

PedsCases Podcast Scripts

This is a text version of a podcast from PedsCases.com on "Seizures Types and Epilepsy." These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedcases.com/podcasts.

Seizure Types and Epilepsy

Developed by Michelle Bischoff and Dr. Francois Bolduc for PedsCases.com.
August 28, 2010

Introduction:

Hi my name is Michelle Bischoff and I'm a medical student at the University of Alberta. This podcast was reviewed by Dr. Francois Bolduc a Pediatric Neurologist and Assistant Professor and Dr. Melanie Lewis, a General Pediatrician and Associate Professor - both at the Stollery Children's Hospital and University of Alberta in Edmonton, Alberta, Canada.

This podcast will describe different types of seizures seen in pediatrics and management of epilepsy. In another podcast, I will talk about the clinical approach to status epilepticus.

Objectives:

The objectives of the podcast are as follows:

- First, to describe the pathophysiology of seizures
- Second, to identify possible etiologies
- Third, to distinguish the various types of seizures focusing on the pediatric clerkship objectives
- Last, to give an approach to a child presenting with a history of two or more seizures

Background:

Seizures are a common condition encountered in pediatric acute care and experienced by approximately 3% of children. Seizures have been described in documents dating back thousands of years, and at the time, attributed to possession by evil spirits. We are a little wiser today, and know that a seizure is due to abnormal activity of brain cells and may be a sign of a serious medical condition – either a neurological injury or disease or a physiological condition originating outside the brain. Conversely, it may be an isolated unprovoked event. In any case, it is a condition that must be investigated.

What is the mechanism of a seizure?

A seizure can be defined as the abnormal synchronized firing of electrical impulses in the

Developed by Michelle Bischoff and Dr. Francois Bolduc for PedsCases.com.
August 28, 2010

brain causing a change in motor activity and/or behavior. Essentially, excitation of cortical neurons overcomes normal inhibition. Abnormal discharging from one region of the brain may produce manifestations concurrent to that functional area. For instance, if seizure activity originates in the visual cortex, the patient may present with visual disturbances.

Some precipitating factors include neuronal damage and a genetic predisposition. Neonatal age is another important risk factor for seizures. Infants less than one month of age have the highest incidence of seizures compared to any other age group, which suggests that the immature brain is more susceptible to seizure activity.

What causes a seizure?

There are many etiologies of seizures – when a cause may be identified in the brain, we say the seizure is symptomatic. When no cause is found -the seizure is said to be idiopathic.

Symptomatic seizures may be linked to genetic causes, neurological conditions like a stroke, tumor, or head trauma, or may be provoked by fever and infection, drug withdrawal, metabolic or electrolyte disturbances, hypoxia, and cardiac arrhythmias.

Less than 1/3 of children experiencing a seizure will be diagnosed with epilepsy. Epilepsy diagnosis is given when the patient experiences at least two seizures.

There are various types of seizures—I will describe the following:

1. The classification of seizures as either generalized or partial depending on the clinical presentation. And, the two types of partial seizures – simple or complex – depending on the child's level of consciousness.
2. Some special conditions -namely, febrile seizures and status epilepticus
3. Seizure imitators, specifically breath-holding spells and other vagal events or potentially deadly ventricular arrhythmias

Seizure Classification:

Seizures are classified based on spread in the body and level of consciousness.

First, when we talk about extent of brain involvement, we mean seizures can be either focal or diffuse. Seizures produced by focal areas are termed PARTIAL seizures. Those that involve both cerebral hemispheres are called GENERALIZED seizures.

Partial seizures are further classified based on whether or not the patient is conscious during the episode. If the patient is conscious, we call this a SIMPLE partial seizure. If the patient is unconscious, we say the seizure is a complex partial seizure.

Generalized seizures, again, are seizures that involve bilateral cerebral hemispheres. There are 4 main types of generalized seizures: tonic-clonic (grand-mal), absence seizures (also known as petit mal seizures), myoclonic, and atonic seizures.

