to the long axis of the hippocampus has improved detection of hippocampal atrophy and hippocampal high T2 signal; findings that correlate with the pathological finding of hippocampal sclerosis and an epileptogenic temporal lobe. Additional sequences that should be routine include T2-weighted gradient-echo (GRE), to detect hemosiderin indicating old hemorrhage associated with vascular malformations or trauma, and diffusion-weighted images (DWI) for cytotoxic edema sometimes present with acute cerebral injury from prolonged seizures.

An MRI should be obtained in all patients suspected of having epilepsy except those with definite benign epilepsy with centrotemporal spikes (BECTS) or definite idiopathic generalized epilepsy (e.g., CAE and JME). CT scan with contrast is an alternate study for those who cannot have MRI, but is not as good at detecting small lesions. Any patient with seizures and abnormal neurological findings or focal slow-wave abnormalities on EEG should have neuroimaging. Repeat neuroimaging should be considered if there is an unexplained change in seizure pattern to evaluate for a new lesion.

Positron emission tomography (PET) and single-photon emission computed tomography (SPECT) use physiologically active, radio-labeled tracers to image the brain's metabolic activity (PET) or blood flow (SPECT). SPECT is most useful when an ictal and interictal study are combined to identify an extratemporal seizure focus. Abnormalities on PET or SPECT can be present when brain structure on MRI is normal.

Other Tests

Routine blood tests rarely offer diagnostic assistance in otherwise healthy patients with epilepsy. Serum electrolytes, liver function tests, and complete blood count are useful with acute new onset seizures and as baseline studies before antiepileptic drug therapy is started. Adolescents and young adults with unexplained seizures should be screened for substance abuse (especially cocaine) with blood or urine studies. Genetic testing should be considered in specific cases with suspected phenotypes, especially if a positive genetic test would alter therapy, such as in SCN1A associated epilepsies (e.g., Dravet syndrome). Lumbar puncture is indicated only if there is a suspicion of meningitis, encephalitis, or a CNS glucose transporter abnormality. Repeated generalized seizures and status epilepticus can increase cerebrospinal fluid protein content slightly and produce a mild pleocytosis for 24 to 48 hours; cerebrospinal fluid pleocytosis should be attributed to seizures only in retrospect after excluding an intracranial inflammatory process. An electrocardiogram (ECG) should be obtained in any young person with a first generalized seizure if there is a family history of arrhythmia, sudden unexplained death, or episodic unconsciousness. An ECG should also be obtained in any patient with a personal history of cardiac arrhythmia or valvular disease.

DIFFERENTIAL DIAGNOSIS

Not every paroxysmal event is a seizure, and misidentification of other conditions leads to ineffective, unnecessary, and potentially harmful treatment. Misdiagnosis accounts for patients who have not responded to antiepileptic drug treatment. The conditions confused with epilepsy depend on the age of the patient and the nature and circumstances of the attacks (Table 118-3).

TABLE 118-3 NONEPILEPTIC EPISODIC DISORDERS THAT MAY RESEMBLE SEIZURES

Movement disorders: subcortical myoclonus, paroxysmal choreoathetosis, episodic ataxias, hyperekplexia (startle disease)
Migraine: confusional, vertebrobasilar, visual auras
Syncope
Behavioral and psychiatric: psychogenic nonepileptic attacks (pseudoseizures), hyperventilation syndrome, panic/anxiety disorder, dissociative states
Cataplexy (usually associated with narcolepsy)
Transient ischemic attack
Alcoholic blackouts
Hypoglycemia

Nonepileptic paroxysmal disorders that are confused with epileptic seizures have sudden, discrete abnormal behaviors, variable responsiveness, changes in muscle tone, and various postures or movements.

Psychogenic nonepileptic attacks (PNEA), such as pseudoseizures and psychogenic nonelectrical seizures, frequently cause intractable "epilepsy" in adults. PNEA are due to the unconscious mind converting emotional conflicts or stressors into a physical state, mimicking a seizure. Some patients with psychogenic seizures also have epilepsy. Definitive diagnosis requires video-EEG documentation, although a history of atypical and nonstereotyped attacks, emotional or psychological precipitants, psychiatric illness, lack of response to antiepileptic drugs, and repeatedly normal interictal EEGs suggest psychogenic attacks. About 80% of patients with PNEA have been the victims of physical or sexual abuse. PNEA are more common in females.

Panic attacks (anxiety attacks) with hyperventilation can superficially resemble partial seizures with affective, autonomic, or special sensory symptoms. Hyperventilation typically causes perioral and finger tingling. Prolonged hyperventilation results in muscle twitching or spasms (tetany); affected patients may faint.

Syncope (see Chapter 9) refers to the symptom complex that occurs when there is a transient global reduction in cerebral perfusion associated with cardiovascular dysfunction. Loss of consciousness lasts only a few seconds, uncommonly a minute or more, and recovery is usually rapid. If the cerebral ischemia is sufficiently severe, the syncopal episode may include tonic posturing of the trunk or clonic jerks of the arms and legs and incontinence *(convulsive syncope)*.

Some forms of *migraine* can be mistaken for seizures, especially if the headache is atypical or mild. The visual aura, present in some migraineurs, is typically black, gray, and white; a colored aura almost always indicates an epileptic seizure. Basilar artery migraine, usually in children and young adults, can include lethargy, mood changes, confusion, disorientation, vertigo, bilateral visual disturbances, and loss of consciousness.

TREATMENT

If the cause of symptomatic seizures is corrected, AEDs are usually not necessary. Adults with a single, unprovoked seizure and normal clinical and laboratory findings frequently do not have subsequent seizures; AEDs are usually not indicated if only one seizure has occurred. However, patients with focal neurological findings on clinical, radiological, or EEG examinations are more likely to have repeated seizures. In individual