

### Pathophysiology

Regardless of the etiologic factor or type of seizure, the basic mechanism is the same. Abnormal electrical discharges (1) may arise from the simultaneous activation of neurons in both hemispheres of the brain (generalized seizures); (2) may be restricted to one area of the cerebral cortex, producing manifestations characteristic of that particular anatomic focus (partial seizure); or (3) may begin in a localized area of the cortex as a partial seizure and spread to other portions of the brain and, if sufficiently extensive, produce generalized seizure activity.

A seizure occurs when there is sudden excessive excitation and loss of inhibition within neuronal circuits, allowing the circuits to amplify their discharges simultaneously. These discharges occur in response to the activity of sodium, potassium, calcium, and chloride ion channels. Normally these discharges are restrained by inhibitory mechanisms. In response to physiologic stimuli, such as brain injury or infection, genetic abnormalities, cellular dehydration, severe hypoglycemia, electrolyte imbalance, sleep deprivation, emotional stress, and toxic exposures, these abnormal neuronal discharges can spread to nearby cortex and subcortical structures. Primary generalized seizures begin with abnormal discharges in both hemispheres, which can involve connections between the thalamus and neocortex. On the basis of these characteristic neuronal discharges (manifested as stereotypical symptoms observed and reported during seizures and/or as recorded by the EEG), seizures are designated as partial, generalized, and unclassified epileptic seizures.

### Seizure Classification and Clinical Manifestations

There are many different types of seizures, and each has unique clinical manifestations. Seizures are classified into two major categories:

- Partial seizures, which have a local onset and involve a relatively small location in the brain