep pain of the limbs can be assessed by pinching the toes (superficial sensation) or the pad/bone (deep sensation) and obtaining a CONSCIOUS response. The animal may pull its limb away as in the withdrawal reflex, but it must also indicate conscious awareness by turning the head, vocalizing, or showing pupillary dilation and elevated heart rate in animals that cannot turn or vocalize. It is very important to distinguish this response from the withdrawal reflex described above.

**Hyperesthesia:** increased sensitivity to sensory stimulus

**Hypalgesia:** decreased sensitivity to pain

**Analgesia:** absent pain perception

The neurological examination is a tool to help confirm and localize nervous system injury. Evaluating all components of the exam, including physical appearance/symmetry, gait abnormalities, cranial nerve dysfunction, abnormal sensation, and abnormal reflexes, can help localize disease and assist in creating a differential diagnostic list and diagnostic plan. It is important to understand all of the components of the neurological exam and the terminology used in order to effectively communicate with owners, other members of the staff, practitioners, and referral institutions to ultimately enhance the quality of care provided in your practice.

**References**