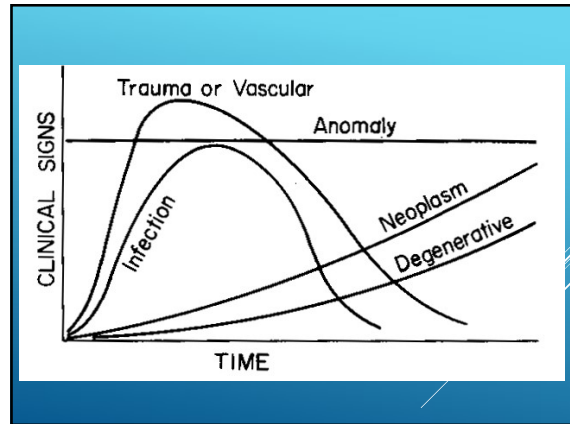


NEUROLOGY TILT – A – WHIRL: DEMYSTIFYING VESTIBULAR DISEASE IN DOGS AND CATS



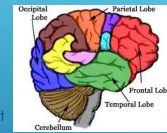
- ▶ Karen L. Kline, DVM, MS, DACVIM (Neuro)
- ▶ VCA Northwest Veterinary Specialists



THANK YOU !!!!



- ▶ Brain
 - ▶ Forebrain (Cerebrum)
 - ▶ Divided in to 4 lobes
 - ▶ Thalamus (Diencephalon)
 - ▶ Brainstem
 - ▶ Cerebellum
- ▶ Spinal Cord
 - ▶ C1-C5 / C6-T2 / T3-L3 / L4-S2 segment



DIVISIONS OF THE NERVOUS SYSTEM

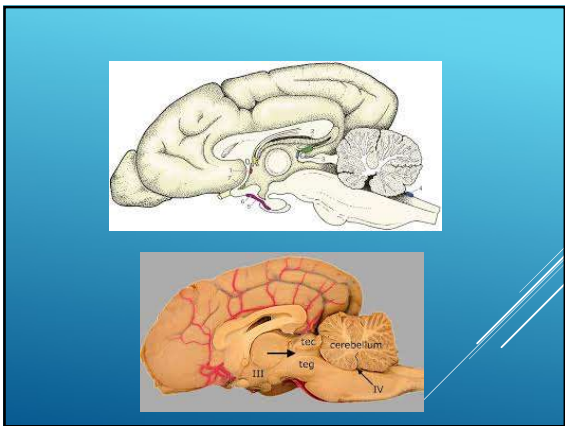
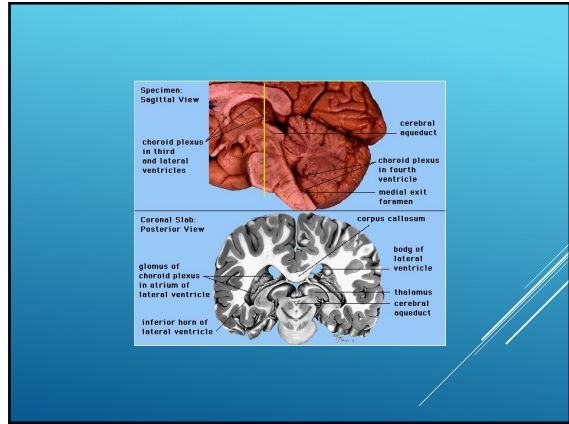
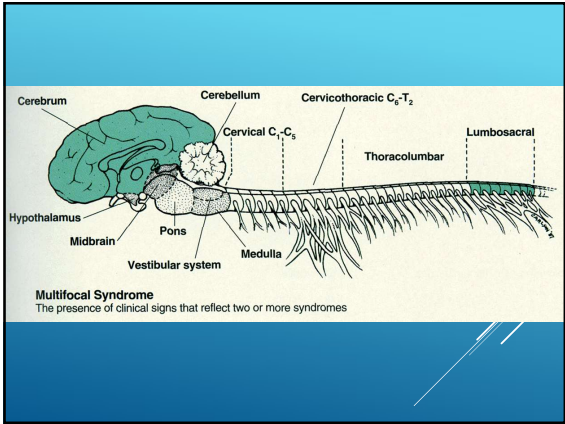
- ▶ Physical exam to rule out underlying metabolic cause of clinical signs
- ▶ Neurologic exam is necessary to evaluate the patient
- ▶ Instruments needed include hemostat, pleximeter and light source
- ▶ Owner history is extremely important

DOES THIS PATIENT HAVE
NEUROLOGIC DISEASE ?

