About Me....

- **Hometown**
  - Roswell, GA

- **High School**
  - Roswell High

- **Vet Assistant**
  - WHVH
  - Smyrna, GA
About Me....

- Auburn University
  - B.S.
- University of Georgia
  - DVM
- Cornell University
  - Rotating internship
About Me....

• Neurology Internship
  ▪ BVNS
  ▪ Springfield, VA

• Residency
  ▪ Neurology
  ▪ Neurosurgery
  ▪ BVNS
  ▪ Leesburg, VA
The Approach

• Useful for both intracranial and spinal diseases

• The system I use...
  ▪ 4 questions
    • Onset?
    • Progression?
    • Symmetry?
    • Pain / Discomfort?
The Approach

• Onset?
  ▪ Peracute
    • Hours
  ▪ Acute
    • Days
  ▪ Chronic
    • Weeks to months
The Approach

• Progression?
  - From onset of symptoms
  - Yes
  - No
    • Static or improving
The Approach

• Symmetry?
  ▪ Symmetric
  ▪ Asymmetric
The Approach

• Painful?
  ▪ Yes
  ▪ No
  ▪ What hurts??
    • Meninges
    • Bone
    • Nerve
    • Muscle
  ▪ What doesn’t??
    • Spinal cord
- V • Vascular
- I • Infectious / Inflammatory
- T • Toxin / Trauma
- A • Anomalous
- M
- I
- N • Neoplasia
- D • Degenerative
Vascular

- Ischemic myelopathy
- Fibrocartilagenous embolism (FCE)
Ischemic Myelopathy

• Anatomy
  ▪ Ventral spinal artery
  ▪ Dorsal spinal arteries
FCE – How??

- Multiple hypotheses
  - Direct penetration into cord / vasculature
  - Neovascularization of disc
  - Embryonic vessel
  - Herniation into bone?
    - Schmorl’s node / nodule
Ischemic Myelopathy

• **Signalment**
  - Young-to-middle aged dogs
    - Large, giant breeds
    - 80% > 20 kg
  - Exceptions
    - Miniature Schnauzers
    - Irish Wolfhounds
Ischemic Myelopathy / FCE

• **The 4 Questions**
  
  ▪ **Onset?**
    • Peracute (<6 hours)
      – Up to 80% → physical activity
  
  ▪ **Progression?**
    • Non-progressive
  
  ▪ **Symmetry?**
    • Very commonly asymmetric
  
  ▪ **Painful?**
    • Transient pain at onset
    • Non-painful
Ischemic Myelopathy in Cats??

- Cats?
  - Less likely fibrocartilage
  - More commonly
    - Thrombus!
    - Older
    - Concurrent medical conditions
    - Cervicothoracic
      - 60%
IM in Cats – Cranial Cervical SC

- *J Feline Med Surg 2014*
  - All cats had concurrent illness
  - 6/8 had cervical ventroflexion
  - Mean age of 14 years
  - 3/8 had recurrence
Ischemic Myelopathy

- Diagnostics
  - **MRI-required diagnosis**
  - CSF analysis
    - Often normal
    - May have elevated
      - Protein
      - RBC
      - WBC
MRI in Ischemic Myelopathy

• Valuable tool!
  ▪ Diagnosis
  ▪ Prognosis

• JAVMA 2008
  ▪ Vertebral length ratio
    • > 2.0
  ▪ Cross-sectional area
    • > 67%
Ischemic Myelopathy

• Treatment?
  ▪ Supportive care
  ▪ Physical therapy / Rehab
  ▪ *No evidence to support use of NSAID / steroids*
Ischemic Myelopathy

• Prognosis
  ▪ Good.
    • 84% complete or partial recovery
  ▪ Negative prognostic factors
    • Neurologic grade
    • LMN signs
      – C6-T2 / L4-S3
    • MRI findings
• V – Vascular
• I – Infectious / Inflammatory
• T – Trauma
• A – Anomaly
• M – Metabolic
• I – Idiopathic
• N – Neoplasia
• D – Degenerative
Inflammatory Spinal Disease

