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SPECIALISTS**
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Seizures

What is a seizure?

Seizures are caused by abnormal electrical activity from the brain. This electrical activity most commonly results in uncontrolled muscle movements. It can also cause behavioral changes, aggression, blindness, and changes in consciousness. Seizures vary widely in severity and duration. Seizures are generally repetitive, although the frequency is quite variable.

- *Generalized* (or *grand mal*) seizures are those with no obvious focus that typically result in an animal falling over, chewing/salivating, and experiencing full body convulsions with rigidity and paddling; the complete event is typically less than 1-2 minutes
- *Partial* (or *focal*) seizures are those that cause abnormal movement in a specific area of the body (causing single limb twitching or uncontrolled chewing/salivating, for example); these disorders can also result in episodic behavioral changes; these events can be short or rather extended
- The *aura* is the period just before the seizure; the *ictal* period is the seizure; the *post-ictal* period is the period after the seizure
- *Cluster seizures* are groups of seizures that occur in brief periods; *status epilepticus* is a single prolonged uncontrolled seizure; these are more severe forms of seizure disorders that can cause brain damage or be fatal if left untreated
- Although more common in dogs, cats can also experience seizures

What causes a seizure?

The causes of seizures are generally divided between *extracranial* (outside the brain) and *intracranial* (inside the brain) causes. The extracranial causes include hypoglycemia, electrolyte abnormalities, hypertension, toxins, vitamin deficiencies, kidney disease, liver disease, and hyperlipidemia. Intracranial causes include primary diseases of the brain such as tumors, infections, immune-mediated diseases, and structural or developmental abnormalities. Perhaps the most common intracranial cause of seizures is *idiopathic epilepsy*, seizures of unknown origin. This is a diagnosis made only after all other potential causes have been eliminated.

Different age groups are more likely to have certain causes of seizures: animals under a year are more prone to congenital structural or developmental abnormalities; animals that are 1-6 years are more likely to have idiopathic epilepsy; animals greater than 6 years are more likely to have tumors or acquired structural disease



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- *Hypoglycemia* is low blood sugar; it can be caused by a number of different things
- Abnormalities in calcium or potassium are the most common electrolyte changes that cause seizures
- *Hyperlipidemia* is an elevation in the fats that circulate in the blood (triglycerides and cholesterol); this can lead to atherosclerosis (deposits in the blood vessels) or fat emboli (clots)
- *Hypertension* is elevation in blood pressure
- *Breeds* predisposed the idiopathic epilepsy include Golden Retrievers, Labrador Retrievers, German Shepherds, Huskies, and Cocker Spaniels

What laboratory changes are seen with seizures?

Most patients with seizures do not have any labwork abnormalities. Seizures can cause mild alterations in labwork, however. Sometimes bloodwork reveals the cause of the seizures.

Laboratory changes secondary to seizures include:

- Elevated creatine kinase and AST
- Mild liver enzyme elevation
- Mild electrolyte abnormalities
- Mild hypoglycemia

Laboratory changes that can indicate a potential cause of seizures include:

- Severe liver enzyme elevations
- Severe azotemia
- Severe electrolyte abnormalities
- Severe hypoglycemia

- *Creatine Kinase* and *AST* are muscle enzymes that increase with seizure-associated muscle trauma
- *Azotemia* is an increase in kidney values

What testing is recommended for seizure patients?

There are three main goals in evaluating patients with seizures. Firstly, evaluating for potential extracranial causes; secondly, evaluating for changes secondary to the seizures; and finally, searching for prognostic and complicating factors.

Patients evaluated for seizures may need the following tests:

- Chemistry profile
- Urinalysis
- Abdominal ultrasound
- Complete Blood Count (CBC)
- Blood pressure
- CT-scan or MRI
- Chest x-rays



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- *Abdominal ultrasound* is a non-invasive test that uses sound waves to create images of internal organs and structures; this may be performed in cases where underlying cancer is suspected
- CT-scan and MRI are advanced imaging techniques that allow for evaluation of the brain structure, something x-rays can not do

What complications can arise in patients with seizures?

The greatest risk for complications in patients with seizures is in those animals that have unregulated or prolonged seizures. With status epilepticus or cluster seizures, life-threatening elevations in body temperature can result. This temperature elevation can lead to permanent brain injury, internal organ failure, or coagulation abnormalities. Of course, any underlying disease could cause a number of complications.

What treatment options are available for seizures?

With so many potential causes for seizures, there are many considerations for treatment. Any correctable underlying causes are treated appropriately. Animals with brain tumors can undergo surgery, radiation therapy, and/or chemotherapy with variable prognoses, depending on the location and type of the tumor. For patients with idiopathic epilepsy or underlying disease that can not be corrected, anti-seizure medications are indicated. The most common anti-seizure medications include potassium bromide and phenobarbitol. In patients that do not respond to these, other medications are available. In patients that experience particularly severe or cluster seizures, quick acting anti-seizure medications may be prescribed to control these events when they occur.

What sort of long-term monitoring is recommended for seizure patients?

Recommendations for follow-up vary widely depending on the cause of the seizures. Patients on anti-seizure drug therapy require follow-up drug level monitoring. Because these drugs can have side effects, follow-up CBC and chemistry are also often recommended. Specific underlying causes will determine particular follow-up that may be required.

- *Phenobarbitol*, although being an excellent means to control seizures, can have rare but significant side effects on the liver and bone marrow



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What is the prognosis with seizures?

The prognosis in patients with seizures is highly variable depending on the underlying cause identified. Idiopathic epilepsy is often controlled with one or two medications with an excellent long term prognosis and quality of life. The specifics of your case will be discussed at the time of your appointment.

What do I do if my pet is having a seizure?

- Do not hold down or interfere with an animal during a seizure. Dogs generally do not 'swallow their tongue' as people can (risking respiratory distress). Attempts to prevent this or interfere with the mouth in any way during a seizure places you at great risk for a serious bite injury.
- Without contacting the animal, you can clear furniture or other potentially harmful objects from the area
- In known diabetic patients (at risk of hypoglycemia with insulin over-dosage), you can apply corn syrup or honey to the gums
- If an animal experiences seizures greater than five minutes or multiple seizures in a row, you should contact your veterinarian or seek emergency care
- Record seizure type, severity and duration