- ▶ Neuromuscular
 - ▶ Nerve Root(s)
 - ▶ Peripheral Nerve
 - ▶ Neuromuscular Junction
 - ▶ Muscle

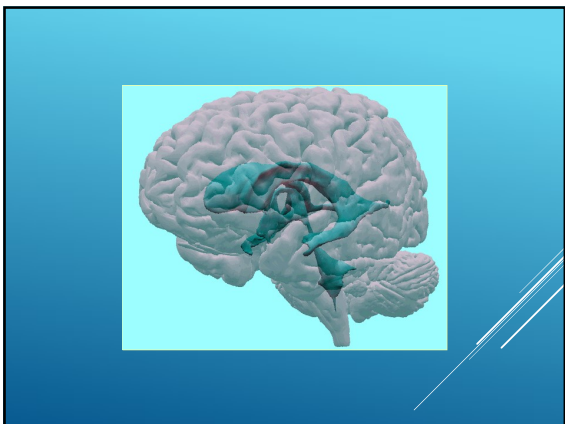


DIVISIONS OF THE NERVOUS SYSTEM

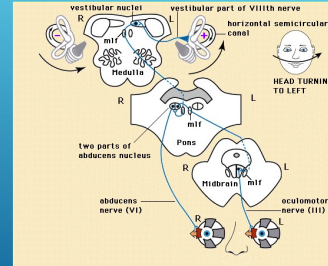
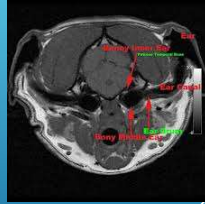


- ▶ Peripheral vestibular disease
- ▶ Central vestibular disease
- ▶ Key features:
 - ▶ Head tilt
 - ▶ Vestibular ataxia
 - ▶ Pathologic nystagmus

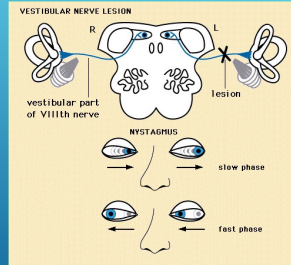
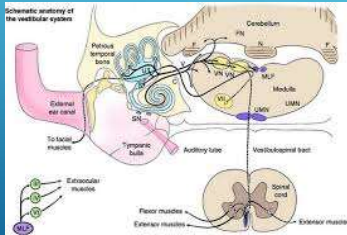
VESTIBULAR DISEASE

NEUROANATOMY



Vestibular Anatomy



- ▶ Components of the vestibular system
- ▶ Physiologic nystagmus
 - ▶ Oculocephalic reflex – Forebrain
 - ▶ Doll's eye reflex – Brainstem
- ▶ Pathologic nystagmus
 - ▶ Sustained, non-positional
 - ▶ Positional
 - ▶ Horizontal / rotary / vertical downbeat



REVIEW OF NYSTAGMUS

PATHOLOGIC NYSTAGMUS

- ▶ Peripheral vestibular:
 - ▶ Sustained
 - ▶ Non-changing
 - ▶ Rotary or horizontal
- ▶ Central vestibular:
 - ▶ Changes with position
 - ▶ Rotary, horizontal, vertical downbeat



VESTIBULAR DISEASE

- ▶ Watch the orientation of the eyes within the orbit
- ▶ Can you assess the direction of the nystagmus ?



- ▶ Other Brainstem Signs to include:
 - ▶ Ventrolateral strabismus
 - ▶ CNN deficits (CNN V, VI, VII) – complete LMN
 - ▶ +/- Cerebellar signs
 - ▶ Change in level of consciousness
 - ▶ Hemiparesis / CP deficits ipsilateral to lesion
 - ▶ Can see vomiting / nausea

CENTRAL VESTIBULAR DISEASE

- ▶ Midbrain / Pons / Medulla
- ▶ Level of consciousness change (Alert, dull, stuporous or comatose) but appropriate
- ▶ Regulated by the reticular activating system
- ▶ Projects information to the cerebral cortex for cognition
- ▶ "Rheostat" of the CNS

