

FELINE NEUROLOGY, PART I: EXAMINATION AND LOCALIZATION

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Neurology can be a complicated and frightening subject for the general practitioner. However when approached systematically, neurological disease can be quite predictable. The importance of developing a routine when approaching the neurological patient cannot be overemphasized. While the same basic principles will apply regardless of the species being evaluated, cats pose a particular challenge given their inherent resistance to handling. Fortunately, there are several modifications to the basic neurological examination that can be used to facilitate the process.

A thorough understanding of the neurological examination will allow the practitioner to recognize clinical signs of neurological disease, and distinguish neurological disease from musculoskeletal disease or signs of dysfunction of other body systems that may resemble neurological disease. Once a patient is determined to be neurologically abnormal, the practitioner can then further localize that lesion to the brain, a functional segment of the spinal cord, the peripheral nervous system, or diffuse/multifocal disease.

There are of course a few caveats to consider. Animals with neurological disease may be normal when examined. Neurological signs reflect the location of the disease and not the underlying etiology. Furthermore, animals may have abnormalities on their examination that are not truly neurological in nature. Cats in particular are offenders for the latter. Routinely practicing the neurological examination will help the practitioner appreciate the variability in normal responses and thus better recognize true abnormalities. A localization and list of differentials can then be created.

The age of the patient will often help prioritize the list of differential diagnoses. While breed specific conditions are more prevalent in dogs, there are a few feline specific considerations. Good history taking is paramount, especially with the feline patient, with which examination may be limited. Key points will include the rate of onset and progression of signs, relationship to other events, whether the patient is painful or not, and any response to current or previous therapies.

The neurological examination is an extension of the physical examination, not its replacement. Proper examination will require both time and patience. This can be another hurdle in today's busy practice. Consider scheduling additional time for patients with a presenting complaint that suggests a neurological problem, or hospitalizing these patients for the day such that examination can be performed in segments as time (and the patient) permits.

THE NEUROLOGICAL EXAMINATION

1. General Observations or the “Hands-Off” Examination

The first, and arguably most important, part of the examination involves simply observing the patient. The ideal environment is a quiet room with ample space and appropriate flooring. There are times, especially with the feline patient, when the distance examination is the only portion of the neurological examination that can be completed. Remember to look for both abnormal behaviors and the absence of normal behaviors.

Mentation

Observe the patient to develop a general impression of the level of consciousness as well as the quality of behavior. Changes in level of arousal often indicate brainstem disease, while changes in the character of the patient’s behavior often reflect forebrain disease. *Obtundation* describes a dull mentation and/or abnormal interaction with the environment. This can include pacing, circling, and compulsion. *Stupor* describes a patient unresponsive to all but noxious stimuli. *Coma* refers to a lack of response to all stimuli. It is not uncommon for cats to be quiet and minimally interactive in a hospital setting. A patient that was once fractious and is now easy to handle may also be neurologically inappropriate. The owner is usually the best judge of subtle behavior changes.

Gait

In quadrupeds, the majority of gait generation originates in the brainstem. While a patient with forebrain disease may exhibit alterations in gait, they generally remain ambulatory. *Paresis* refers to decreased voluntary movement while *plegia* refers to absent voluntary movement. These terms should not be confused with *weakness* or a lack of strength. *Ataxia* refers to a lack of coordination and can further be categorized as proprioceptive, vestibular, and/or cerebellar. A crouched stance and low tail carriage may be normal for a cat in an unfamiliar environment. Pay close attention to paw placement and symmetry of gait. Provide motivation/incentive for the cat to move. This may include opening a carrier across the room, opening a door, or providing toys or a laser pointer to grab their attention. Asking the owner to video the cat’s gait in their home may also be of benefit.

Posture

Normal posture is maintained by motor responses to sensory input from receptors in the limbs, body, visual system, and vestibular system. When observing the patient, note the position of the head, limbs, trunk, and tail both at rest and during movement. Cervical ventroflexion is a commonly detected abnormality in cats with generalized weakness. This is due to the absence of a nuchal ligament in this species. A plantigrade stance, characteristic of a sciatic neuropathy, can develop secondary to a variety of conditions in cats including Diabetes Mellitus. Pelvic limb weakness and reluctance to jump are also commonly encountered here.

2. The “Hands-On” Examination

Cranial Nerves

Testing cranial nerve function is extremely valuable as deficits can provide evidence of very localized disease. While this is traditionally considered part of the hands-on examination, assessment of cranial nerves begins during observation. Vision can be assessed by providing obstacles to navigate, using a laser pointer, or throwing cotton balls.