• Inflammation of nervous tissue or surrounding structures
• Can be broken into 2 categories
  ▪ Infectious
  ▪ Non-infectious
    • Parainfectious
    • Autoimmune
    • Immune-mediated
Infectious Diseases

- Bacterial
- Viral
  - CDV
- Fungal
  - Cryptococcus
- Protozoal
  - Toxoplasma
  - Neospora
- Rickettsial
- Parasitic
Diskospondylitis

- Infection of the...
  - Cartilagenous endplates
  - Intervertebral disc
    - Secondary

- Source of infection
  - Autogenous
  - Iatrogenic
  - Foreign body
Diskospondylitis

- Autogenous sources of infection
  - #1 – urinary tract
  - Respiratory
  - Oral cavity
  - Skin
- Infection settles in end plate
  - Blood flow
  - Sinuses / vascular channels
Pathogens in Diskospondylitis

• **Bacterial**
  ▪ **Most common**
    • *Staphylococcus sp.*
    • *Streptococcus sp.*
    • *E. coli*
    • *Brucella*

• **Fungal**
  ▪ *Aspergillus sp.*
Diskospondylitis

- **Signalment**
  - Overrepresentation
    - Breeds
    - Size
    - Age
- **Clinical Signs**
  - Variable
    - Hyperesthesia most common
Diskospondylitis

• Diagnostics
  • Numerous modalities
    • Radiographs
    • CT
  • MRI is more sensitive
    • Early in disease
    • Soft tissue changes
  • L7-S1 most common
Diskospondylitis Sequelae

- **Empyema**
  - Most common
  - ➔ compressive myelopathy

- **Pathologic fracture**
Ancillary diagnostics

- CBC / Chemistry
- Urine culture
- Blood culture
- Fungal serology
- Brucella

***C-reactive protein***
Diskospondylitis

• Treatment
  ▪ Ideally based on culture results
    • Broad spectrum antibiotic therapy
      – With good bone penetration
    • Cephalosporins
      – Cephalexin
    • Clindamycin
    • +/- addition of fluoroquinolone
  ▪ Length??
Diskospondylitis

- Prognosis
  - Generally favorable
    - Bacterial
    - 1 site affected
    - Mild deficits
  - Poor
    - Fungal / resistant bacterial
    - Multiple sites
    - Severe deficits
Diskospondylitis in Cats??

• Sparse case reports
• “Ginger”
  ▪ 8 mo Bengal
  ▪ Reluctant to jump
  ▪ LS pain
Feline Diskospondylitis
Feline Diskospondylitis
Diskospondylitis

• **The 4 Questions**
  - **Onset?**
    - Acute to chronic
  - **Progression?**
    - Progressive
  - **Symmetry?**
    - Symmetric
  - **Painful?**
    - Hallmark of disease
Inflammatory Spinal Disease

- Non-infectious / Immune-mediated
  - Meningomyelitis
    - MUE / GME
  - Meningitis / arteritis
    - SRMA
Inflammatory Spinal Disease

- **MUE / GME**
  - Young to middle aged dogs
  - Maltese, Poodle, Lhasa Apso
  - Clinical findings
    - Pain
    - Varying degrees of dysfunction

- **SRMA**
  - Young dogs (~ 8 mo)
  - Boxer, Bernese, Beagle, Lab, GSP
  - Clinical findings
    - Pain (cervical)
    - Fever
MUE / GME

- **Diagnostics**
  - **MRI**
    - Focal or multifocal lesions
      - Variable contrast enhancement
    - Meningeal enhancement
  - **CSF**
    - Abnormal
      - 70-100%
    - Too many cells / high protein
      - Pleocytosis
SRMA