BRAINSTEM LOCALIZATION

- ▶ Clinical Findings
 - ▶ Level of consciousness change
 - ▶ Ipsilateral conscious proprioceptive deficits
 - ▶ Spastic (UMN) weakness or paralysis of all four limbs or limbs on the ipsilateral side
 - ▶ UMN reflexes ipsilateral to side of the lesion
 - ▶ Ipsilateral multiple CNN deficits (III-XII) – complete LMN deficits
 - ▶ Ventilatory / PLR changes

BRAINSTEM LOCALIZATION

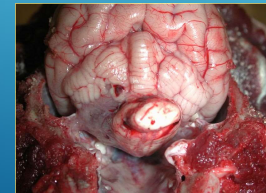
- ▶ Central Vestibular Disease
 - ▶ Flocculonodular lobe (cerebellum), vestibular nuclei, (medulla), MLF
 - ▶ Head tilt – can be toward or away from the side of the lesion
 - ▶ Paradoxical head tilt
 - ▶ Loss of balance / Falling / Rolling
 - ▶ Positional / Changing nystagmus
 - ▶ Horizontal / Rotary / Vertical downbeat

VESTIBULAR SYNDROME

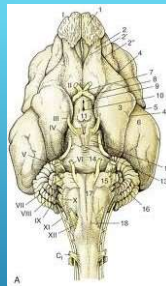


CENTRAL VESTIBULAR DISEASE

- ▶ Traumatic injury
- ▶ Peracute vestibular signs
- ▶ Gradual return to function
- ▶ Serial neurologic examinations



- ▶ Inflammatory
- ▶ Infectious
- ▶ Traumatic
- ▶ Vascular
 - ▶ Thromboembolism
 - ▶ Thrombocytopenia
- ▶ Neoplasia
- ▶ Metabolic / Endocrine



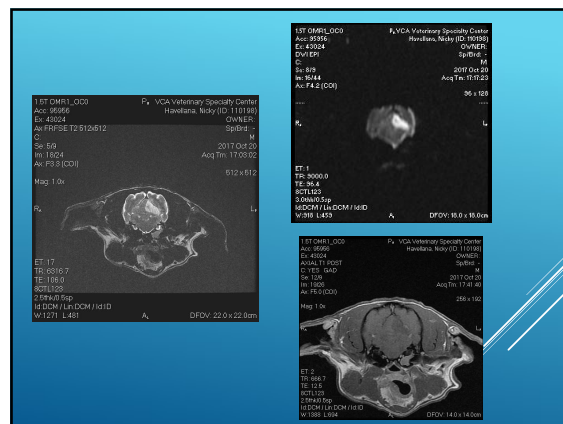
DIFFERENTIALS FOR BRAINSTEM SIGNS

- ▶ Neoplasia
 - ▶ Meningioma / CPP / ependymoma / metastatic
- ▶ Inflammatory / Infectious
 - ▶ Meningoencephalomyelitis of unknown origin (MUE)
- ▶ Infectious
 - ▶ Canine distemper / Fungal (cryptococcosis) / FIP / Protozoal
 - ▶ Extensional middle / inner ear
- ▶ Vascular - bland or hemorrhagic infarct
- ▶ Endocrine / Metabolic – hypothyroidism, hyperadrenocorticism (Cushings), hypertension
- ▶ Toxicity
 - ▶ Metronidazole

DIFFERENTIALS FOR CENTRAL VESTIBULAR SIGNS

CENTRAL VESTIBULAR DISEASE

- ▶ "Otis"
- ▶ 9 month old American Bulldog
- ▶ Progressive history of central vestibular signs



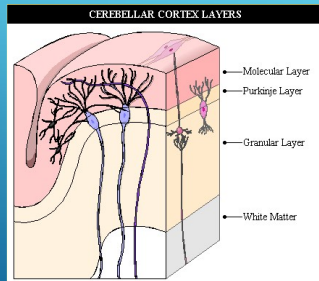
- ▶ Functions to regulate the range, rate and force of a movement
- ▶ Inhibitory
- ▶ Dysfunction results in disinhibition and the resultant clinical signs



CEREBELLUM

- ▶ Absence of proprioceptive deficits or weakness
- ▶ Ipsilateral absent menace reflex
- ▶ Broad-based stance
- ▶ Preservation of strength