Generalized tonic-clonic seizures, also known as grand mal seizures, are extremely common. These seizures involve the entire body from onset and are characterized by tonic posture (meaning tensing and extension of the extremities) followed by clonic movements, which are rhythmic movements of flexion and extension. Sometimes, the child may experience just a clonic or just a tonic generalized seizure. In any case, a generalized tonic-clonic seizure may occur alone or may be preceded by a partial seizure or an aura. When preceded by an aura, we may call this a partial onset seizure with secondary generalization.

During a generalized tonic-clonic seizure, the child may be apneic and cyanotic, incontinent, and may vomit. The patient is usually amnesic in the post-ictal period, the time immediately following the seizure.

The second type of generalized seizure is called an absence seizure, also known as a petit mal seizure – in French, meaning a smaller seizure. In an absence seizure, the child is suddenly unresponsive and may stare into space. There is no movement or stiffening in the body. Lapse of consciousness lasts a few seconds or longer, and can occur with blinking or facial twitching. After a few seconds of staring, the child will suddenly be back to normal. The absence of a post-ictal state will help differentiate it from the other staring spells caused by partial complex seizures. Absence seizures usually occur multiple times a day, often occur in school-age children, and may be mistaken for inattention or daydreaming.

The third type of generalized seizure is known as a myoclonic seizure, "myo" meaning muscle and "clonus" meaning muscle jerking. Myoclonus seizures produce muscular contractions either in a single muscle, in one area of the body, or the entire body - the patient may or may not lose consciousness. In some instances, myoclonic seizures in teens may lead to a diagnosis of juvenile myoclonic epilepsy.

The last type of generalized seizure is the atonic seizure. An atonic seizure is a brief loss of muscle tone, lasting only a few seconds that may cause injury for instance if the patient falls, or the head drops unexpectedly. If the patient falls, this is commonly referred to as a "drop attack".

Partial Seizures:

That concludes types of generalized seizures. Next, we'll talk about Partial seizures.

Partial seizures are seizures that originate in an isolated area of the cerebral cortex and therefore manifest with focal neurological signs. There are essentially two types of partial seizures – simple partial and complex partial -both of which can be preceded by an aura. In simple partial, the child is conscious and in complex partial, the child is not. Symptoms of partial seizures depend on the focal location of the abnormal electrical firing in the brain, and include motor, sensory, autonomic and psychic manifestations. For instance, if the motor cortex is affected, the child may experience tonic or clonic movements in one extremity only. Alternatively, numbness suggests activity in the sensory cortex. Partial seizures are often confused with psychiatric symptoms when they occur with fear, déjà vu or hallucinations.

An aura is a sensation experienced at the onset of a seizure, also known as a partial seizure with sensory or psychological manifestations. For instance, the patient may experience a distinct smell or see flashes of light at the onset of a seizure; and these perceptions are usually stereotyped with each seizure.

Febrile seizures

Now let's discuss the most common type of seizure seen in pediatrics – febrile seizures. By definition, these seizures occur in children 3 months to 5 years of age.

There are two types of febrile seizures: simple and complex. Simple febrile seizures are the most common type of febrile seizure. To be a simple febrile seizure, it must be generalized, last less than 15 minutes, and must not recur within a 24 hour period. The child must have a normal developmental history, and there must be no evidence of a CNS infection or any other cause. Children experiencing simple febrile seizures often have a family history of febrile seizures.

The other type of febrile seizure is a complex febrile seizure. A complex febrile seizure is either focal, prolonged or recurs within 24 hours. Complex febrile seizures can indicate a more serious underlying etiology such as encephalitis, meningitis, or an underlying seizure disorder.

What is the risk of recurrence? Approximately 1/3 of children who experience a typical febrile seizure will have a subsequent febrile seizure. Therefore, in most children, this is an isolated event.