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Lateralizing value of ictal dorsiflexion of the great toe in refractory partial epilepsy

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ABSTRACT

Introduction: A case of ictal dorsiflexion of the great toe was reported two years ago in a patient with insular cortex seizures. Since that publication, series of patients with the sign have not been reported.
Objectives: The aims of the present study were to describe the frequency of the ictal sign and to evaluate positive predictive value (PPV) to lateralize the epileptogenic zone.
Methods: We retrospectively analyzed archived seizures of all patients who were consecutively evaluated at two tertiary centers for epilepsy surgery. All patients underwent a standard presurgical evaluation. We evaluated the dorsiflexion latency and, also, examined whether dorsiflexion of the great toe appeared when ictal electrographic activity remained focal or generalized.
Results: Ictal dorsiflexion of the great toe was seen in only 15 (9.1%) out of 165 patients and in 25 (9.2%) of 272 seizures. The seizure localized to the temporal lobe in 22 (88%) out of 25 seizures. More than 50% of these seizures were associated with hippocampal sclerosis. Ictal dorsiflexion of the great toe was contralateral to the epileptogenic zone in 72% of the patients. In 7 out of 25, the seizures had a short latency period. In 6 out of these 7 seizures, the sign was contralateral to the epileptogenic zone (VPP = 85.7).
Conclusion: This ictal motor sign is not infrequent in refractory partial epilepsy and has a high positive predictive value.

1. Introduction

Neurologists have been investigating the clinical behaviors that occur during seizures for many years. Several ictal behaviors have been defined in focal epilepsy by video-EEG monitoring [1–3]. Many of these are very important in the evaluation of candidates for epilepsy surgery [3]. Useful ictal lateralizing signs in patients with refractory focal epilepsy include contralateral dystonic posturing [3,4], unilateral hand automatisms [3], early ipsilateral head deviation [3], forced contralateral head deviation [3], ictal speech [3], ictal vomiting [1], unilateral eye blinking [1], postictal nose wiping [2,3], automatisms with preserved consciousness [1], "figure-of-four", unilateral last clonic contractions [2], and postictal dysphasia/aphasia [4–6]. On the basis of their observations, Machado and Solarte Rodrigo published what they considered a new lateralizing ictal sign: ictal dorsiflexion of the great toe [7]. To our knowledge, this work was the first to describe the sign during ictal recordings. Nevertheless, the above-mentioned authors also recommended that occurrence of ictal dorsiflexion of the great toe would require confirmation in additional cases. The aims of the present study were to describe the frequency of the ictal sign in a series of patients with refractory partial epilepsy and to evaluate its positive predictive value (PPV) to lateralize the epileptogenic zone.

2. Methods

We retrospectively analyzed archived seizures of all patients who were consecutively evaluated at the Epilepsy Section of the Antioquia University, Medellín, Colombia and at the National Neurology and Neurosurgery Institute (NNNI), Havana, Cuba from 2008 to 2012. All patients gave a detailed clinical history and underwent neurological examination, 1.5-T cerebral magnetic resonance imaging (MRI), PET (positron emission tomography) or SPECT (single photon emission tomography), neuropsychological and psychiatric studies, and psychosocial assessments. Video-EEG monitoring was performed with up to 32-channel EEG recording, with electrodes placed according to the 10–20 system over the temporal lobes, including T1–T2, and zygomatic additional electrodes in all patients investigated for temporal lobe epilepsy (TLE). A total of 215 patients completed the presurgical workup. Fifty patients were excluded because of discordant preoperative findings. Fifteen of those fifty patients had temporal lobe epilepsy (30%), twenty-seven had frontal lobe epilepsy (54%), five had parietal lobe epilepsy (10%), and three had occipital lobe epilepsy (6%). One hundred and sixty-five patients were included in this

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study. Ictal dorsiflexion of the great toe was seen in only fifteen patients.

Due to the fact that seizure surgery started in our institution in the present year only, only 6 of these 15 patients had undergone surgery. The period of follow-up after surgery was 3–9 months.

Laterality of the epileptogenic zone (EZ) was determined when a total coincidence on lateralization was assessed by ictal semiology (different from dorsiflexion of the great toe), neuropsychological deficits, laterality of the focal lesion on MRI study, laterality of the ictal and interictal recordings, and laterality of the ictal onset zone where ictal SPECT was available. If the presurgical evaluation showed no concordance in the laterality of the different tests, the patients and their video records were not included in the evaluation. Thus, only patients with a well-lateralized EZ were included, and only videotapes where the entire body was visualized by two reviewers were included in the evaluation.

2.1. Ictal dorsiflexion of the great toe

For the purpose of the present study, ictal dorsiflexion of the great toe was considered whenever a progressive movement of the leg over the bed was documented and the patient touched the bed with the lateral part of the sole (Babinski's sign), rubbing the external border of the foot on the bed (Chaddock's sign), or when a forceful passive plantar flexion of the ankle was observed (Moniz' sign). If the Brissaud reflex component was observed (when the movement was accompanied by internal rotation of the leg and recruitment of the tensor fascia lata), dorsiflexion was considered more likely a reflex and not a voluntary response (see Fig. 1).

