



IDIOPATHIC EPILEPSY (IE)

Extended version

Classic case: 3-year-old Beagle; History of two seizures in past month. He is otherwise normal on exam.

Presentation:

- Signalment
 - **Dogs 1-5 years old**, slightly more common in males
 - **Any dog breed**, but inherited in beagle, Belgian Tervuren, keeshond, dachshund, Labrador retriever, golden retriever, Shetland sheepdog, Irish wolfhound, Vizsla, Bernese mountain dog and probably more
 - Cat, idiopathic epilepsy (IE) less common than dogs
 - Horses
 - **Arabian foals**
 - Adult horses do not usually have seizures due to IE
- **History** - Need detailed, accurate Hx. IE has many, many rule outs
 - One or more seizures, usually about a month apart
 - Generalized tonic-clonic – duration of 30 seconds to 3 minutes
 - Loss of consciousness
 - Sustained contraction of all muscles
 - Paddling limb motions or rhythmic muscle contractions (esp limbs, masticatory muscles)
 - Usually urinary and fecal incontinence
 - Generalized mild seizures affecting only the face and jaws
- Clinical presentation
 - **Patients are usually normal when presented in clinic**
 - May have temporary neurologic deficits if present w/in 24 hours of a seizure
 - Ataxia, abnormal behavior, cortical blindness, hemiparesis
 - If these sx continue more than 24 hours after a seizure – consider differentials below
 - Normal fundic examination – if abnormal, consider differentials listed below



Seizure activity in a beagle. Note bell on collar to alert veterinary staff.

Image courtesy Dr Shirlev Scott

DDX: **VITTAMINN D** acronym:

Vascular (stroke, coagulopathy)

Inflammatory (encephalitis)

Toxic (lead, metaldehyde, organophosphate)

Trauma

Anomalous (hydrocephalus, lissencephaly)

Metabolic (hepatic encephalopathy, hypocalcemia, hypoglycemia)

Idiopathic (epilepsy)

Neoplasia

Nutritional (thiamine deficiency)

Degenerative (lysosomal storage disease)

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Test(s) of choice: Diagnosis is based on exclusion of other causes of seizures

- **Basic work-up**
 - **Bloodwork** to rule out metabolic or toxic cause of seizures
 - **Bile acids** to rule out hepatic encephalopathy
 - If normal physical and neurologic examination and typical signalment,
 - Presumptive diagnosis of epilepsy can be made at this point.
 - If deterioration or failure to respond to medication, pursue more advanced testing
- **Advanced testing**
 - **MRI** or CT of brain to rule out structural brain disease (e.g., brain tumor)
 - **Cerebrospinal fluid analysis** to rule out encephalitis
 - ± Electroencephalography to confirm seizure activity
- **Monitoring**
 - **Monitor anticonvulsant blood levels** (DO NOT USE SERUM SEPARATOR TUBES)
 - 2-4 weeks after starting meds or changing dosage (3 months for potassium bromide)
 - Every 6-12 months
 - If there is poor seizure control
 - If concerned with anticonvulsant toxicity
 - **Monitor bile acids** every 6-12 months if using meds that can be hepatotoxic (ie: phenobarbital)

Rx of choice:

- **Acute treatment to halt seizure activity**
 - **Benzodiazepines:** Intravenous diazepam, midazolam, lorazepam (if necessary, diazepam may be given rectally and midazolam may be administered intramuscularly or intranasally)
 - Very short half-life; will need concurrent maintenance anticonvulsant if seizures recur
 - If not effective after 3 doses, give propofol IV to stop seizure then continuous infusion)
 - Digital ocular pressure – vagal stimulation
 - If temporarily effective but seizures reoccur
 - Benzodiazepine continuous rate infusion (CRI)
 - Propofol or isoflurane anesthesia
 - After seizure stops
 - Administer oxygen; Place IV catheter
 - Check glucose, calcium, hematocrit, protein
 - Maintain hydration & blood pressure w fluid therapy
 - Monitor temperature and treat >104°F (40°C)
 - Turn at least every 4 hours
 - Express bladder if needed every 8 hours
 - Keep clean, warm dry
 - May require 24-72 hours of heavy sedation
 - **If animal is not already on anticonvulsants**
 - Give parenteral loading dose of Phenobarbital (IV) or levetiracetam (Keppra) (IV or SQ)
 - Then continue with maintenance therapy
 - **If animal is already on anticonvulsants**
 - Draw blood for anticonvulsant levels
 - **Continue anticonvulsants** on schedule (give parenterally if necessary, potassium bromide can be given rectally if necessary)



Belgian Tervuren, a breed predisposed to inherited epilepsy.

