Long term monitoring (LTM) with simultaneous recording of electroencephalogram (EEG) and video (LTM), which was introduced 30 years ago, has been developed into an indispensable clinical tool to document epileptic seizures or other episodic disturbances of neurologic function (Lagerlund et al 1996). Long term monitoring has the advantage that seizure semiology can be analyzed in detail especially with regard to the temporal sequence of the various symptoms. This has also led to the proposal of a new seizure classification based exclusively on the ictal semiology (Lueders et al 1993; Noachtar et al 1998). The differentiation between epileptic and pseudoepileptic seizures is a diagnostic problem, which a clinical neurologist/epileptologist is often faced with. Over the years, a multitude of clinical observations has been gathered by the careful analysis of ictal symptoms obtained by LTM in many centers around the world. In this short overview a summary of the ictal symptoms which have been described in the literature and which can provide localizing or lateralizing information as well as hints whether seizures are epileptic or pseudoepileptic in origin is given.

**Localizing/lateralizing ictal signs.**

(i) **Auras.** Auras are usually the first clinical although exclusively subjective manifestation of a focal seizure. They are the consequence of an epileptic activation of a circumscribed brain region either directly or secondarily by spread from a primarily clinically silent focus. This has to be kept in mind when the patient reports localized somatosensory or visual symptoms which in fact can indicate the actual seizure onset and thus not only give lateralizing but also localizing information. However, one should be cautious to draw this conclusion automatically since seizures may originate from clinically silent areas and produce symptoms (for example auras) only when an eloquent area becomes activated. (ii) **Version of head and eyes.** Version means a sustained, forced, involuntary movement leading to an unnatural positioning of the head sometimes preceding the evolution to a secondarily generalized tonic-clonic seizure. Versive movements (which should be distinguished from turning movements (Ochs et al 1984; Abou-Khalil and Fakhoury 1996) are a reliable lateralizing sign in complex partial seizures (Wyllie et al 1986; McLachlan 1987). (iii) **Dystonic posturing.** Dystonic posturing consists of a sustained, forced, unnatural posturing of one extremity with an element of rotation of the forearm which differentiates it from tonic posturing in which sustained posturing of the extremity in flexion or extension is seen but without an element of rotation (Kotagal et al 1989, 1997; Bleasal et al 1997). Dystonic posturing is probably an expression of involvement of basal ganglia during the evolution of seizure activity starting from the medial temporal lobe. So far, dystonic posturing is proven to be a reliable lateralizing sign only in patients with temporal lobe epilepsy and has not been observed in a carefully analyzed group of patients with frontal lobe epilepsies (Janszky et al 2001). (iv) **Ictal paresis.** Oestreich et al (1995) found in 5 (5.3%) of 94 patients with partial epilepsy ictal unilateral arm or hand paresis contralateral to the epileptogenic temporal lobe. It should be emphasized that none of the patients had postictal (Todd's) paresis demonstrating that the patients showed clear ictal paresis. (v) **Ictal speech manifestations.** Speech manifestations during seizures can be divided into ictal speech with identifiable content and disturbance of language functions in form of dysphasia or aphasia. Lateralizing value of these ictal symptoms again is proven only for seizures arising from the temporal lobes. Ictal speech points to the non dominant hemisphere and ictal/postictal aphasia to the dominant hemisphere (Gabr et al 1989). For seizures originating from extratemporal areas such as frontal or parietal lobes these ictal symptoms cannot be regarded as reliable lateralizing signs due to the often rapid spread of seizure activity to contralateral regions (Kanner 1997) (vi) **Unilateral blinking.** Benbadis et al (1996) described unilateral blinking as a relatively uncommon but reliable lateralizing sign in partial seizures, which usually indicates an ipsilateral epileptogenic zone. (vii) **Tongue...**
biting. Benbadis (1996) found in a series of 106 consecutively monitored patients 7 with tongue biting during their partial seizures. Five patients (71%) had their tongue injury ipsilateral to the epileptogenic zone. (vii) Ictal vomiting. The few reports in the literature indicate that ictus emeticus is a lateralizing sign for the non-dominant hemisphere (Kramer et al 1988; Devinsky et al 1995). (ix) Nose wiping. Leutmezer et al (1998) and Hirsch et al (1998) described a clinical observation with a high lateralizing value consisting of 'nose wiping' ipsilateral to the seizure focus. So far this sign seems to lateralize relatively reliably in temporal lobe epilepsies but not so in extratemporal forms (Janszky et al 2001).