2.2. Evaluation

The period of time from the first seizure manifestation (EEG or semiology — whichever occurred first) to the onset of ictal dorsiflexion of the great toe was measured. This time was recorded as dorsiflexion latency. We also examined whether dorsiflexion of the great toe appeared when ictal electrographic activity remained focal or generalized. The dorsiflexion latency was defined as early or late depending on the total duration of the seizure semiology.

For the purpose of our study, we defined an early sign as one that appeared before the 10th percentile of the total distribution time according to statistical analysis of the normal distribution curve. In our sample, the total seizure duration ranged between 3 and 129 s (mean 5.4 ± 14.3). As the latency time of the dorsiflexion of the great toe was normally distributed (Kolmogorov–Smirnov curve: $p<0.01$), the signs were considered as early signs when they appeared 20 s before seizure evolution. We considered 3 standard deviations of the mean to be a prolonged latency period (late sign). This time corresponds to the 97th percentile of the distribution of the total seizure time (49 s) in our study.

All video recordings of the assessed seizures were reviewed and analyzed by two blinded observers (R.A.M. and R.A.S.M.). Only symptoms where both observers agreed were included in the analysis. The authors did not assess inter-observer reliability.

2.3. Ethics

The ethics committees of the University of Antioquia and NNNI approved the study, and informed consent was obtained from all participants prior to their inclusion. The study was performed in accordance with the ethical standards of the Declaration of Helsinki.

2.4. Statistic analysis

Statistical descriptors, expressed as a percentage, were calculated from the tables as positive predictive value (PPV) = true positives / (true + false positives) and negative predictive value (NPV) = true negatives / (true + false negatives).

3. Results

The socio-demographic data and epilepsy types are presented in Table 1. One hundred and sixty-five patients were included in this study (40 males and 125 females). A total of 465 seizures were recorded on videotapes, but only 272 (59%) were subsequently analyzed because in the remaining 193 (41%) seizures, the feet of the patients were not caught on video recordings. Dorsiflexion of the great toe was seen in only 15 (9.1%) out of 165 patients and in 25 (9.2%) of 272 seizures (Table 2).

In 10 (40%) out of 25 seizures, ictal dorsiflexion of the great toe was the first semiological sign, and it was the only sign with lateralizing value in 2 (8%) of 25 seizures. Other ictal signs with lateralizing value in our study can be seen in Table 2.

All subsequent analysis refers to those seizures presenting with dorsiflexion of the great toe as part of ictal motor behavior.

The seizures originated from the temporal lobe in 22 (88%) out of 25 seizures. One of them had a neocortical seizure onset. More than 50% of these seizures were associated with hippocampal sclerosis. The predominant seizure type was typical for a temporal lobe-onset seizure (68%) (aura + oral automatisms + focal contralateral dystonic posturing

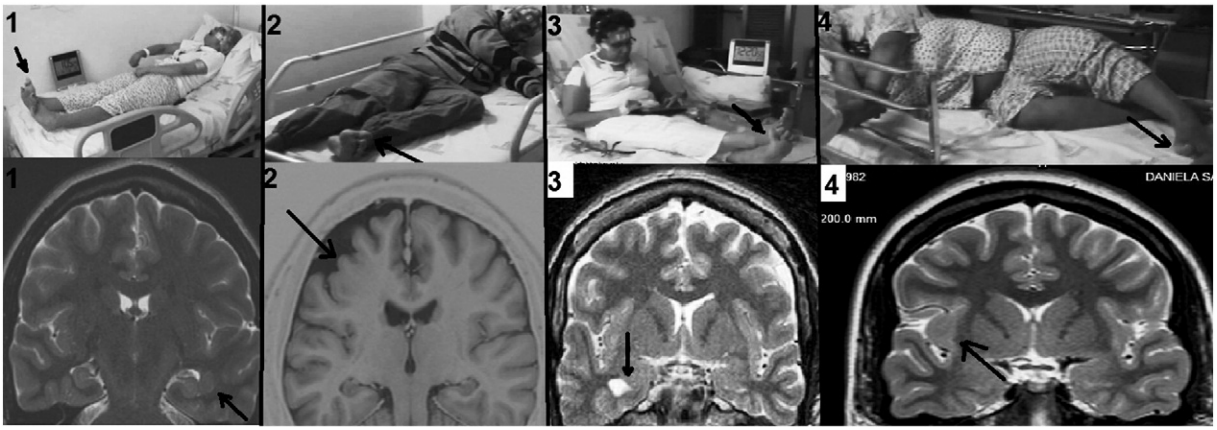

Fig. 1. Dorsiflexion of the great toe in different patients of our series. Black arrow indicates the sign and in the MRI images, the lesion; patient 1 (left nodular periventricular heterotopia), patient 2 (right frontal cortical dysplasia), patient 3 (right hippocampal sclerosis) and patient 4 (right insular tumor).