time between seizures (which can be seconds to years) is the *interictal phase*.

The *epilepsy syndromes* can be divided into three major categories: *focal epilepsy, idiopathic (primary) generalized epilepsy,* and *symptomatic generalized epilepsy*. This classification is based on the widely used scheme of the International League against Epilepsy. This scheme is undergoing revision. In the future, the epilepsies may be classified as genetic, structural/metabolic, and unknown cause. The current classification of the epilepsy syndromes closely follows the classification of the seizures. In the following paragraphs, the specific seizure types are described followed by a description of the attendant epilepsy syndromes.

Partial Seizures (Seizure Types)

In *partial seizures* (also known as localization-related or focal seizures) a localized region of the brain has abnormal neurons that intermittently fire hypersynchronously, recruiting the surrounding, otherwise normal neurons, generating a seizure. If the abnormal neuronal firing is confined, there may be no clinical manifestation and the event, which can only be detected with EEG, is termed a *subclinical* or *electrical seizure*.

Simple Partial Seizures

If the electrical discharge involves a clinically functional small area, a *simple partial seizure (SPS)* occurs and manifests as a symptom without impairment of consciousness. The symptom may be a sensation, autonomic function (e.g., nausea or another epigastric sensation), abnormal thought (e.g., fear, dèjá vu), or involuntary movement. An SPS is commonly called an *aura* and can serve as a warning that a more intense seizure is about to occur. Auras occur in about 60% of patients with focal epilepsy.

During an SPS the patient can interact normally with their environment except for limitations imposed by the seizure itself on specific functions. Thus, SPSs are divided into *SPS without impairment*, which do not interfere with function (e.g., just an internal sensation) and *SPS with impairment*, which can interfere with function (e.g., a jerking limb that would disrupt the ability to drive safely).

The motor signs of a seizure can be *clonic* (rhythmic jerking) or *tonic* (stiffening) movements of a discrete body part. An SPS restricted to the precentral (Rolandic) gyrus that spreads to involve adjacent areas of the primary motor cortex, is expressed as clonic movements that progress in an orderly sequence *(Jacksonian march)* that reflects the motor cortex homunculus topographic organization (e.g., mouth to hand to arm to leg).

Complex Partial Seizures

A *complex partial seizure (CPS)* is a focal-onset seizure with impairment of consciousness. The degree of consciousness impairment ranges from minimal to complete unresponsiveness. The patient's eyes are almost always open during the ictus indicating an awake state (albeit impaired). The eyes may close after the seizure ends and the patient typically experiences some degree of postictal confusion, fatigue, and sometimes headache (with the head pain often ipsilateral to the seizure focus due to the increased metabolic demand). An CPS typically lasts 1 to 3 minutes with a postictal state of a few minutes to hours. The specific signs and symptoms that occur during a partial seizure characteristically reflect the location of seizure onset (Table 118-2). The location of the focus is important because it can predict the nature of the pathology and directs diagnostic testing. Both medical and surgical treatment is determined, in part, by focus location.

TABLE 118-2 LOCALIZATION OF SEIZURES BY SYMPTOMS AND ICTAL MANIFESTATIONS

LOCUS	MANIFESTATION
TEMPORAL LOBE	
Uncus/amygdala	Foul odor
Middle/inferior temporal gyrus	Visual changes: micropsia, macropsia
Parahippocampal-hippocampal area	Déjà vu; jamais vu
Amygdala-septal area	Fear, pleasure, anger, dreamy sensation
Auditory association cortex	Voices, music
Insular, anterior temporal cortex	Lip smacking, drooling, abdominal symptoms, cardiac arrhythmia
FRONTAL LOBE	
Motor cortex	Contralateral clonic movements of face, fingers, hand, foot
Premotor cortex	Contralateral arm extension, hypermotor behaviors
Language areas	Speech arrest, aphasia
Lateral cortex	Contralateral eye deviation
Bifrontal	Absence-like seizure
Parietal lobe cortex	Sensory symptoms
Occipital lobe cortex	Visual hallucinations (often in color), teichopsias, metamorphopsias

Psychomotor, *temporal lobe*, and *limbic seizures* are terms that have been used in the past to describe a variety of ictal behaviors now classified as CPSs, but they are not synonymous. Not all complex partial seizures arise from the temporal lobe, nor do all involve the limbic system. Similarly, certain temporal lobe and limbic phenomena may not be associated with the alteration in awareness that is required to term it a CPS.

Secondarily Generalized Convulsive Seizures

A focal-onset seizure that spreads throughout the brain results in a *secondarily generalized seizure*. Typically there is a tonic phase that consists of extensor posturing lasting 20 to 60 seconds followed by progressively longer periods of inhibition manifesting as a clonic phase that lasts up to another minute: hence the descriptive name *generalized tonic-clonic (GTC)* seizure. The terms convulsion, GTC, grand-mal, and major-motor seizure are often used interchangeably, although GTC is a specific phenomenological description of the behavior. In some patients, a few clonic jerks precede the tonic-clonic sequence; in others, only a tonic or clonic phase is present.

As a partial seizure transitions into a secondarily generalized convulsion the arm contralateral to the seizure focus may extend first, while the ipsilateral arm is flexed at the elbow. This is termed the *figure-4 sign* and is useful for lateralizing the seizure focus. A loud *tonic-cry* may occur at the onset of a convulsion as air is forcibly expelled through tightly contracted vocal cords. The eyes are open and commonly described to roll upward. During a convulsion, breathing stops and cyanosis may develop. Foaming at the mouth may be present. Oral trauma, especially biting the tongue, is typical. Urinary incontinence is common. Fecal