Image courtesy of Ron Armstrong

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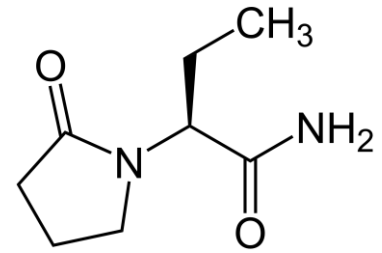
- **Maintenance therapy to control seizures**

- Goals:

- Reduce frequency & severity of seizures
- Maximize quality of life of patient and family
- Avoid serious side effects.

- Risks of seizures versus risks of treatment

- Seizures: seizures themselves and emotional effect on family
- Treatment: Side effects of meds; expense, effort of giving meds BID/TID, monitoring med levels.



Levetiracetam structure.

Image courtesy of Mykhal

- **Phenobarbital**

- Potent inducer of cytochrome P450
- **Multiple side effects: sedation, ataxia, PU/PD, polyphagia**
- Decreases T₄, free T₄, and increases TSH without clinical signs of hypothyroidism

- **Potassium bromide**

- Renally excreted, half-life of 24 hours
- Often administered with phenobarbital, or alone
- Bromide competes with chloride for renal elimination
 - High chloride diet increases bromide elimination
 - **Do not alter dietary salt!**
- **Multiple side effects:**
 - Ataxia, sedation, vomiting, PU/PD, polyphagia, hyperactivity,
 - Pruritic rash, pancreatitis, **pneumonitis (cats)**

- **Levetiracetam (Keppra)**

- Renal metabolism
- Half-life of 4 hrs but anticonvulsant effect appears to last longer; available in extended release
- 100% bioavailability after oral or parenteral dosing
- **No drug interactions** – can be given with any other anticonvulsant
- **Very safe** in dogs and cats
- “Honeymoon effect” – reported in people – excellent control for first several months only

- **Zonisamide**

- Hepatic metabolism – give double dose when administered with phenobarbital because phenobarbital will increase clearance of zonisamide
- Side effects-high safety margin, transient sedation, ataxia, vomiting, thyroid suppression

- **Felbamate**

- May be beneficial in dogs refractory to phenobarbital and bromide
- Side effects: nervousness, hyperexcitability, decr appetite, hepatotoxicity, blood dyscrasia, KCS
 - Monitor CBC every few months

- **Gabapentin**

- Hepatic metabolism but no enzyme induction
- Mixed results as add-on anticonvulsant
- Side effects uncommon: sedation, ataxia, polyphagia, weight gain

- **Pregabalin**

- Gabapentin analog, effective add-on in some dogs
 - Side effects: sedation, ataxia

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Prognosis:

- Guarded to good
- Can have normal lifespan if well-controlled.
- Animals with **repeated** emergency episodes of **status epilepticus** (continuous seizure >5 min) or **clusters** (several seizures in a 24 hour period) tend to have a **shorter lifespan**.
- **Only 70-75% of dogs will be controlled with phenobarbital and/or potassium bromide**
- Larger breed dogs tend to have more difficult to control seizures

Prevention:

- Spay females (estrogen can lower seizure threshold)
- Client education – give meds on time. A missed dose can precipitate a cluster or status epilepticus.
- **Do not breed affected dogs**

Pearls:

- Goal of treatment is to reduce seizure frequency by 50%
- Less than two seizures every 2-3 months is considered adequate control
- **Its an emergency when:**
 - **More than 3 seizures in 24 hours**
 - or
 - **A single seizure lasting more than 5 minutes**
- **Have owner keep diary** of seizure activity, meds, med levels, unusual events
- **Seizures happen most often at night** or when patient is resting or sleeping.
- Can be “provoked” by a visit to the veterinary hospital, groomer, or loud noises.
- **Have owner videotape episode** if possible-helps ddx from syncope, narcolepsy, etc
- **Kindling effect:** Seizures themselves seem to increase seizure frequency over time
- Don't combine or change anticonvulsants unless the therapeutic blood level is achieved with 1st drug
- If need to discontinue an anticonvulsant, do so as gradually as possible
- The number one cause of seizures in a dog over 5 years old is a brain tumor



Midazolam injectable can be administered IM or intranasal.

Image courtesy of James Heilman, MD

Refs: A Practical Guide to Canine and Feline Neurology, Dewey, 2nd ed. p 237-251, Veterinary Neuroanatomy and Clinical Neurology, de Lahunta and Glass, 3rd ed. p 458-463, Small Animal Neurology, Jaggy. p 446-453, Large Animal Neurology, Mayhew, 2nd ed. p83-86; Clinical Veterinary Advisor, Côté, 2nd ed, p 353-355; and Merck Manual, 10th ed (online): Anticonvulsants Used to Stop Ongoing Seizure Activity, Maintenance Anticonvulsant Therapy