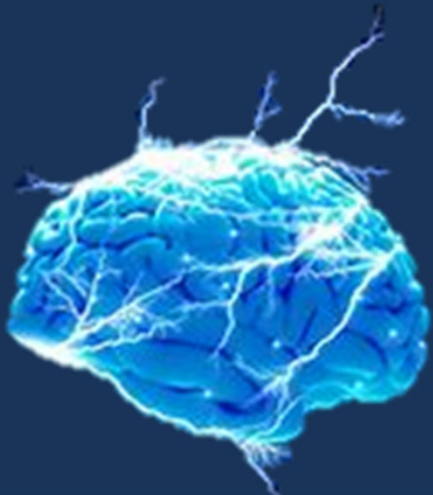


# Neurology Latest and Greatest

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## Lecture Outline

- ACVIM Consensus Statement on seizure management in dogs
- Midazolam CRI
- Ketamine boluses for RSE
- Updates on Canine Intervertebral Disc Herniation
- International Veterinary Canine Dyskinesia Task Force ECVN Consensus Statement: Terminology and Classification

# Introduction

- 2015 ACVIM Small Animal Consensus Statement on seizure management in Dogs
- Epileptic seizure
  - Clinical manifestation of excessive and/or hyper-synchronous electrical activity in the *cerebral cortex*

# When should treatment be started?

- Identifiable structural lesion present or prior history of brain disease or injury.
- Acute repetitive seizures or status epilepticus. (Ictal events greater than or equal to 5 minutes or greater than or equal to 3 generalized seizures in 24 hours)
- Greater than or equal to 2 seizure events within a 6 month period
- Prolonged, severe, or unusual post ictal periods

# Which drug should be used first?

- Phenobarbital
- Potassium Bromide
- Primidone
- Imepitoin
- Levetiracetam
- Zonisamide

# Phenobarbital

- Monotherapy recommendation
  - Level I
  - Grade A
- Monitor drug levels
  - Yes
- Efficacy 82%

# Bromide

- Monotherapy Recommendation
  - Level I
  - Grade B
- Monitor Drug levels
  - Yes
- Efficacy
  - 73.9%

# Levetiracetam

- Monotherapy recommendation
  - Level 4
  - Grade C
- Monitor Drug levels
  - N
- Efficacy
  - ??



# Zonisamide

- Monotherapy Recommendations
  - Level 3
  - Grade C
- Monitor Drug Levels
  - Yes
- Efficacy
  - 60%

# How should monitoring be performed?

- Objective
  - What is the goal of monitoring?
- Steady state concentrations
  - 5 half lives
- Trough levels?
- Therapeutic range
  - Population statistic

# Phenobarbital

- First steady state point
  - 2 weeks
- Steady state clearance time point
  - 6 weeks
- Additional monitoring
  - Every 6 months thereafter
  - >2 seizure events
  - 2 weeks after a dosage change
- Therapeutic range
  - 15-35 mcg/mL

# Bromide

- Steady state concentration point
  - Between 6-12 weeks
- Additional monitoring
  - Annually
  - If >3 seizures occur
  - Toxicity
- Collect any time point 2 hours after dosing

# Levetiracetam

- Not routinely checked in practice
- Reference range has not been established for dog

# Zonisamide

- Levels usually checked
  - 1-2 weeks after initiation of treatment
  - After dosage adjustments
  - If seizure frequency increases

# Risks

- Phenobarbital
  - Behavioral changes, PU/PD/PP, bone marrow suppression, drug induced hepatotoxicity.
- Bromide
  - PU/PD/PP, increased lethargy, mild ataxia, mucosal irritant, GI upset, pancreatitis

# Risks

- Levetiracetam
  - Unsteady gait, salivation, vomiting, and sedation. Rare to see significant side effects.
- Zonisamide
  - Sedation, generalized ataxia, vomiting, inappetence, KCS and polyarthritis?, acute toxic hepatopathy, renal tubular acidosis



# Alternative, non pharmacological treatments

- Vagal Nerve Stimulation (VNS)
- Dietary alteration
  - Ketogenic diet in humans (not effective in dogs and causes adverse effects)
  - MCT
    - Purina Neuro Care diet
- Acupuncture

