

## Practical Neurology Head Tilts & Falling Down When is it Serious?

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## Head Tilts and Falling Down

### Etiology

- Vestibular Disease
- Cerebellar Disease
- Severe Conscious Proprioception Deficits
- Weakness

## 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 proprioception
- 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 vestibular nucleus
  - Imbalance interpreted by the brain stem as rotation of the body

## Vestibular & Cerebellar

### Signs of Cerebellar Disease

- Dysmetria/hypermetria
- Cerebellar Ataxia, broad based stance
- Intention Tremor
- Lack of Menace Response
- Side to side head movement
- Vestibular Signs

### Decerebellate Rigidity

- opisthotonus
- Extension of thoracic limbs
- Flexion of the hips
- Consciousness not impaired
- Lesion – acute cerebellar (herniation)

## Vestibular Disease

### 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

### 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

## Vestibular Disease

### 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

## Neurologic Exam

### Eye & Ear

#### 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 away 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

### Neurologic Exam

#### Gait (4 parts)

- Lameness & Stride Length
  - Increased stride length with cerebellar disease
- paresis/paralysis
  - No weakness with cerebellar or vestibular disease

### Neurologic Exam

#### 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

### Neurologic Exam

#### Gait – Ataxia

##### 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

### Neurologic Exam

#### 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

### Neurologic Exam

#### 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

### DDx Vestibular Disease

#### DDx Central Vestibular Disease

- Multifocal CNS Disease
  - Prognosis variable
  - Sometimes poor
- Metronidazole toxicity
  - With dose > 50-60 mg/kg/day
  - Central vestibular signs
  - Sometime also cerebral signs
    - Altered mental status
    - Seizures
    - opisthotonus
  - Prognosis Good
    - Signs resolve within 1-2 weeks of stopping metronidazole
  - >30 mg/kg/day rarely needed

### 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 proprioceptive 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

### Peripheral Vestibular Disease

#### 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

### Peripheral Vestibular Disease

#### Drug Toxicity

- Systemic – furosemide
- Local
  - Aminoglycosides
  - Ear cleaners

### Treatment

#### 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

### **Cerebellar Hypoplasia**

- Panleukopenia infection or MLV vaccine
- Canine Herpesvirus
- Present at Birth
- Non-progressive
- Sometimes animal improves as it ages - compensates

### **Cerebellar Trauma**

- Trauma to the back of the head
- Brain stem herniation
  - Head trauma
  - CSF tap with high CSF pressure
- Non-progressive