Seizures in Cats

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Compared to dogs, much less has been written about seizures in cats. Commonly veterinarians have been taught that seizures in cats are always the result of an identifiable brain or metabolic abnormality. Certainly there are multiple possible causes for seizures in cats. Differentials include hydrocephalus, previous head trauma, a brain tumor, infectious/inflammatory diseases (meningitis, Toxoplasma, FIP, Cryptococcus), or a vascular disease (infarct). The existence of idiopathic epilepsy has been disputed in cats. One contributing factor in this debate is the lack of either clinical data (MRI) or adequate post mortem exams. However, using various definitions of epilepsy, the estimated range of epilepsy in cats is 25-54%. The formal definition of idiopathic epilepsy is a cat that is normal between seizures, has normal laboratory testing, normal CSF analysis, and a normal MRI. Cats have a relatively high incidence of focal seizures. These are paroxysmal events in one part of the body that may or may not include an impairment of consciousness. Cats commonly experience facial involvement. In a recent study by Wahle and others, using strict definitions for causes of seizures, 22% of cats were considered to have idiopathic epilepsy. However, using other retrospective studies, that number has been suggested to be around 33%. In the study by Wahle, structural brain lesions were found in 47% and a metabolic disease or toxicity was found in 31% of cats. The relatively high incidence of structural lesions is a reason some have strongly recommended a thorough diagnostic evaluation in a cat with seizures. The most common type of cat with idiopathic epilepsy is the domestic shorthair. The median age at which the cats have its first seizure is 3.8 years and most cats have their first seizure at less than 5 years old, similar to dogs with idiopathic epilepsy. Of these cats, 78% were indoors only. In cats with with idiopathic epilepsy, 50% had a form of focal seizure initially. In the past focal seizures were thought to indicate a structural brain lesion, however partial seizure activity is becoming recognized as a feature of idiopathic epilepsy. Also, focal seizures are more common with idiopathic epilepsy than when a lesion was identified. Common signs of focal seizures include salivation, orofacial twitches, tremor, rapid running, mydriasis, urination, defecation, or vocalization. Seizures are generally short and are usually not longer than 3 minutes. Seizures in cats with idiopathic epilepsy occur many times while the cat is resting or in non-REM sleep. Sleep increases cortical neuronal synchronization, which lowers the seizure threshold.

Diagnostic evaluation for cats with seizures takes into account history, physical exam, and laboratory testing. If possible a video recording of the event can be very helpful in identifying seizure-like activity. Cats with idiopathic epilepsy are generally normal between seizure events. Abnormal neurological signs unrelated to seizures suggest a structural brain disease.
The neurological exam can be challenging in cats. A very useful part of the evaluation is to allow the cat to walk around the exam room and watch its behavior. Standard diagnostic evaluation recommendations include blood pressure measurement, routine labwork (CBC, serum chemistry, urinalysis). If possible MRI and cerebrospinal fluid analysis help rule out structural brain disease. If liver disease is suspected, bile acid measurement can help identify liver dysfunction. Commonly infectious disease testing for Toxoplasmosis, FeLV, FIV, and FIP are considered. However, if no other systemic signs of disease are evident, these tests are unlikely to be helpful and add to the cost of the diagnostic evaluation.

Cats have a fairly distinct syndrome related to seizures. A subset of cats with orofacial type partial seizures may have hippocampal necrosis. This condition has been described in multiple reports. A recent report linked some cats to an immune mediated condition involving voltage gated potassium channels in the hippocampus. Lesions of the hippocampus and piriform lobe have fairly distinct changes on MRI. Other than facial twitching, signs of hippocampal lesions include acute cluster seizures, salivation, and aggression. The immune mediated encephalitis can be treated with corticosteroids.

The decision to begin anticonvulsant therapy is similar to what is reported in dogs: presence of a structural lesion, 2 or more seizures in a 4-6 week period, cluster seizures, or recent trauma. The 1 year survival rate for cats with epilepsy is 73%. A significant number of cats (44%) can have remission of seizures. Phenobarbital is generally the drug of choice in cats. It has been reported to control seizures in 93% of cats. The dose range for this drug is 1.3-2.6 mg/kg PO q 12 hours. A serum range of 15.5-28.3 ug/mL is recommended. Phenobarbital can cause leukopenia in cats. Phenobarbital is available in a liquid (elixir 15 mg/5 ml or 20 mg/5 ml) or pill form (15 mg or 30 mg tablets). Some cats do not like the liquid form and therefore a pill is easier to give.

When phenobarbital is not a treatment option, or another anticonvulsant is necessary, multiple drug options exist. Diazepam and clorazepate have been used successfully and the development of tolerance does not seem to be a problem as compared to dogs. The clinician should be aware of the possibility of acute hepatic necrosis when beginning diazepam in cats. Other drugs used in cats include levetiracetam, gabapentin, zonisamide, pregabalin, and topiramate. Limited data are available regarding the efficacy of these drugs in cats both as sole anticonvulsants and as add on drugs. It should be noted that due to the half-life, zonisamide may be given once daily in some cats. Potassium bromide is not recommended due to the high incidence (almost 50%) of asthma like signs. These can develop months after starting the drug.

Administration of an oral drug to cats can be problematic. Transdermal PB administration has been shown to result in therapeutic serum concentrations. Two transdermal drug administration formulations have been evaluated. The delivery vehicles Pluronic lecithin organogel (PLO) and Lipoderm Activemax (PCCA – proprietary compounding base, Professional Compounding Centers of America) were applied to the pinnae of cat’s ears every 12 hours. Both formulations when used at 9 mg/kg resulted in serum levels between 15-45 ug/ml. There were
minor side effects reported. Lipoderm Activemax has an increased solubility which may allow for an increased dose above 9 mg/kg when necessary. It is important to monitor serum phenobarbital concentrations with this drug administration method.

In summary, the prognosis for idiopathic epilepsy can be good. There is much work to be done regarding the characterization of this disease.

**Anticonvulsants used in cats and dosage recommendations:**

- **Phenobarbital 1–5 mg/kg q12h**: Sedation, ataxia, PU/PD/PP, leukopenia, thrombocytopenia, lymphadenopathy, skin eruptions, coagulopathy. Serum level monitoring (23–30 ug/mL)
- **Diazepam 0.2–2 mg/kg q8–24h**: Sedation, PU/PD/PP, hepatic failure. Liver function monitoring is advisable.
- **Potassium bromide** (not recommended due to high incidence of eosinophilic bronchopneumonia)
- **Clorazepate 3.75–7.5 mg/kg q6–12h**: As diazepam
- **Levetiracetam 10–20 mg/kg q8h**: Inappetence, sedation, hypersalivation
- **Gabapentin 5–20 mg/kg q6–12h**: Sedation, ataxia. No clinical studies available
- **Zonisamide 5–10 mg/kg q12–24h**: Sedation, inappetence, vomiting, diarrhea
- **Pregabalin 1–2 mg/kg q12h**: Sedation. No clinical studies available
- **Topiramate 12.5–25 mg q8–12h**: Sedation, inappetence. No clinical studies available
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