Working up the Weakness Neuromuscular Diseases of Dogs and Cats

Anatomy

- Neuromuscular System
  - Cell body in the ventral horn of the spinal cord
  - Ventral nerve root
  - Spinal nerve
  - Peripheral nerve
  - Neuromuscular junction
  - Muscle cell

Clinical Signs of Neuromuscular Disease

- Similar signs with different underlying causes
- Weakness worsens with exercise with muscle and NM junction disease
- NO ATAXIA!
- Short-strided choppy gait vs. high stepping gait
- Plantigrade stance
Clinical Signs of Neuromuscular Disease

- Decreased reflexes
- Decreased muscle tone
- Severe muscle atrophy
- Animals with severe disease may appear like a "dish rag"
- Ventroflexion in cats common
- Must differentiate from C1-T2 spinal disease
Spinal Reflex Assessment

Neuromuscular Disease

Further Clinical Signs
- Dysphagia
- Dysphonia
- Laryngeal paresis
- Intercostal weakness
- Diaphragm paresis
- Contractures
- Urinary / faecal dysfunction?
- Spinal pain?

Differentiation of spinal cord and neuromuscular lesions

- **C1-C5 spinal cord?**
  - Tetraparesis or hemi with normal or increased reflexes

- **C6-T2 spinal cord?**
  - Tetraparesis or hemi with normal or depressed thoracic limb reflexes

- **Neuromuscular?**
  - Tetraparesis with depressed or absent reflexes all 4
Neuromuscular Disease

Neurodiagnostic Investigation

- Minimum data base incl. Creatine kinase level
- Thoracic and abdominal radiographs
- Infectious disease titers
- ’Tensilon’ Test / Anti-AchR AB titer
- CSF tap
- Electrodiagnostics
  1. Electromyography
  2. Nerve conduction velocity
  3. Cord dorsum potentials
  4. F-waves
- Nerve & Muscle Biopsy

Diagnostic Examination

Electromyography

- Under anesthesia
- Needle is inserted into muscle belly
- All muscles assessed
- Spontaneous electrical activity present in many cases of muscle disease
- Not specific

Nerve Conduction Velocity

- Require general anesthesia
- Stimulate proximal nerve segment
- Record distal action potentials
- Reduced velocity usually with demyelination (occasionally with axonal disease)
- Normals = 70-90 m/s species and nerve dependent

Muscle & Nerve Biopsy

- Choose affected area
- Guided by EMG
- Muscle & nerve from same area
- More than 1 sample
- Fresh & Fixed specimens
- Use recognised laboratory
  (UC SD - comparative NM lab – Dr Diane Shelton)
Diagnostic Examination

**Muscle Biopsy**
- 
- 
- 1cm³

Nerve Biopsy
- Similar surgical approach
- Fascicular biopsy
- Sciatic-tibial nerve or ulnar nerve
- Minimal morbidity
- Fresh and fixed
- Often non-specific findings

Nerve Biopsy Technique

Cisternal CSF Tap

Nerve Biopsy Technique
Acute Neuromuscular Disease

- (Idiopathic) Polyradiculoneuritis / Coonhound
- Botulism
- Fulminant Myasthenia
- Tick paralysis
- Snake Bite

Acute Polyradiculoneuritis

- Localization is the key!
- Most common cause for acute LMN disease in dogs
- Very rare in cats
- CSF may be mildly abnormal
- Electrodiagnostics or exclusion diagnosis
- Self-limiting disease – 4-6 weeks intense supportive care
- Steroids don’t seem to make a difference!
- Rarely respiratory complications

Acute Neuromuscular Disease

Idiopathic Polyradiculoneuritis
(Coonhound Paralysis)

Chronic Neuromuscular Diseases

- V x
- I Immune mediated / infectious (toxoplasma/ neospora)
- T Organophosphates, Vincristine
- A x
- M Hypothyroid, Diabetes, Cushing’s, Electrolytes, Hypoglycaemia (Insulinoma), Steroid use
- I Idiopathic
- N Paraneoplastic
- D Degenerative

Inflammatory Muscle Disease

- *immune mediated* (idiopathic) – check for underlying neoplasia / rule out infection / check for other immune disorders / responds to immunosuppressive therapy
- *Infectious* – Toxoplasma / Neospora titers and response to trimethoprim-sulphonamide and clindamycin therapy
Idiopathic Polymyositis

- Must rule out infectious diseases
- Prednisone 1-2 mg bid 14d - taper to effect
- Continue for at least 4-6 weeks
- Up-to 12 months or more may be needed
- Other immunosuppressives sometimes needed
- Always consider lymphoma

Inflammatory Nerve / Nerve Root Disease

- Chronic
- Progressive
- Maybe more than one limb involved
- May not appear painful
- All limbs vs. brachial plexus neuritis vs. radiculomyositis

Inflammatory Nerve / Nerve Root Disease

Causes
- Toxoplasma
- Neospora
- Immune-mediated neuritis?

Diagnosis
- Rule out trauma
- CSF tap / filters / dietary history
- Bone marrow / lymph node aspirate
- EMG / Nerve biopsy

Treatment
- Antibiotics (clindamycin / trimethoprim)
- Immunosuppressives

Chronic Polyneuropathies

Degenerative
- Purebred / Often 3 months old / other littermates affected? / in a book / in general poor prognosis

Metabolic
- (Diabetes / Hypothyroidism / Insulinoma)
  - Other clinical signs? / routine lab tests / response to therapy

Chronic Polyneuropathies

(Paraneoplastic)
- Complete tumor search is warranted / can respond to tumor resection or treatment

Toxic
- Question owners / check concurrent medications (vincristine) / perform serum cholinesterase and lead assays
Supportive Care

Treatment

- Physiotherapy
- Hydrotherapy
- Electrical stimulation
- Splints to aid extension of joints – temporary
- Protective foot wear
- Skin care
- Gabapentin 10mg/kg PO ttd

Summary

- Once nerve or muscle disease is likely, the differentials to be considered as similar to other neurological diseases
- Some diseases have good outcome with minor treatment interventions and some can be fatal
- The prognosis will be determined by the clinical signs as well as the underlying disease