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LETTER TO THE EDITOR

# Peculiar EEG signatures, ictal drinking and long-term follow-up in anti-LGI1 encephalitis

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Dear Editor,
The diagnosis of autoimmune encephalitis relies on clinical, radiological, and laboratory criteria [1]. Neither the clinical presentation nor the neuroimaging studies are able to effectively discriminate between different antibody-mediated syndromes. Antibody testing—the only way to confirm the diagnosis and to detect the pathogenic antibody—is not readily accessible in many institutions, and result may require several weeks to be obtained [1]. On the contrary, electroencephalography (EEG) is a safe, inexpensive, and often informative diagnostic tool. Historically, EEG has had limited utility in the diagnosis of autoimmune encephalitis because only nonspecific EEG patterns were described. Only recently, it was demonstrated that certain EEG findings might have a guiding role in request for antibody testing, as the case of the extreme delta brush pattern in anti-NMDA receptor (NMDAR) encephalitis [1]. It is now generally accepted that "faciobrachial dystonic seizures" (FBDS)—thought to be pathognomonic for leucine-rich glioma inactivated-1 (LGI-1)-antibody encephalitis—lack EEG correlates [2] and in the recent past their epileptic nature was also questioned [3]. Few reports exist on EEG abnormalities recorded prior to FBDS [3]. Here, we describe the importance of ictal EEG findings in a case of anti-LGI1 encephalitis with special emphasis on a recently discovered EEG marker, represented by a fronto-central slow wave that consistently precedes the tonic-dystonic movements.

## Case report

A 54-year-old woman presented with a 2-month history of brief, involuntary movements involving her right leg. Her medical history was remarkable for autoimmune polyendocrine syndrome type 3. No focal neurological signs were detected on neurological examination. She developed new-onset anxiety disorder, and initially no ictal correlate was detected on EEG. A diagnosis of functional neurological disorder was considered in the differential diagnosis by the referring neurologist. In the following weeks, memory dysfunction ensued together with behavioral abnormalities. At that time, she was admitted to our university hospital for further diagnostic evaluation. Frequent, stereotypical, jerky movements involving her right leg and arm (video) were documented. Ancillary tests, including serum electrolytes (mild hyponatremia) and brain MRI (T2-hyperintensity over the limbic areas, mostly on the right) raised the suspicion of autoimmune encephalitis. Neuropsychological testing revealed profound and global cognitive impairment, particularly regarding memory and executive functions.

Prolonged video-EEG monitoring showed ictal flattening of the EEG signal (electrodecremental response, see the Figure in the Supplementary material) and anterior, mainly fronto-central, slow wave preceding FBDS (Fig. 1), in retrospect visible also in the initial exam. The latter, in particular, is an intriguing finding: a rather stereotypical 572 ms wave (range 540–579 ms), 74 μV in amplitude (range 68–78 μV) was consistently recorded prior to tonic dystonic seizures.

**Electronic supplementary material** The online version of this article (https://doi.org/10.1007/s10072-019-3729-7) contains supplementary material, which is available to authorized users.

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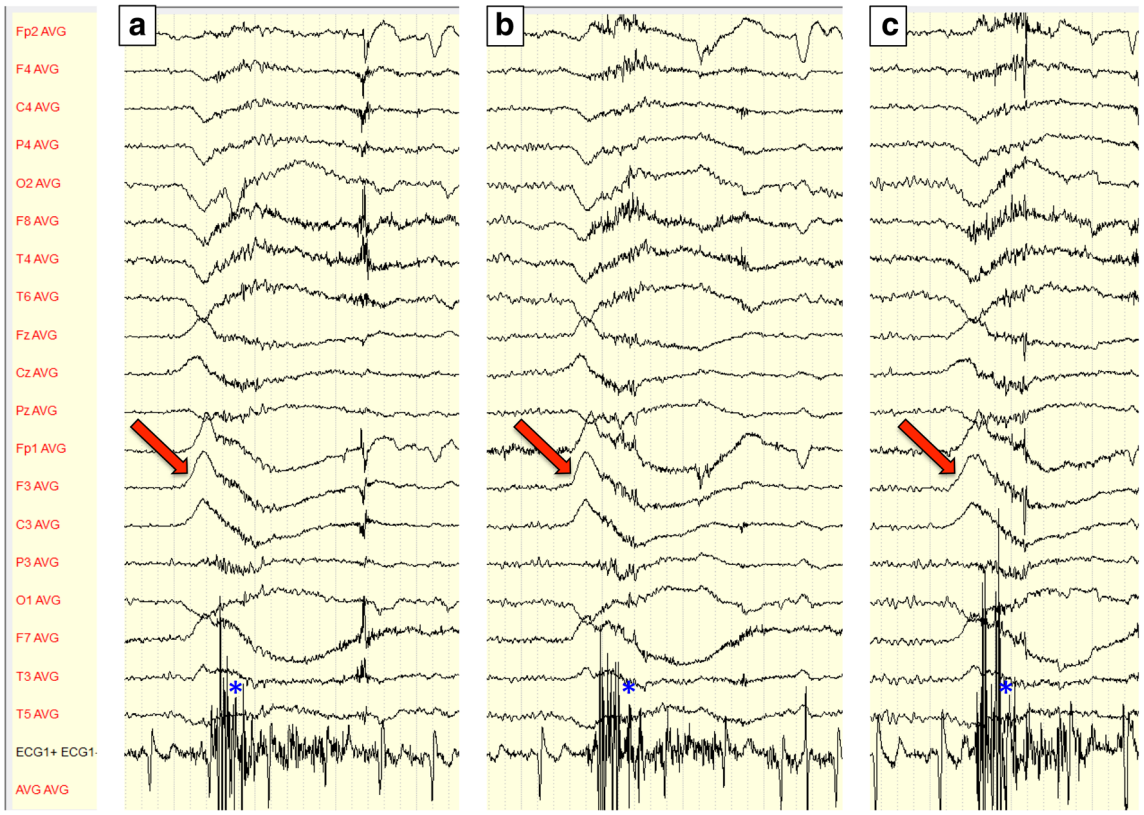


