Periodic lateralized epileptiform discharges (PLEDs) as the sole electrographic correlate of a complex partial seizure

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ABSTRACT – We describe a patient in whom the only electrographic manifestation of a complex partial seizure recorded by video-EEG telemetry was periodic lateralized epileptiform discharges (PLEDs) with a left anterior temporal emphasis. The abnormality, which persisted throughout the whole recorded seizure, lends support to the claim that PLEDs can be an ictal phenomenon.

Key words: complex partial seizure, periodic lateralized epileptiform discharges, electroencephalographic seizure

Case report
An 18-year-old woman was admitted to the telemetry unit of the National Hospital for Neurology and Neurosurgery, London, for presurgical evaluation. She had her first seizure at the age of 10 years, when she became encephalopathic following a pro-drome comprising fever, malaise and lymphadenopathy. Encephalitis was suspected and she was admitted to a different hospital, where she underwent MRI that revealed non-specific, left temporal lobe abnormalities. Cerebrospinal fluid examination revealed no abnormality. She was dis-
charged from hospital within a week having fully recov-ered. A few months later, she developed her habitual seizures, which persist to the present day. Her seizures have been frequent since onset, currently on a weekly basis and have proved resistant to several antiepileptic drugs. She was referred for consideration of epilepsy sur- gery. On admission, her neurological examination was unremarkable. Neuropsychological assessment showed marked impairments of verbal and non-verbal memory. MRI showed clear-cut, left hippocampal sclerosis with no other abnormality.

She underwent 95 hours of video telemetry recording with surface EEG without drug reduction. The interictal EEG revealed background activity of 9-10 Hz, intermixed with theta and delta activity, and multifocal, epileptiform sharp wave discharges, although the latter were most frequent over the left anterior temporal region.

A single, habitual seizure was recorded. This began with an aura of a non-specific, cephalic sensation followed initially by behavioral arrest, and one minute later by oral automatisms and bilateral eyelid blinking. After 30 sec-onds there was posturing of the right upper limb, followed by right lower limb automatisms and then left upper limb automatisms. She was then positioned by the telemetry staff, and following this remained unresponsive and unco-operative, while demonstrating intermittent shivering movements mainly of the left upper limb for 24 minutes after clinical seizure onset at which time she was noted to be responsive but aphasic upon testing.

With seizure onset, there was no change in the EEG (figure 1). The first EEG change occurred 50 seconds after clinical onset, and consisted of left hemisphere PLEDs that were of maximal amplitude over the anterior and mid-temporal electrodes (figure 2). These spread transiently to the right hemisphere and were then obscured by muscle artifacts, but persisted largely at a frequency of 0.6-0.7 Hz for 20 minutes, at which time they became increasingly irregular and finally disappeared nearly 30 minutes after clinical onset.

**Discussion**

PLEDs have been recognized as a distinct EEG phenomenon for 40 years, yet their relationship to ictal activity remains controversial (Chatrian et al. 1964, Bozkurt et al. 2002, Brenner 2002, Garcia-Morales et al. 2002). On one hand, an ictal basis has been supported by SPECT studies that have demonstrated regional hyperperfusion during the occurrence of PLEDs that convert to hypoperfusion once they resolve (Young et al. 1977). On the other, PLEDs are not usually seen in ictal EEGs of seizures recorded in presurgical monitoring units or intensive care units. It is not clear from some of the larger studies describing PLEDs, whether they preceded, followed or were concurrent with seizures in patients with acute neurological illnesses or status epilepticus. Few authors consider them to be part of an ictal-interictal continuum.

There is limited literature on PLEDs occurring as ictal electrographic phenomena. Terzano et al. described the occurrence of PLEDs during recurrent, prolonged, confu-sional episodes in elderly individuals (Terzano et al. 1986). Administration of benzodiazepines acutely, led to both clinical and electrographic resolution, and chronic administra-tion of carbamazepine prevented further recur-rences. Responsiveness of both PLEDs and clinical abnor-malities to anticonvulsants provided evidence of their ictal nature, but it is also likely that such a relationship is an age-related phenomenon restricted to the elderly. Other authors have described subtle motor phenomena such as eyelid closure in association with the periodic EEG dis-charges, and have proposed that such cases represent non-convulsive status epilepticus (Young et al. 1977). Lee et al. (2000) reported the concurrent occurrence of PLEDs in the hemisphere contralateral to the limb with epilepsy partialis continua in one patient with Creutzfeldt-Jacob disease (Lee et al. 2000). However, the temporal correla-tion between limb jerks and electrographic seizures was not clearly established. Finally, transient negative clinical phenomena including aphasia, homonymous hemianopia and agnosia have been associated concurrently with PLEDs (Primavera et al. 1996). The ictal basis of these isolated negative phenomena remains debatable in as much as focal parenchymal brain lesions of vascular or inflammatory nature have not been rigorously ruled out. Although such neurological episodes may represent sei-zures, one has to bear in mind the rarity with which seizures present as negative phenomena.

The present case report is the first and, to our knowledge, the only case of the occurrence of ictal PLEDs in a clini-cally overt, complex partial seizure recorded during rou-tine pre-surgical telemetric monitoring. They were, how-er, not the initial EEG manifestation, but occurred late in the seizure.

Most accounts of PLEDs have been in association with destructive brain lesions in individuals not previously known to have epilepsy. Intercital PLEDs of lasting dura-tion have however, been described rarely in chronic epi-lepsies (Westmoreland et al. 1986). PLEDs in the present case differ in being restricted to a clinical seizure.

The origin of PLEDs is a matter of controversy. While some authors propose a cortical origin, others believe that PLEDs occur because of isolation of portions of the cere-bral cortex due to subcortical inhibition. Furthermore, their functional nature is indicated by the demonstration that PLEDs could be remotely located from sites of brain lesions. We suggest that ictal PLEDs in the present case represent functional disconnection of a region of the cor-tex by subcortical structures or afferents as a result of a propagated ictal discharge.

In conclusion, a case of prolonged, complex partial sei-zures with ictal PLEDs is described. This electrographic

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Figure 1. a: EEG prior to seizure onset. b: EEG at onset of seizure.
Figure 2. First definite EEG change noted 50 seconds after clinical seizure onset.
finding is exceedingly rare. Nevertheless, PLEDs may be added to the list of ictal patterns known to accompany seizures. Meanwhile, the nosological debate on PLEDs – ictal or interictal – continues.

References


