Practical Neurology
Head Tilts & Falling Down
When is it Serous?
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Vestibular & Cerebellar

Function of Vestibular System
- Maintains the animal’s position in space
- i.e., Helps animal tell up from down, and how to deal effectively with gravity

Function of Cerebellar System
- Regulates rate and range of motion (?)
  - Unconscious proprioreception
- Coordinates movement
- Regulates posture

Vestibular & Cerebellar

Signs of Vestibular Disease
- Abnormal Nystagmus
- Vestibular Ataxia, broad based stance
- Leaning, falling - ipsilateral
- Head Tilt
- Side to side head movement if bilateral

Why??
- Vestibular apparatus damaged on one side
- Normal vestibular side continues to feed information to the vest nucleus
- Imbalance interpreted by the brain stem as rotation of the body

Central vs. Peripheral
Peripheral Vestibular Disease
- Lesion Locations
  - Outside the brain stem
  - Inner ear, middle ear, CN8
- Signs
  - Horner’s Syndrome
  - Facial Paralysis
  - Hearing Loss
  - Horizontal or Rotary Nystagmus
    - Horizontal fast phase away from lesion
  - Head tilt away from lesion

Vestibular Disease
Vestibular Disease
Central vs. Peripheral
Central Vestibular Disease
- Location Inside the brain stem
- Signs
  - Vertical or Positional nystagmus
  - Can also have rotary or horizontal nystagmus
    - Fast phase toward or away from the lesion
  - Head Tilt toward or away from the lesion
Paradoxical Vestibular Disease
- Head tilt away from the lesion

Central vs. Peripheral
Central Vestibular Disease
- More likely to show other brain stem deficits
- Other than CN VII and CN VIII
- Altered level of consciousness (RAS)
- CP deficits are a big clue to vestibular disease that is central rather than peripheral
- Other CNS Signs may indicate multifocal CNS disease
  - Forebrain – seizures, behavior changes
  - Spinal cord lesions

Vestibular Disease
Central vs. Peripheral
Central Vestibular Disease
- DDx
  - Often more serious Disease
  - Any multifocal disease
Cerebellar Signs with Vestibular Signs
  Mean either:
  - Central brain stem/cerebellar disease
  - Cerebellar dysfunction

Neurologic Exam
Mental Status and Behavior
- Normal for peripheral vestibular disease
- Possible decreased consciousness for central vestibular disease
- Normal for cerebellar disease
- Anything can happen with multifocal disease

Neurologic Exam
Eye & Ear
Normal Nystagmus
- Physiologic Nystagmus
  - Jerk nystagmus – has fast and slow phase
  - Move patient’s head L, R, up, down
  - Fast phase toward the movement
- Siamese nystagmus
  - Pendular nystagmus - There is no fast and slow phase
  - In Siamese and Himalayan cats, and their mixes
  - Often goes along with congenital strabismus
Abnormal Nystagmus
- Usually indicates vestibular disease
- Or cerebellar disease sending false signals to the vestibular center
1. Abnormal Physiologic nystagmus
- Moving head up, down, L or R stimulates abnormal eye movements
- Central or peripheral vestibular dz
Neurologic Exam

Eye & Ear

2. Abnormal Spontaneous Nystagmus
- Involuntary eye movements present when in a normal standing position
- Horizontal, vertical, rotary
- Depends on which semicircular canal is affected

Neurologic Exam

Eye & Ear

• Horizontal nystagmus
  - Usually Peripheral vestibular disease
  - Can also be central vestibular disease
  - “Fast away” from the lesion if peripheral
  - Fast phase either toward or way from lesion if central vestibular disease

• Rotary nystagmus
  - Either Central or peripheral vestibular disease

• Vertical nystagmus
  - Highly suggestive of Central vestibular disease

Neurologic Exam

Eye & Ear

3. Abnormal Positional nystagmus
- Involuntary eye movements when animal placed in an abnormal position
- Often in dorsal recumbency

Neurologic Exam

Eye & Ear

Menace Response

• Absent with cerebellar disease
• Present with vestibular disease
• May not be present in puppies and kittens less than 12 weeks
• May not work well if there is middle ear disease
  - Peripheral vestibular nerve and facial nerve run together here
  - May be deficient with peripheral vestibular disease due to ear problems

Neurologic Exam

Attitude, Posture and Gait

Attitude
- position of the eyes and head with respect to the body

Posture
- position of the body with respect to gravity

Gait
- Movements when walking or running

Neurologic Exam

Attitude

• Head tilt (one ear lower)
  - Unilateral vestibular lesion
  - Either central or peripheral
  - Secondary association with cerebellar dz
  - Head tilt toward the lesion with peripheral vestibular disease
  - Head tilt can be toward or away with central vestibular disease

• Dropped eye – when head lifted
  - Aka Positional Strabismus
  - Vestibular disease
  - Disconjugate Strabismus – deviation of both eyes in different directions
    - Rare, but when it happens – central dz
### Neurologic Exam

**Posture**
- No CP deficits with peripheral vestibular disease or cerebellar disease
- Single strongest sign of central vestibular disease is CP deficits

