The Neurologic Examination

Cheryl L. Chrisman, DVM, MS, EdS, Diplomate ACVIM (Neurology)

The neurologic examination is a series of observations and tests done to answer the following four questions:

- Is a lesion in the nervous system present?
- Where is the lesion located (focal or multifocal)?
- How severe is the lesion?
- Is the disease worsening, improving, or staying the same? (serial neurologic examinations)

What You Will Need

The equipment necessary to perform the neurologic examination includes a penlight, a percussion hammer, and a pair of hemostatic forceps. A neurologic examination form (a sample may be downloaded from www.cliniciansbrief.com) may be useful to ensure that all observations and tests are done and that the results are recorded for future reference.

STEP BY STEP HOW TO PERFORM A NEUROLOGIC EXAM

INITIAL OBSERVATIONS & CRANIAL NERVES

1. Initial observations. Mentation, head posture, and coordination and function of some cranial nerves can be directly observed. The animal will sniff and eat if the olfactory nerves (CN1) are functional and will avoid objects in a strange environment if the optic nerves (CN2), optic tracts, and occipital cortex are intact. By observing reactions to sounds while the animal is sleeping, hearing (the cochlear nerves [CN8]) can be evaluated.

2. Menace response. To evaluate the menace response, advance the hand toward the eye. A blink should be observed, indicating that CN2, the facial nerves (CN7), and their connections in the brain and brainstem are functional.

3. Pupillary light reflex. Shining a light into one pupil causes constriction of the pupil tested (direct pupillary light reflex) as well as the opposite pupil (indirect pupillary light reflex). This test evaluates CN2, the oculomotor nerves (CN3), and their brainstem connections.

continues...
Positional strabismus. When the nose is elevated, the position of the eyeballs should be level if CN3, CN4, CN6, the vestibular nerve (CN8), and their brainstem connections are normal. Positional strabismus (usually manifested as a ventral deviation of the eyeball on one side) is an abnormal finding.

Temporal/masseter muscles. Palpate these muscles for atrophy. Muscle atrophy indicates a lesion of the motor portion of the trigeminal nerves (CN5), the associated brainstem region, and the muscles themselves.

PROCEDURE PEARL
Pupil size and symmetry, eyelid aperture, and the position of the third eyelid are affected by CN2, CN3, and sympathetic innervation to the eyes.

Physiologic nystagmus. Move the head to the left, right, up, and down. Two to three rhythmic beats of the eyeballs should be observed with a fast phase in the direction of the movement (normal physiologic nystagmus). This tests the function of CN8 and associated structures in the caudal brainstem and cerebellum.

Swallowing. Induce swallowing by external or internal palpation of the pharynx to evaluate the glosopharyngeal nerves (CN9) and vagus nerves (CN10).

Trapezius muscle. Palpate the trapezius muscle for atrophy. If atrophy is present, the patient may have a lesion of the accessory nerve (CN11) or caudal brainstem.
GAIT EVALUATION

7 Jaw tone and range of motion. Open the jaw to evaluate muscle tone and range of motion. Reduced muscle tone indicates a lesion of the motor portion of CN5 and the associated brainstem region. Reduced range of motion usually indicates muscle disease.

PROCEDURE PEARL
Reduced range of motion usually indicates muscle disease.

8 Palpebral reflex, aural reflex, and buccal reflex. Touch the palpebrae, tickle the ears, and pinch the lips to elicit movement of these structures to evaluate the three branches of the sensory portion of CN5, the motor portion of CN7, and their caudal brainstem connections.

PROCEDURE PEARL
Hemistanding and hemiwalking (standing and walking on one side) isolates the left and right sides to determine if one side is less coordinated or weaker than the other.

12 Tongue. Observe the tongue for appropriate movement and strength, and palpate it for atrophy or hypertrophy (muscle disease) to evaluate the hypoglossal nerve (CN12) and caudal brainstem.

13 Hemistand and hemiwalk. Evaluate the gait during walking, trotting, and galloping and while turning the patient to the left and right. Hemistanding and hemiwalking (standing and walking on one side) isolates the left and right sides to determine if one side is less coordinated or weaker than the other. Pushing down on the shoulders and hips and observing the resistance to this pressure can also evaluate strength.

POSTURAL REACTIONS

8 Palpebral reflex, aural reflex, and buccal reflex. Touch the palpebrae, tickle the ears, and pinch the lips to elicit movement of these structures to evaluate the three branches of the sensory portion of CN5, the motor portion of CN7, and their caudal brainstem connections.

PROCEDURE PEARL
Hemistanding and hemiwalking (standing and walking on one side) isolates the left and right sides to determine if one side is less coordinated or weaker than the other.

14 Wheelbarrow thoracic limbs and wheelbarrow pelvic limbs. Support the animal while making it stand and walk, first on the thoracic limbs and then on the pelvic limbs. The wheelbarrow test can detect subtle deficits in coordination, strength in the thoracic and pelvic limbs, and whether one side is less coordinated or weaker than the other.
POSTURAL REACTIONS (cont.)

