CASE 8.5
Seizure Disorders | Level 3

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1. What subjective and objective evidence supports the diagnosis of absence epilepsy?

SUBJECTIVE FINDINGS: The patient "spaced out" for about a minute at a time, during which he was conscious but unresponsive. The mother noted that his facial muscles appeared to jerk along with his eyelids briefly. Just before his episodes occurred, she saw him take a large long swallow. These subjective signs are characteristic of absence seizures.

OBJECTIVE FINDINGS: Although an EEG is not generally recommended in a patient with simple febrile seizure who is neurologically healthy, the patient is presenting with some signs that go beyond those of simple febrile seizures. The bedside EEG revealed small, subtle spike and wave patterns at 3 Hz generalized and symmetrical. The EEG also captured the characteristic pattern of regular and symmetrical spike-and-slow-wave complexes. This EEG pattern is characteristic of absence seizures.

Febrile seizures are divided into two categories (simple or complex) and are differentiated by their length of duration, presence of focal features, and number of episodes in 24 hours. *Complex febrile seizures* tend to last more than 15 minutes, have focal features, and occur more than once in a 24-hour period, while *simple febrile seizures* last less than 15 minutes, do not have focal features, and do not recur in a 24-hour period. Although this patient has a history of febrile seizures, he presents with features that fit closely with that of an absence epilepsy. *Absence seizures*, which are categorized as *generalized seizures*, are also known as *petit mal seizures* and are mostly present in childhood between the ages of 4 to 10. Absence seizures can start and stop abruptly. Patients with absence seizures typically present with blank stares and/or myoclonic jerks of the facial muscles and automatisms (lip smacking, swallowing, and clumsiness of a task at hand).

It is important to differentiate different seizure types. Most seizure types are placed in two categories: *partial* and *generalized* seizures. What differentiates the two is the spread of electrical activity—*partial* being focused to a specific area in one hemisphere while *generalized* affects both hemispheres and has electrical activity that is more widespread. Partial seizures are differentiated between simple and complex, with the main difference being the presence or loss of consciousness, respectively. Generalized seizures are further differentiated into absence, atonic, tonic-clonic, myoclonic, and infantile spasms.

Atonic seizures are also known as *drop attacks* and present as a brief loss of muscle tone where self-injury can occur. *Tonic-clonic seizures*, also known as *grand mal seizures*, typically result in a loss of consciousness and present in two phases: a *tonic* phase where there is extension of the trunk and limbs and a *clonic* phase where there is synchronous muscle jerking. *Myoclonic seizures* result in rapid, brief muscle contractions that can affect the extremities, head, or trunk of the body and can be isolated or repetitive. *Infantile spasms* are considered as an age-specific generalized epilepsy mostly secondary to another disease and presents as an extension followed by flexion of the head, trunk, and/or limbs. *Febrile seizures* occur in children between the ages of 6 months through 6 years and typically present with clonic, atonic, or tonic symptoms.

Both absence and febrile seizures have shown a genetic component. In 10% to 15% of patients with absence epilepsy, there is a history of earlier febrile seizures. Febrile seizures can show a 25% to 75% risk of development if the patients have had a family history. One study has shown that in a family with several epileptics and the two main phenotypes being childhood absence and febrile seizures, it was noted that there could be an inherited gene mutation on chromosome 5 responsible for a $GABA_A$ receptor and gamma2 subunit. Other chromosomes have been implicated (10, 13, 14, and 15); however, research is still warranted in this area. Although the patient's father appears to have some form of epilepsy, the form remains unknown, which may be a risk factor for this patient. The patient also received a dose of DTaP, which in a large cohort study showed that febrile seizures were significantly increased the day of vaccination and 8 to 14 days following the MMR vaccine.

2. Develop a nonpharmacologic and pharmacologic regimen for the treatment of the patient's epilepsy.

NONPHARMACOLOGIC

Diet

The ketogenic diet introduced in 1921 is a popular therapy for patients who have refractory seizures consisting of a high-fat (90%), low-protein (8%), and low-carbohydrate (2%) dietary restriction. Other less stringent diets have been studied such as the modified Atkins diet introduced in 2003, which allows for a higher percentage of protein (30%) and carbohydrates (6%) and less fat (64%) and the low glycemic index treatment (LGIT) introduced in 2005, which is also a high-fat diet (60%) with restrictions on carbohydrate (10%) and protein intake (30%) with a focus on the glycemic index of foods and how they raise blood glucose.

Studies estimate a complete cessation of seizure activity in approximately 50% of patients utilizing the ketogenic diet or the modified Atkins diet and an approximately 90% improvement in 35% of patients. The LGIT shares similar efficacy achieving approximately 50% reduction in seizure frequency.

Gastrointestinal (GI) disturbances are the most common early onset adverse reactions. Less frequent early and later onset adverse reactions are weight loss; hypertriglyceridemia; transient hyperuricemia; hypercholesterolemia; symptomatic hypoglycemia; hypoproteinemia; hypomagnesemia; repetitive hyponatremia; low concentrations of high-density lipoprotein; lipoid pneumonia due to aspiration; hepatitis; acute pancreatitis; persistent metabolic acidosis; and prolonged QT interval.

Adverse reactions and efficacy would require monitoring monthly for patients that are started on a diet and every 3 months thereafter. Generally upon initiation of the ketogenic diet, patients may require hospitalization for careful monitoring, while a diet such as the modified Atkins diet and LGIT may be started outside of the hospital. Vitamin supplementation is generally necessary as the patient is maintained on a diet that increases the risk of nutritional deficiency and should be monitored. Reports of thiamine, vitamin D, vitamin C, selenium, and calcium deficiency have been found in children. If diets are initiated, a multivitamin and additional supplementation with calcium and vitamin D would be recommended.

Recommendation

Although there are data to support the use of diets for preventing seizures, it is not indicated