CEREBELLAR LOCALIZATION



CEREBELLAR ATAXIA

- ▶ Note the hypermetric gait
- ▶ Another term is dysmetria
- ▶ Cerebellar rebound

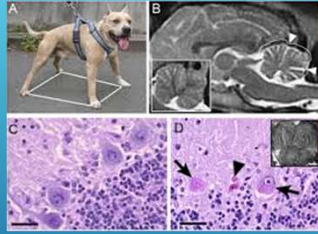


- ▶ Dysmetria of the head (Intention tremor)
- ▶ Dysmetria of the eyes (Pendular or oscillatory nystagmus)
- ▶ Dysmetria of the limbs (Hypermetria, goose-stepping)
- ▶ Truncal ataxia
- ▶ Absence of behavior change

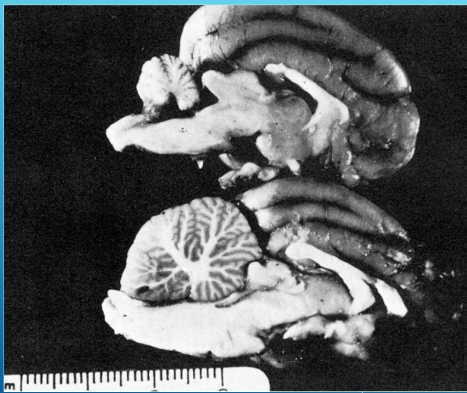
CEREBELLAR LOCALIZATION



- ▶ Inflammatory
- ▶ Infectious
- ▶ Vascular
- ▶ Neoplasia



DIFFERENTIALS FOR CEREBELLAR SIGNS



PERIPHERAL VESTIBULAR SIGNS

- ▶ Non-changing rotary or horizontal nystagmus
- ▶ Fast phase of the nystagmus is away from the side of the lesion



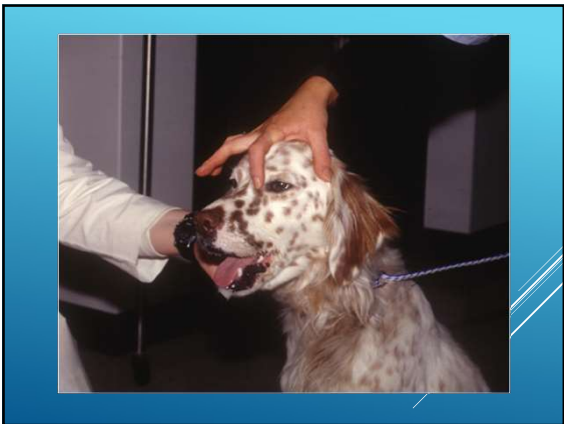
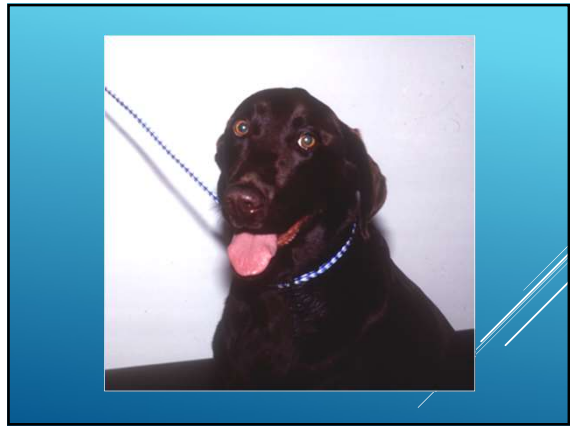
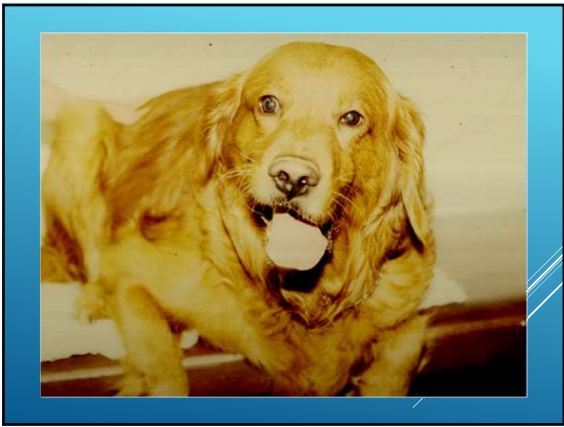
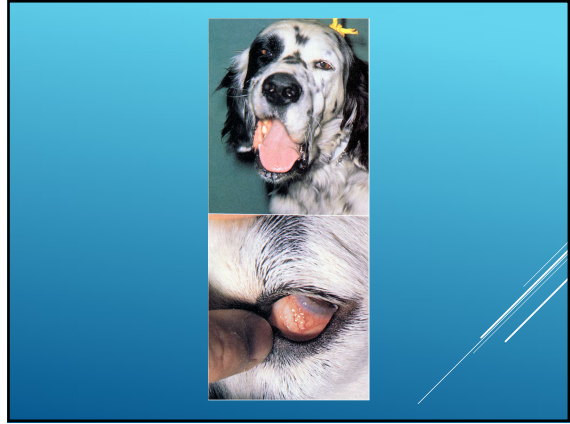
- ▶ Peripheral Vestibular Disease
 - ▶ CNN VIII and its receptor
 - ▶ Head tilt
 - ▶ Loss of balance, rolling, falling usually toward the side of the lesion
 - ▶ Sustained, non-changing horizontal or rotary nystagmus
 - ▶ Normal to increased myotatic reflexes