(iv) Pre-ictal pseudosleep. Benbadis et al (1996) found in a series of 106 consecutively monitored patients 7 with tongue biting during their partial seizures. Five patients (71%) had their tongue injury ipsilateral to the epileptogenic zone. (viii) Ictal vomiting. The few reports in the literature indicate that ictus emeticus is a lateralizing sign for the non-dominant hemisphere (Kramer et al 1988; Devinsky et al 1995). (ix) Nose wiping. Leutmezer et al (1998) and Hirsch et al (1998) described a clinical observation with a high lateralizing value consisting of 'nose wiping' ipsilateral to the seizure focus. So far this sign seems to lateralize relatively reliably in temporal lobe epilepsies but not so in extratemporal forms (Janszky et al 2001).

(x) Peri-ictal headache. Bernasconi et al (1997) studied the lateralizing value of headaches (HA) in focal epilepsies (27 with temporal lobe epilepsy, 17 with extratemporal epilepsy). Headache occurred in 20 patients (45%); as a prodrome in 15%, at seizures onset in 20%, during the seizure in 5%, and postictally in 95%. Periictal HA was in 84% ipsilateral to the seizure focus in temporal lobe epilepsy (TLE) compared to 13% in extratemporal epilepsy. The authors concluded that perictal HA is a lateralizing sign in TLE. (xi) Automatisms with preserved responsiveness (APR). The onset of oral and manual automatisms is usually associated with loss of consciousness or more operationally defined loss of responsiveness. However, given that the patient is adequately tested during the course of his/her seizure the presence of typical distal automatisms with preserved responsiveness can be observed. This APR reliably indicates a seizure arising from the non-dominant temporal lobe (Ebner et al 1995).

Clinical signs which can help to differentiate pseudoepileptic (psychogenic non-epileptic seizures, PNES) from epileptic seizures (ES). Long term monitoring is sometimes the only method that is able to differentiate ES from PNES since description by history or video recording alone, namely, the clinical seizure semiology alone can be misleading. A clear statement can be made that during LTM (i) unresponsiveness in the presence of a normal posterior background activity proves that the patient is not having an ES. A number of clinical observations using LTM have been made in the recent past which seem to be highly suggestive of PNES: (ii) closed eyes during a paroxysmal event in the vast majority of true epileptic seizures eyes are held open by the patients. Therefore, closed eyes during an attack are mostly a sign of an PNES (DeToledo and Ramsay 1996). (iii) Pre-ictal headache. Ellman et al (1997) studied patients with ES (N=138), PNES (N=43) and both (N=4). They found that pre-ictal headache is a rare occurrence (1.5%) among patients with ES (cf. also [x]) but common among patients with PNES (25%). They conclude that pre-ictal headache should raise suspicions of PNES. (iv) Pre-ictal pseudosleep. Benbadis et al (1996) observed that PNES often arise out of a state they termed pre-ictal pseudosleep (namely, a patient motionless with eyes closed). Pre-ictal pseudosleep was seen in 10 out of 18 patients with PNES but in none of 39 prospectively studied patients with ES. The authors conclude that pre-ictal pseudosleep may be a useful adjunctive finding to support the diagnosis of PNES. (v) Ictal weeping. Ictal weeping was found to be a strong hint that a paroxysmal event is not epileptic in nature. Walczak and Bogoljubov (1996) observed ictal weeping in 31% of patients with PNES but in none of 48 patients with ES studied by LTM. (vi) Duration of attacks. A considerably longer duration of PNES compared to ES is a very consistent finding in most studies using LTM for differentiating seizures of various origin. Typical focal seizures (without secondary generalization) last between 30 and 120 seconds and only seldom much longer than 2 minutes whereas PNES on average lasts 10 minutes and longer (Pierelli et al 1989). Other ictal symptoms with a prominent motor component such as asynchronous extremity movements, alternating head movements, pelvic thrusting, body rocking, or atypical vocalizations are not reliable sign differentiating PNES from ES. Careful analysis of ictal symptoms revealed that seizures of frontal lobe origin frequently are associated with these ictal motor manifestations (Boon and Williamson 1993; Saygi et al 1992; Leis et al 1992).

Further Reading


