

# Examination and Diseases of Cranial Nerves

*A PowerPage Presented By*



Cranial nerve evaluation is an important part of a neurologic exam. There are some differences in the assessment of cranial nerves with different species but the general principles are the same. Going into a board exam, you should know the names and functions of the 12 pairs of cranial nerves and be able to recognize dysfunction. This PowerPage reviews the cranial nerves and how to examine their function as well as a few specific disorders that can affect them. They may also be affected by focal or multifocal central nervous system lesions of any etiology.

## The function and examination of cranial nerves

### **CN I – Olfactory Nerve**

- Mediates the sense of smell
- Rarely has a primary neurologic problem. Examined by observing patient sniff around

### **CN II – Optic Nerve**

- Carries visual signals from retina to occipital lobe of brain
- Examine by:
  - Drop a cotton ball and watch the patient follow it to the ground (II only)
  - Menace response (II for visual cue and VII for blink response)
  - Pupillary light response or PLR (II for visual cue and III for pupil constriction)
    - Check ipsilateral and contralateral constriction to differentiate the response components

### **CN III – Oculomotor Nerve**

- Provides motor to most of the extraocular muscles (dorsal, ventral, and medial rectus) and for pupil constriction
- Examine by:
  - Observing for physiologic nystagmus when turning head (also involves IV, VI, and VIII)
  - Observing pupillary constriction in PLR

### **CN IV – Trochlear Nerve**

- Provides motor function to the dorsal oblique extraocular muscle and rolls globe medially
- Examine by observing for dorsolateral rotation of the pupil

### **CN V – Trigeminal Nerve – Maxillary, Mandibular, and Ophthalmic Branches**

- Provides motor to muscles of mastication (masseter, temporal) and sensory to eyelids, cornea, tongue, nasal mucosa and mouth.
- Examine by:
  - Palpate masseter and temporal muscles for symmetry, atrophy, and pain
  - Check jaw tone
  - Touch medial septum of nose and look for retraction
  - Touching the globe and observing for retraction (also tests VI for motor)
  - Palpebral response -blink reflex when touching medial canthus (also tests VII for motor)
  - Pinching the lip and observing for snarl response (also tests VII for motor)

### CN VI – Abducens Nerve

- Provides motor function to the lateral rectus extraocular muscle and retractor bulbi
- Examine by:
  - Touching the globe and observing for retraction (also tests V for sensory)
  - Observing for medial strabismus
  - Observing for physiologic nystagmus when turning head (also involves III, IV, and VIII)

### CN VII – Facial Nerve

- Provides motor to muscles of facial expression (eyelids, ears, lips) and sensory to medial pinna. Also taste to rostral tongue and parasympathetic innervation to lacrimal glands and some salivary glands
- Examine by:
  - Menace response (II for visual cue and VII for blink response)
  - Palpebral response -blink reflex when touching medial canthus (also tests V for sensory)
  - Observe for facial paralysis, deviation of nose to one side, or droopy lips
  - Schirmer tear test
  - Ear flick in response to stimulation of medial pinna

### CN VIII – Vestibulocochlear Nerve

- Sensory input for hearing and head position
- Examine by:
  - Hearing assessment; deaf animals may startle easily
  - Observe for head tilt, abnormal nystagmus, and presence of normal physiologic nystagmus (see PowerPage on Vestibular Disease for more detail)

### CN IX – Glossopharyngeal Nerve

- Provides motor and sensory innervation to pharynx for swallowing (with X). Also innervates some salivary glands and provides taste innervation from caudal tongue
- Examine by eliciting a gag reflex and observing for dysphagia

### CN X – Vagus Nerve

- Innervates the larynx, esophagus, and pharynx. Also provides parasympathetic innervation to the heart and viscera
- Examine by:
  - Elicit a gag reflex
  - Observe for laryngeal paralysis
  - Assess for megaesophagus and regurgitation

### CN XI – Spinal Accessory Nerve

- Innervates cranial cervical muscles
- Rarely assessed and rarely a clinical problem

### CN XII – Hypoglossal Nerve

- Provides motor to the tongue
- Examine by observing tongue movement and symmetry or for problems drinking and prehending food

## Memory Aids

There are many mnemonic aids that have been used to help remember the names and functions of the cranial nerves. For a list of over 20 clever aids (you should just pick the one that helps you the most), follow this link:

- [http://en.wikipedia.org/wiki/List\\_of\\_mnemonics\\_for\\_the\\_cranial\\_nerves](http://en.wikipedia.org/wiki/List_of_mnemonics_for_the_cranial_nerves)



## Specific Disorders of Cranial Nerves

Some specific cranial nerve disorders are seen, particularly in dogs. CN VIII syndromes are reviewed on the Vestibular Disease PowerPage. Idiopathic trigeminal neuritis and facial nerve paralysis are briefly reviewed here.

### Idiopathic Trigeminal Neuritis

- A syndrome seen in dogs with peracute onset of a dropped jaw and inability to close the mouth
- No other sensory deficits or other cranial nerve deficits are present
- Dogs are typically normally alert and responsive without difficulty swallowing food that is placed on the back of the tongue
- Should be distinguished from these differentials (usually based on speed of onset and lack of other signs):
  - Mandibular fracture
  - Rabies
  - Neoplasia of mandibular nerve
  - Masticatory muscle myositis
- Treated with supportive care with fluids and hand feeding of soft food as prognosis is excellent, with most dogs regaining function within 1-2 weeks and returning to normal within 3-4 weeks

### Idiopathic Facial Nerve Paralysis

- Acute onset of several signs
  - Inability to blink (lack of menace or palpebral response)
  - Drooping lip and ear
  - Drooling from one side of the mouth
  - Dry eye
- Facial sensation is normal
- Should be distinguished from these differentials (usually based on speed of onset and lack of other signs):
  - Otitis media
  - Neoplasia of the facial nerve
  - Brainstem disease
- Best treatment is controversial but may consist of tear supplementation, thyroid supplementation (if concurrent hypothyroidism), immunosuppressive doses of glucocorticoids
- Prognosis is fair as complete recovery often does not occur, but most dogs can function well with these moderate deficits and only need long term tear supplementation

## References and Links

VIN On-Line Conference Proceedings:

<http://www.vin.com/Members/Proceedings/Proceedings.plx?CID=wvc2008&PID=pr19544&O=VIN>

<http://www.vin.com/Members/Proceedings/Proceedings.plx?CID=wvc2006&PID=pr11970&O=VIN>