15 Hopping. With support, have the animal stand and hop (hopping test) on each limb individually to detect subtle deficits in limb coordination, strength, and whether one limb is more uncoordinated or weaker than the others.

16 Conscious proprioception. Individually knuckle the paw of each limb onto its dorsum. It should immediately return to the correct position if conscious proprioception is normal.

17 Biceps reflex. Place a finger on the biceps tendon and percuss the finger. A brief elbow flexion indicates a normal biceps reflex (C6–C8). The response can be subtle in healthy dogs and cats.

18 Triceps reflex. Place a finger on the triceps tendon and percuss the finger. A brief elbow extension indicates a normal triceps reflex (C7–T2). The response can be subtle in healthy dogs and cats.

19 Extensor carpi radialis muscle reflex. Directly percuss the muscle. A brief extension of the carpus indicates a normal extensor carpi radialis muscle reflex (C7–T2).

20 Withdrawal reflex. Pinch the toe with fingers or forceps. Flexion of all thoracic limb joints indicates a normal withdrawal reflex (C7–T2). Pain is present if the animal turns to look, cries, or growls.

21 Crossed extensor reflex. When the withdrawal reflex is elicited, there should be no obvious extension of the opposite limb; such extension is a crossed extensor reflex, indicating a lesion between the brain and C5.

SPINAL REFLEXES

The anatomical components of each spinal reflex are specific peripheral sensory nerves, spinal cord segments, motor peripheral nerves, and muscles (indicated in parentheses below). All components must be functional for the spinal reflex to be present. A depressed or absent spinal reflex indicates a lesion in the specific region of the spinal reflex tested. An exaggerated spinal reflex often means a lesion is present somewhere between the brain and the spinal reflex tested.

Thoracic Limb Reflexes
Pelvic Limb Reflexes

22 **Patellar reflex.** Percussing the patellar tendon and observing a brief extension of the stifle joint indicates a normal patellar reflex (L4–L5).

23 **Gastrocnemius muscle reflex.** Grasp the gastrocnemius muscle between the thumb and forefinger and percuss the thumb. A brief hock extension indicates a normal gastrocnemius muscle reflex (L6–S2).

24 **Cranial tibial muscle reflex.** Percussing the cranial tibial muscle directly and observing a brief flexion of the hock indicates a normal cranial tibial muscle reflex (L6–S2).

25 **Sciatic nerve reflex.** Place a finger over the sciatic nerve in the sciatic notch and percuss the finger. Brief extension of the hip, stifle joint, and hock indicates a normal sciatic nerve reflex (L6–S2).

26 **Withdrawal reflex.** Pinching the toe with fingers or forceps and observing flexion of the joints of the pelvic limb indicates a normal withdrawal reflex (L7–S2). Pain is present if the animal turns to look, cries, or growls.

27 **Crossed extensor reflex.** Extension of the opposite limb when the withdrawal reflex is elicited is a crossed extensor reflex, which is seen with a lesion between the brain and L5.

**PROCEDURE PEARL**

Pain is present if the animal turns to look, cries, or growls when the toe is pinched.

28 **Anal reflex.** Pinching the perineal area with a finger or forceps and observing contraction of the anal sphincter indicates that the anal reflex (S1–S3) is present. If the tail simultaneously pulls down, this indicates the anal/caudal reflex (S1–Cd5) is present. The anal reflex can also be elicited by rectal palpation.
**Step by Step: How to Perform a Neurologic Exam**

**Other Examinations**

29. **Babinski’s sign.** Scrape the tip of the percussion hammer proximally on the metacarpal and metatarsal bones to elicit slight flexion of the digits. Extension of the digits is a positive Babinski’s sign and indicates a lesion somewhere between the brain and C5 (thoracic limb) or the brain and L5 (pelvic limb).

30. **Limb muscle atrophy.** Atrophy of the limb muscles is detected by palpation and observation. Muscle atrophy often indicates a lesion of the specific nerves to that muscle.

31. **Cervical muscle palpation.** Deeply palpate cervical muscles to detect evidence of neck pain (will induce muscle spasms, crying, or growling).

32. **Neck range of motion.** A limited range of motion could indicate that the neck is painful and may induce muscle spasms, crying, or growling.

33. **Back pain.** Back pain may be elicited by palpating the paravertebral muscles; pain may result in muscle spasms, crying, or growling.

34. **Cutaneous trunci muscle response (panniculus).** Pinching the skin with hemostatic forceps and observing contraction of the cutaneous trunci muscles indicates a normal cutaneous trunci muscle response (T2–L5). Superficial sensation is observed if the animal turns to look, cries, or growls.

**Procedure Pearl**

Extension of the digits is a positive Babinski’s sign and indicates a lesion somewhere between the brain and C5 (thoracic limb) or the brain and L5 (pelvic limb).

Acknowledgments: In memory of my beloved whippet, “Solo” Windsome’s A Simple Twist of Fate, 1993-2005, the model in the photographs. The author thanks Mark Hoffenberg for the photography.