**Fig. 1** Scalp EEG recordings with average reference montage (A, B, C) demonstrate a focal slow wave on frontal electrodes (arrows) preceding CBDS, evident as muscle artifacts on EKG channel (asterixes). High pass filter 0.5 Hz, low pass filter 70 Hz, notch filter on, black bar = 1 s. The same EEG pattern is captured during hyperventilation in a 30-min routine EEG using a bipolar montage (Fig. 2, Supplementary material), preceded by a generalized electrodecremental event

Diagnostic confirmation was reached when antibodies against the LGI-1 protein were detected in both serum and cerebrospinal fluid. By this time, the patient has been already treated with steroid bolus, a course of intravenous immunoglobulin and levetiracetam. Despite these treatments, she continued to experience FBDS together with transient episodes of extreme fear, tachycardia, and automatisms (ictal drinking). Interestingly, oral automatisms followed FBDS in this case, possibly indicating ictal propagation towards the mesial temporal lobe structures.

On last follow-up examination—2 years and 6 months after hospital discharge—tonic seizures were no longer present, an improvement of cognitive functions was registered, but temporal seizures were still reported. A clear reduction in seizure frequency was registered with bimonthly intravenous immunoglobulin infusions.

## Discussion

Stereotypic tonic dystonic seizures usually represent the first manifestation of LGI1 encephalitis [1–3]. Their recognition is crucial to orient treatment: early immunotherapy is often effective in stopping FBDS—otherwise resistant to antiepileptic drugs—and preventing anti-LGI1–associated cognitive impairment [2, 3]. Nevertheless, FBDS are frequently misdiagnosed as paroxysmal movement disorders, psychogenic, or indeterminate events. Diagnostic delay is favored by the reported absence of EEG correlates to FBDS [2, 3]. A fronto-central slow wave was consistently recorded prior to tonic dystonic seizures in this case, at times preceded by an electrodecremental event. Navarro et al. observed the same pattern in 7 patients with LGI1 encephalitis and, in retrospect, in 1 patient described by others [3]. Our patient manifested two major seizures types: FBDS and temporal lobe seizures, with the latter being more common in the advanced stage of the disease and more refractory to immunotherapy. Intriguingly, FBDS were followed by oral automatisms, suggesting seizure spreading to the mesial temporal lobe.

Temporal lobe seizures had a distinct semiology, characterized by early ictal fear and drinking automatisms. Ictal drinking is an exceedingly rare seizure manifestation—with only 51 reported cases—that was never documented in LGI1 encephalitis [4]. Both ictal fear and perictal drinking lateralize seizure onset to the non-dominant temporal lobe [4], where the largest abnormality was documented on brain MRI. Frequent ictal drinking could, in theory, exacerbate LGI1-associated hyponatremia.

An extreme sensitivity to a standard EEG activation procedure (hyperventilation) was documented in this case, and the same finding was observed previously in autoimmune encephalitis [5].

Although these changes are not specific, we believe that special attention should be reserved for hyperventilation-induced EEG modifications in patients with immune-related epilepsy.

In conclusion, this case highlights unique electroclinical features of seizures in the context of LGI1 encephalitis. Similarly, to the extreme delta brush pattern in anti-NMDAR encephalitis, the "preceding slow wave" sign could represent a promising EEG marker prompting rapid LGI1-antibody-testing, although further studies are needed to examine its frequency, specificity, and sensitivity.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Disclosure** The corresponding author had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Ethical standard** The patient's consent was obtained for publication of this case report.

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