

NEUROLOGY

Seizures

by Anthony Conte, DVM

A seizure is the manifestation of abnormal/excessive electrical brain activity in the cerebral cortex. In other words, a seizure is an intracranial disturbance located in the larger part of the brain known as the forebrain, which contains the Cerebrum and Thalamus. The pathophysiology (or mechanism) of how a seizure truly occurs is still poorly understood with the three most agreed upon theories either being 1) inadequate inhibition of neurons, 2) excessive excitation of neurons, or 3) a combination of both options 1 and 2.

There are many different types or forms of seizures, however below we will cover the two most commonly seen/diagnosed. The first most common type of seizure is known as a *Generalized Tonic-Clonic Seizure* (formerly known as a Grand-Mal Seizures). This type of seizure is best described as a tonic phase, or the portion in which the animal has continued contraction of all the muscles (for example the animal falls over, is stiff, and their limbs are extended) followed by a clonic phase or the phase in which padding or jerking of the limbs is seen. The second most common type of seizure is known as a *Focal Seizure*, or partial seizure. Focal seizures are normally not as dramatic as Grand-Mal seizures, but they do originate in the same parts of the brain however affect one focal area or muscle group. One major separating factor between the two aforementioned seizure types is that during a simple focal seizure it is unlikely that consciousness is impaired and there usually is an ability to respond to normal

stimuli. In most cases, partial seizures that are inadequately treated usually get worse over time as the seizures affect more and larger parts of the brain and if uncontrolled can cause permanent brain damage.

A seizure can be broken down into three parts/phases: the pre-ictal phase, the ictus, and the post-ictal phase. The pre-ictal (or before the ictus) are the events that immediately precede the seizure event itself. This period is not long lasting and can last seconds to minutes, with the most common signs seen during this period being: attention seeking behavior, agitation, or hiding activity. The ictus phase is what follows, and as mentioned this is the seizure event itself during which it is not uncommon to see loss of bowel control. Lastly, the post-ictal phase is the period immediately after the seizure and is most commonly described as disorientation or "seeming dazed/out of it", and/or ataxia (wobbliness) the duration of this portion of the seizure varies however it can last for minutes to hours.

It is important to note that some dogs get frightened, disoriented or aggressive after a seizure. Behavior is definitely unpredictable, so please use caution around your pet after a seizure event.

Some of the more common breed that are affected by seizures are, but not limited to, the following: Australian Shepherd, Beagle, Bernese Mountain Dog, Border Collie, Boxer, Cocker Spaniel, Dachshund, German Shepherd, Golden Retriever, Labrador



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Retriever, Miniature Schnauzer, Siberian Husky, Vizsla.

Seizures can arise from a variety of different underlying etiologies (or causes). In dogs whose first seizures occur between one and five years old, our primary rule-out, and most common, is Idiopathic or Genetic Epilepsy, meaning occurring without a known cause, but often thought to have a genetic link in some breeds. Some criteria for a dog to fit this category are listed below:

- -age of onset: 1 to 4 years
- -stereotypy: very similar initiation, actions, movements
- -breeds with high incidence
- -typically tonic-clonic generalized seizures
- -periodicity with a progressive nature • -seizures occur spontaneous during times of rest or at night
- -the interictal examination is normal • -laboratory work is normal
- -neurological work-up (MRI and CSF tap) is normal

Other causes however for seizures during this age range are potentially: metabolic problems (severe liver or kidney disease, low blood sugar, toxins) or problems within the brain itself (congenital malformations, infections or inflammation of the brain and/or the tissues that surround it, vascular events (or stroke), masses or tumors, head trauma, degenerative brain diseases). In dogs



whose first seizure events occurs later in life as an adult outside of that 1-5 year window, while idiopathic epilepsy is

possible, it is far less common and there is oftentimes an intracranial cause for the seizures found. We know that roughly up to 50% of dogs with intracranial pathologies (abnormalities) have seizures as their only symptom. Intracranial causes would include a tumor (cancer), vascular accident (stroke) and inflammation /infection.

Now in order to obtain a diagnosis so that the underlying etiology (cause) is found and the most appropriate treatment plan is started going forward, an MRI and CSF (cerebrospinal fluid) analysis are recommended. The images produced by the MRI along with the results of the CSF analysis provides the most complete clinical picture and information to make a diagnosis. The MRI itself is done under general anesthesia and therefore pre-surgical bloodwork and chest radiographs (x-rays) are required for anesthetic purposes.

Treatment and prognosis for seizures depends on the underlying etiology (cause) of the seizure itself and will have an anticonvulsant medication(s) at the core. It is important to note once your pet starts an anti-convulsant medication it is very rare that this medication is discontinued and your pet will need to remain on the medication long term.

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In the case of Idiopathic or Genetic Epilepsy this is a life-long diagnosis and your pet will most likely need to remain on one or more anti-convulsant drugs going forward. In these cases however, there is no effect on pet longevity and therefore once the seizures are under control with the appropriate medication(s) prognosis is usually favorable. There is going to be no medication or combination of medication that will prevent seizures in your pet altogether, however eliminating seizure activity without subjecting the pet to adverse side effects of the medication is the goal. Normally one seizure in a two to three month period is considered very good seizure management.

