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Original article

Ictal EEG patterns in epilepsy with centro-temporal spikes

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Abstract

Purpose: To describe the EEG pattern of seizures in patients with benign childhood epilepsy with centro-temporal spikes (BCECTS). *Methods:* The clinical and EEG data of 701 BCECTS patients with at least a 3 years follow-up were reviewed from 10 epilepsy centers. *Results:* Thirty-four seizures were recorded in 30 patients. Four different ictal EEG patterns (A–D) were identified. The most frequent (pattern A) was characterized by low voltage activity of fast rhythmic spikes, increasing in amplitude and decreasing in frequency, and occurred in 14 children. Pattern B (six patients) was constituted by a discharge of spikes intermixed with sharp waves increasing in frequency and amplitude. Pattern C (seven children) consisted of monomorphic theta which progressively formed a discharge increasing in amplitude and decreasing in frequency. Pattern D (5 children) was characterized by a initial focal depression of the electrical activity, followed by one of the three above described patterns. In 21 out of 28 children, the initial ictal pattern, altered from one pattern to another one. No clinical or EEG feature was predictive of a specific ictal pattern. *Discussion:* We failed to identify a unique ictal EEG pattern in our patients with BCECTS. The occurrence of per-ictal features, e.g., initial EEG depression or post-ictal slowing, is common and should not be interpreted with prejudice. Alteration of ictal EEG pattern from one to another is not in conflict with the diagnosis of BCECTS.

Keywords: BCECTS; Rolandic epilepsy; EEG; Benign epilepsy; System epilepsy

1. Introduction

Benign epilepsy with rolandic or centro-temporal spikes (BCECTS) is a focal epilepsy of childhood characterized by absence of neurological deficits, motor focal seizures, peculiar EEG abnormalities and spontaneous recovery [1,2]. BCECTS is the most common form of idiopathic epilepsy in children [2], but, since seizure frequency is generally low in this syndrome, there are scarce descriptions of the ictal discharge [3–9] due to the difficult to capture the episodes. The first described ictal patterns are characterized by a sequence of rhythmic sharp waves or by a sequence of spikes remaining

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quite monomorphous throughout the discharge, not followed by significant signs of post-ictal abnormalities [3,4]. In 1990, Gutierrez et al. described an ictal subclinical event in a child with BCECTS characterized by a pattern of multiple spike and wave complexes, followed by post-ictal slowing [5]. Oliveira de Andrade, in 2005, reported two subclinical rhythmic discharges of spike and wave in a boy with BCECTS [8]. Saint-Martin et al. in 2001, described a series of patients presenting with different types of positive or negative ictal manifestations. In four cases the description of focal seizures was given [10]. Dalla Bernardina et al. in 2005, wrote that, generally, the ictal pattern is characterized by a sequence of rhythmic sharp waves or spikes, not preceded by an important EEG depression, remaining unchanged during the seizure and not followed by post-ictal slowing [1]. The aim of our paper is to describe BCECTS patients in which electroclinical and/or subclinical seizures were recorded and to compare our to literature data.

2. Patients and methods

Approval from the local institutional Ethic Committee and informed consent signed by the parents were obtained. We reviewed clinical and EEG documentation of our cases with BCECTS (701 patients) referred to 10 different Epilepsy Centre in Italy, with at least 3 year follow-up. Strict inclusion criteria were the presence both of typical sensorimotor seizures affecting orofacial district with or without generalization and focal interictal EEG paroxysms in the centro-temporal areas activated by drowsiness and sleep. Furthermore, all patients fulfilled the classic criteria for BCECTS: normal pregnancy and delivery, uneventful past medical history, normal psychomotor development at diagnosis, normal neuroimaging, onset between 2 and 13 years, spontaneous recovery [11–13]. From clinical charts we selected these informations: sex, age, age at seizure onset, personal antecedents of febrile seizures, family history of epilepsy and or febrile seizures, neurological and neuropsychological evaluations, neuroimaging, interictal EEG and ictal video-EEG, antiepileptic drugs (AEDs) prescribed. All patients had repeated and prolonged EEG recordings, performed both at awake state and during sleep. Scalp silver–silver chloride electrodes were placed using the International 10–20 system. Additional electrodes were used for polygraphic parameters, in particular for muscular poligraphy. All examinations were recorded on split-screen video-EEG. All interictal and ictal patterns were reviewed by two investigators (GC and FB). Subclinical seizures were defined by the occurrence of an ictal discharge without concomitant clinical manifestations detected by video-EEG. The correlation between the identified ictal patterns and the clinical-EEG data of the patients (i.e., side of ictal abnormalities, occurrence of secondary generalization or post-ictal slowing, presence of drug-resistance), were analyzed by two-way analysis of χ^2 with Yates' correction, with $p < 0.05$ taken as significant.

3. Results

From 701 BECTS patients, we recorded subclinical and/or clinical seizures in 30 patients (20 males).

3.1. Demographic data

Clinical characteristics of the patients are shown in Table 1. All the patients had an uneventful personal history. In four patients, seizure onset was preceded by simple febrile seizures. A positive family history of epilepsy is present in 10 cases, mostly for idiopathic forms. In adjunction, four cases had a positive family history for febrile seizures, two cases had a positive family history for both epilepsy and febrile seizures.

3.2. Onset age

The age at epilepsy onset varied between 2 and 11 years (mean 6 years 4 months), and does not differ from the cases reported in the literature.

3.3. Seizure semeiology

3.3.1. Referred by parents

All the patients presented with typical lateralized motor faciobrachial seizures during drowsiness, sleep or awakening. At awake state, the seizures were present in nine cases. A secondary generalization was referred by the parents in eight cases.

3.3.2. Video-recorded

In two cases the seizures were only subclinical. Three cases presented with both clinical and subclinical seizures in different EEG recordings. In the other cases, the patient presented with a wide spectrum of polymorphous clinical episodes. The duration of the attacks was comprised between 10 s and 15 min (mean 1 min and 40 s). Ictal manifestations are detailed in Table 2.

3.4. Neuropsychological profile

Psychomotor development before seizure onset was normal, as neuroimaging with MRI/CT scan (26/4 patients, respectively). Eight children (Case 1, 10–13, 19, 21 and 22) experienced transient learning difficulties and mild attention deficit or behavioural problems during epilepsy history, completely recovered at the end of follow-up.