A menace response can be elicited by making a threatening gesture towards one eye. The normal response is a blink and sometimes an aversive movement of the head. Ensure that the vibrissae are not stimulated concurrently. Cats are notoriously difficult to menace, and tapping around the eye before gesturing may strengthen the response. While an absent menace bilaterally can be a normal variant for cats, an asymmetrical response is always abnormal. As this is a learned response, it will not be evident in patients under 12 weeks of age.

The stress of the hospital setting will invariably increase a cat's sympathetic tone. This can lead to mydriasis and difficulty eliciting a pupillary light reflex. To better assess this reflex, start with a dim room, allow the patient to acclimate to the environment, and use a bright light source. Once the pupillary light reflex has been deemed normal or abnormal, pharmacological dilation can be used to then perform a fundic examination.

The oculomotor, trochlear, abducent, and vestibular nerves, as well as their connections within the brainstem, control eye position and movement. First note the patient's eye position at rest. Movement of the head from side to side should elicit a normal physiological nystagmus. With cats, holding up and moving the entire patient from side to side is usually best. Placing the cat in dorsal recumbency can induce pathological nystagmus or strabismus in an otherwise well compensated patient.

Trigemino-facial reflexes are elicited by touching the medial and lateral canthus, the vibrissae, and around the face and mouth. Gentle stimulation with a cotton-tipped applicator, forceps, or a pen allows for more distance between the practitioner and the patient. Facial paresis can be more difficult to detect in cats as compared to dogs. Observe for completeness of palpebral closure, movement of the nares, and twitching of the pinnae when stimulated.

Postural Reactions

Proprioceptive placing is often unrewarding in feline patients. While there are other means to manually test proprioception, observation may again be more effective. Watch the patient jump on/off furniture or get in/out of the litter box. Hopping can be performed by supporting the patient on one limb, moving the patient laterally, and assessing both initiation and follow-through as the patient moves the limb over. More subtle deficits can be detected with a sliding paper test. This involves placing the patient on a sheet of paper and quickly pulling it away. For tactile placing, cover the eyes and bring the patient to a table so that the limb touches the table edge at the level of the carpus or tarsus. The normal response is immediate placement of the limb on the table. Visual placing is the same as tactile placing, except the patient is allowed to see the table. While patient compliance can affect these results, an asymmetrical response is always abnormal.

Spinal Reflexes

Segmental reflexes are best done in lateral recumbency though not all cats will tolerate this. Having an assistant hold the patient in their arms or on their lap may allow the cat to relax. Ensure that your instruments are appropriate for the patient's size. Most pleximeters will be too large for the feline neurological patient. Alternate tools include the handle of the pleximeter, hemostats, or small bandage scissors. The patellar reflex is the most reliably interpreted myotactic reflex. The patellar tendon is struck crisply with an instrument. The normal response is a single extension of the stifle. The flexor or withdrawal reflex can be performed in all four limbs by pinching the webbing between the toes. The normal response is flexion of the entire limb. The perineal reflex is elicited by light stimulation of the perineum with hemostats or a cotton-tipped applicator. The normal response is contraction of the anal sphincter. The cutaneous trunci reflex can be elicited by stimulating the guard hairs along the dorsum, though this reflex is notoriously unreliable in cats.

Palpation

Palpation is done last to avoid losing the cooperation of the patient. This includes palpation of musculoskeletal structures, the vertebral column, and cranium. Note muscle size and tone. Pain is defined as the unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. It is therefore impossible to diagnose pain in our veterinary patients and it must instead be inferred. Recognition of the signs of pain in cats can be made difficult by the variable reaction to pain between individuals. Some cats may give no outward indication that they are in pain, especially while in a hospital setting. Clinical and historical findings that increase the index of suspicion include depressed mentation, decreased activity level, changes in behavior or routine, changes in gait or posture, and autonomic signs.

LESION LOCALIZATION

Most neurological problems in clinical practice can be diagnosed and managed through a basic knowledge of the principles of neural organization. Functional divisions within the brain include the forebrain, brainstem, and cerebellum. Disease of the forebrain will often lead to changes in behavior or mental state, amaurosis, abnormal posture, mild paresis, and postural reaction deficits. Seizures and hemi-inattention syndrome, a phenomenon in which a patient with a structural forebrain lesion ignores input from one-half of his/her environment, also suggest a forebrain localization. Brainstem disease can lead to alternations in level of consciousness, cranial nerve deficits, paresis or paralysis of all four limbs, and postural reaction deficits. Classic signs of cerebellar disease include dysmetria/hypermetria, intention tremors, wide based stance, and truncal ataxia. The spinal cord is divided into the following functional segments: C1-C5, C6-T2, T3-L3, L4-S3 distinguished by the presence of upper motor neuron versus lower motor neuron signs. Weakness, changes in muscle tone, and lower motor neuron signs in all four limbs may indicate dysfunction in the peripheral nervous system. Localization is an indispensable part of the diagnostic approach for neurological disease.