Spinal Cord Diseases

Part 1

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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
<table>
<thead>
<tr>
<th>V</th>
<th>Vascular</th>
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<tbody>
<tr>
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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
Diskospondylitis

- 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)
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??