- MRI
  - Recommended***
    - Often normal
    - +/- meningeal enhancement

- CSF analysis
  - Abnormal
    - Neutrophilic pleocytosis

- C-reactive protein (CRP)
MUE / GME

• Treatment
  ▪ Immune-suppression
    • Cytarabine / Cytosar
      – CRI or SQ
    • Cyclosporine
    • Prednisone
  ▪ Antibiotic coverage
    • Doxycycline
    • Clindamycin
SRMA

- Treatment
  - Steroids.
    - Prednisone
    - Initially immunosuppressive
    - Tapering course over 4-6 months
  - Analgesic therapy
  - +/- other immune-modulation
    - Cyclosporine
    - Azathioprine
**Prognoses**

- **MUE / GME**
  - Guarded-to-fair
    - 70/30 rule
  - Relapse common
  - Repeat diagnostics
    - 3 months
    - **Heavily discounted**
    - Predictive of relapse

- **SRMA**
  - Good-to-excellent
  - Relapse uncommon
MUE / GME and SRMA

- The 4 Questions
  - Onset?
    - Acute
  - Progression?
    - Progressive
  - Symmetry?
    - Symmetric
  - Painful?
    - Absolutely
• V – Vascular
• I – Infectious / Inflammatory
• T – Trauma
• A – Anomaly
• M – Metabolic
• I – Idiopathic
• N – Neoplasia
• D – Degenerative
What we won’t talk about...

- Spinal fractures
- Brachial plexus avulsions
Trauma

- 2 traumatic disc injuries
  - Acute non-compressive nucleus pulposus extrusion (ANNPE)
    - AKA
      - Type 3 disc
      - Traumatic disc
      - Low volume, high velocity disc
      - Missile disc
  - Compressive hydrated disc rupture
Trauma

- 2 traumatic disc injuries
  - Similarities
    - History of trauma / activity
    - Normal discs
  - Main difference
    - One is compressive
    - → benefits from surgery
ANNPE / Type 3 disc
ANNPE / Type 3 disc
Compressive / Hydrated Disc
• Treatment?
  ▪ Supportive care
  ▪ Physical therapy / Rehab
  ▪ *No evidence to support use of NSAID / steroids*
Compressive Hydrated Disc

• Treatment?
  ▪ Depending on degree of compression
    • Surgery
      – Ventral slot
      – Dorsal laminectomy
      – Hemilaminectomy
    • Medical management

• Prognosis?
ANNPE (Type 3)

- De Risio et. al 2009
- 42 cases
- 67% of dogs had successful outcome
- Outcome factors
  - Severity of neurologic deficits
  - Extent of hyperintensity on sagittal and transverse T2-weighted images
- Cross-sectional area of intramedullary hyperintensity was best predictor of outcome
Trauma

• The 4 Questions (ANNPE)
  ▪ Onset?
    • Peracute
  ▪ Progression?
    • Non-progressive
  ▪ Symmetry?
    • Very commonly asymmetric
  ▪ Painful?
    • Transient pain at onset
    • Non-painful

• The 4 Questions (Hydrated disc)
  ▪ Onset?
    • Peracute-to-acute
  ▪ Progression?
    • Progressive
  ▪ Symmetry?
    • Symmetric, severe
  ▪ Painful?
    • > 50% are painful
• V – Vascular
• I – Infectious / Inflammatory
• T – Trauma
• A – Anomaly
• M – Metabolic
• I – Idiopathic
• N – Neoplasia
• D – Degenerative

Next Time!
Take Home Points

• MRI is the best diagnostic modality to evaluate spinal cord health, determine an accurate prognosis and to plan appropriate therapy

• Ischemic myelopathy occurs in older cats and is often associated with concurrent systemic disease
  ▪ Cervical ventroflexion DDX!

• C-reactive protein is a useful adjunctive diagnostic tool to screen and monitor for infectious or inflammatory spinal cord disease

• Repeating spinal diagnostics at 3 months in dogs with MUE is the best predictor of relapse
References


References


Any Questions??