VESTIBULAR SYNDROME

- ▶ + / - increased extensor tone on side opposite head tilt
- ▶ Normal strength / proprioception
- ▶ Normal CNN reflexes (Exception is CNN VII / Horner's Syndrome if otitis media)
- ▶ Strabismus (affected side)
 - ▶ "Eye drop"
- ▶ Vestibular rebound

PERIPHERAL VESTIBULAR DISEASE

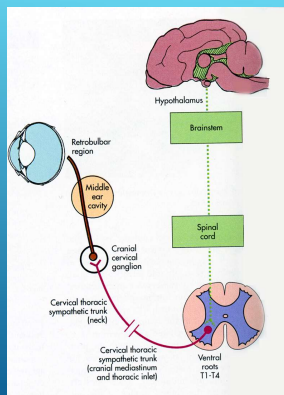


- ▶ Sympathetic tract
 - ▶ Primary, secondary and tertiary
 - ▶ Elevated nictitans, miosis, enophthalmus, ptosis
 - ▶ Pathway

HORNERS SYNDROME

- ▶ Otitis media / interna
- ▶ Geriatric or "Old Dog" peripheral vestibular disease
- ▶ Hypothyroidism
- ▶ Foreign body
- ▶ Aminoglycoside intoxication
- ▶ Feline
 - ▶ Idiopathic peripheral vestibular syndrome
 - ▶ Nasopharyngeal polyps

DIFFERENTIALS FOR PERIPHERAL VESTIBULAR SIGNS

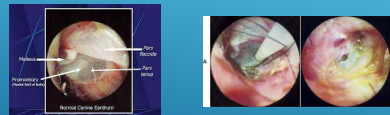


- ▶ Routine bloodwork to include CBC, serum chemistry, UA
- ▶ Thyroid testing – free T4 by ED and TSH
- ▶ Blood pressure
- ▶ Other endocrine testing ie. LDDST
- ▶ 3 view chest radiographs
- ▶ Abdominal ultrasound

DIAGNOSTICS



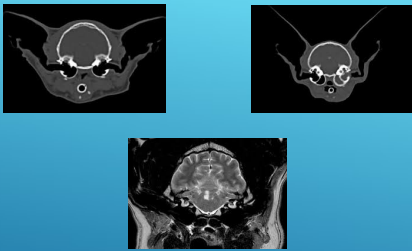
- ▶ Peripheral vestibular disease



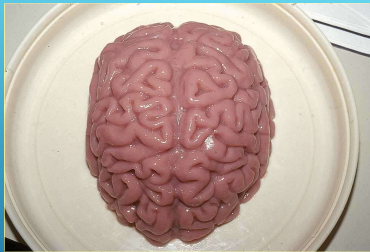
OTOSCOPIC EXAMINATION

- ▶ MRI – optimal view of the soft tissues and ideal for imaging the brain
- ▶ CT scan – optimal view of the bony structures – inner/middle ear and the tympanic bullae

DIAGNOSTIC IMAGING



DIAGNOSTIC IMAGING



QUESTIONS ?