# Midazolam CRI

- 106 dogs
  - 129 separate visits
- Median time to start of midazolam CRI was 4 hours
- Typical dose 0.25mg/kg/hr
  - 60% no dose escalation
  - 40% dose escalation
- Seizures successfully controlled in 77%
  - Unsuccessful in 22%
- Median CRI duration
  - 25 hours
- Adverse effects

# IV Ketamine for the treatment of SE, RSE, and CS

- Roynard et al
- Frontiers in Veterinary Science 2021
- GABA receptors become inactive with prolonged seizure activity
- NMDA receptors are over expressed
- Retrospective study
  - 12 cases of RSE given Ketamine boluses
    - 5mg/kg
    - Stopped seizures 12/12
    - Recurred 4/12
    - Not effective unless there is pharmacoresistance (RSE)

# ACVIM Consensus Statement on diagnosis and management of acute canine TL IVDE

- Background
- Objective
- Materials and methods
- Introduction

# Diagnostic approaches

- MRI
  - >98.5%
- Computed tomography
  - 81-100%
- Myelography/CT Myelography
  - 53-97%

# Medical vs surgical management

- Medical
  - Restricted activity
  - Analgesia
- Surgical
  - Spinal cord decompression
    - Hemilaminectomy most common
    - +/- disc fenestration
- Recommendations?

# Duration of exercise restriction

- At least 4 weeks
  - Healing of annulus fibrosus
  - Crate confinement!
  - Low evidence

# Use of anti-inflammatory medications

- Steroids
  - Steroids not recommended in the acute stage of the disease.  
Moderate evidence
  - May be beneficial in the chronic phase
- NSAIDs
  - Recommended for 5-7 days post op



# Recommendations for analgesia

- NSAID
- Gabapentin
- Pregabalin
  - Muscle relaxant
    - Diazepam
    - Methocarbamol

# Adjunctive treatments

- Acupuncture
  - Low evidence of effectiveness
    - Not recommended as an alternate to surgery
- Rehab
  - Recommended as additional treatment

# Surgery

- Hemilaminectomy
- Mini-hemilaminectomy/pediculectomy
- Dorsal laminectomy
- Partial corpectomy
- +/- fenestration

# Timing of surgical decompression

- Sooner is better, but do not know the specific timeline
- Okay to do surgery on dogs that have been paralyzed for an extended period

# Fenestration

- Removing the disc material in situ
- Site of extrusion
- Distant site

# Management of urination

- Incomplete urination
  - May have to intervene pharmacologically

# International veterinary canine dyskinesia task force ECVN consensus statement

- Terminology and classification
  - Movement disorders
    - Involuntary movements without changes in consciousness.
    - Tremors, peripheral nerve hyper excitability, paroxysmal dyskinesia, and dystonia

# Introduction

- Involuntary movements without changes in consciousness
  - Tremors
  - Peripheral nerve hyperexcitability
    - Fasciculations
    - Myokymia
    - Neuromyotonia
    - Myotonia
    - Cramps
    - Tetanus/tetany
    - Myoclonus
    - Paroxysmal dyskinesia (not a seizure!)
    - Dystonic movements



# Current terminology and adaptation to veterinary medicine

- Hyperkinetic
  - Involuntary active movements (dyskinesia)
  - Sustained muscle contractions (dystonia)
- Hypokinetic

# Description of Veterinary Movement disorders

- Tremors
  - Rhythmicity main factor
  - Rest tremor
  - Action tremor
    - Postural or orthostatic
    - Kinetic

# Peripheral nerve hyperexcitability

- Fasciculations
- Myokymia
- Neuromyotonia
- Cramps
  - Scotties
- Tetanus/tetany

# Myoclonus

- Physiological
  - Hiccups
- Pathological

# Paroxysmal Dyskinesia

- Episodes of abnormal, self limiting movements
- Episodic bad movement
- Looks like a seizure. Historically misdiagnosed.

# Dystonia

- Hyperkinetic movement disorder
- “Dys”- bad/ill/abnormal
- “Tonia”- tension
- Sustained or intermittent muscle contractions
- Patterned, twisting movements

# Recommended clinical approach and descriptions for veterinary cases

- Hyperkinetic vs hypo kinetic
- Paroxysmal vs persistent
- Exercise induced vs not
- Movement disorder or not
- Inherited or acquired