**Gait (4 parts)**
- Lameness & Stride Length
- Ataxia
- Paresis/paralysis
- Abnormal movements

**Gait – Ataxia**

**Cerebellar Ataxia**
- Inability to regulate unconscious proprioception
  - Rate and range of movement
- Signs of cerebellar ataxia:
  - Dysmetria, hypermetria
  - Hypermetria – exaggerated goose-step type gait
  - Broad based stance

**Vestibular Ataxia**
- Inability to tell up from down (assess and respond to gravity)
- Signs of unilateral vestibular ataxia:
  - Head tilt (ipsilateral or contralateral)
  - Abnormal nystagmus
  - Falling in one direction
- Signs of bilateral vestibular ataxia:
  - Crouched position
  - Reluctant to move
  - Side to side head movement
  - Can look very much like cerebellar disease, but not hypermetric & no intention tremor

**Cranial Nerves**

**CN 8 – vestibulocochlear**
- Vestibular portion – balance
  - Ipsilateral head tilt
  - Vestibular ataxia – ipsilateral lean
  - Abnormal nystagmus
  - Broad based stance
  - Positional nystagmus
    - Dorsal recumbency produces spontaneous nystagmus
    - “bed spins”
  - Lesion localization – vestibular disease
    - Brain stem, inner ear, middle ear, peripheral nerve

**Spinal Nerve Reflexes**
- Should be normal with vestibular disease
- May seem exaggerated with cerebellar disease due to hypermetria
- But there will be no clonus
Neurologic Exam

Palpation & Pain
Neck
- Brain stem lesions can be associated with neck pain
  - Possible central vestibular disease

DDx Vestibular Disease

DDx Peripheral Vestibular Disease
- Congenital Vestibular Disease
- Hypothyroidism
- Neoplasia – primary and metastatic
- Idiopathic
- Otitis Media/Interna
- Drug Toxicity
- Trauma

Prognosis generally good for all but neoplasia

Peripheral Vestibular Disease

Hypothyroidism
- Acute onset, non-progressive
- Head tilt and positional strabismus
- Some will have decreased menace and decreased palpebral
  - Facial paralysis
- Vestibular Ataxia
- Sometimes circling
- Signs actually suggest central vestibular disease
- Make sure you rule out hypothyroidism before giving Dx of central vestibular disease 
  & probably poor prognosis

Peripheral Vestibular Disease

Neoplasia
- Include the many neoplasias discussed under spinal cord disease
- Also ear neoplasias
  - Ceruminous gland carcinoma
  - Squamous Cell carcinoma
  - Chondrosarcoma
  - Osteosarcoma
  - Fibrosarcoma

Peripheral Vestibular Disease

Idiopathic Vestibular Disease
- Cats of any age
- Geriatric dogs
- Confused with vascular accident or “stroke”
- No detectable structural, metabolic or inflammatory disease
- Acute or peracute onset
- Mild head tilt to severe imbalance and rolling
- No proprioreceptive deficits or other signs of central disease
Peripheral Vestibular Disease

Idiopathic Vestibular Disease
- Often improves rapidly (72 hours)
- Recovery may take up to 2-3 weeks
- Some have a persistent head tilt
- Condition can be relapsing
- Supportive treatment

Otitis Media/Interna
- 50% of peripheral vestibular disease in older dogs is due to otitis
- Less common in cats
- Dx – PE and radiographs
- Tx
  - Myringotomy to get C&S and clean middle ear cavity
  - Systemic antibiotics
  - Local antibiotics – quinolones, Timentin
  - Bulla osteotomy may be required for inner ear infection
    - Commonly needed for cats with polyps

Drug Toxicity
- Systemic – furosemide
- Local
  - Aminiglycosides
  - Ear cleaners

Symptomatic Tx of Vestibular Disease
Motion Sickness
- Chlorpromazine
  - 0.2-0.4 mg/kg SQ TID
- Diphenhydramine (Benadryl)
  - 2-4 mg/kg PO or IM TID
- Dimenhydrinate (Dramamine)
  - 4-8 mg/kg PO TID
- Meclizine (Antivert)
  - 25 mg PO SID – medium to large dogs
  - 12.5 mg PO SID – small dogs and cats

Cerebellar Disease DDx
- Cerebellar Abiotrophy
- Cerebellar Dysplasia
- Neoplasia
- Trauma

Cerebellar Abiotrophy
- Degeneration of the cerebellum beginning after birth
- Onset 3-12 weeks of age
- Slowly progressive over weeks to months to years
- Some will stabilize and plateau
<table>
<thead>
<tr>
<th>Cerebellar Hypoplasia</th>
<th>Cerebellar Trauma</th>
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<tbody>
<tr>
<td>• Panleukopenia infection or MLV vaccine</td>
<td>• Trauma to the back of the head</td>
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<tr>
<td>• Canine Herpesvirus</td>
<td>• Brain stem herniation</td>
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<tr>
<td>• Present at Birth</td>
<td>– Head trauma</td>
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<tr>
<td>• Non-progressive</td>
<td>– CSF tap with high CSF pressure</td>
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<tr>
<td>• Sometimes animal improves as it ages -</td>
<td>• Non-progressive</td>
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<td>compensates</td>
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