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Rolandic discharges: Clinico-neurophysiological correlation

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ABSTRACT

Objective: The aim of this study was to analyze neurophysiologic aspects of rolandic discharges.
Methods: We reviewed 45 electroencephalograms of patients divided into two groups: those with benign childhood epilepsy with centrotemporal spikes (BCECTS) and symptomatic partial epilepsy (SPE), following ILAE criteria (1989). The EEG data analyzed were: horizontal dipole discharges, double spike phenomenon, the extension of epileptiform discharges and background activity.
Results: There was a predominance of horizontal dipole between patients with BCECTS compared with patients with SPE; however, this difference was not statistically significant. There was also no statistically significant difference between the two groups when the double spike phenomenon and the extension of discharges beyond the rolandic area were considered. The slower background activity in the SPE group was the only variable with statistical significance.
Conclusions: This study revealed similarities between rolandic discharges of two different epilepsy groups. The only reliable parameter to differentiate the groups was the background activity.
Significance: Our findings suggest that most EEG rolandic features are not pathognomonic of BCECTS, as they are related to the area of the discharges and not to the epileptic syndrome itself.

1. Introduction

Benign childhood epilepsy with centrotemporal spikes (BCECTS), or rolandic epilepsy, is defined as an epileptic syndrome with age onset at 3–13 years (peak 9–10 years), and brief, simple, partial, hemifacial motor seizures, usually associated with somatosensory symptoms that may evolve into generalized tonic-clonic seizures (International League Against Epilepsy, ILAE, 1989), particularly during sleep. The electroencephalogram (EEG) shows normal background activity and high voltage epileptic discharges in the centrotemporal area (rolandic discharges), increasing during drowsiness and sleep. The spike has a characteristic diphasic component followed by a slow wave. Benign childhood epilepsy with centrotemporal spikes is a benign condition, self-limited and age-dependent, with no relation to structural lesions in the CNS.

Rolandic discharges seem not to be pathognomonic of BCECTS and may represent both a functional focus (Gastaut, 1982) and an expression of a focus secondary to an organic brain damage. Therefore, it seems that both BCECTS and symptomatic partial epilepsy (SPE) with a lesion in rolandic area may present with rolandic discharges.

It is still not clear if there are EEG parameters that may be related to the epilepsy outcome, although some studies suggest certain characteristics are extremely useful in determining prognosis (Van der Meij et al., 1992; Massa et al., 2001).

Thus, the aim of this study was to analyze neurophysiologic aspects of two different epilepsy groups, both presenting with rolandic discharges.

2. Methods

We reviewed 45 EEGs of patients divided into two groups: Group I (BCECTS) and Group II (SPE), following ILAE criteria (1989).

- Patients with rolandic epilepsy or BCECTS (Group I):

We selected 21 patients with BCECTS (13 males) with epileptiform discharges in the rolandic area and ages ranging from 5 to 14 years. Patients with a progressive disease or with abnormalities seen in brain MRI were excluded.

- Patients with SPE (Group II):

We selected 24 patients with SPE (16 females) with epileptiform discharges in the rolandic area and ages ranging from 6 to 18 years. Symptomatic epilepsies are considered the consequence of a known disorder of the central nervous system (International

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League Against Epilepsy, ILAE, 1989). Therefore, we selected patients with a lesion in the rolandic area, such as a dysplastic lesion, gliosis, etc.

2.1. EEG

The study was performed at UNICAMP between January 2001 and March 2009. All EEG recordings were performed with electrodes placed according to the international 10–20 System (Jasper, 1958). Interictal EEGs lasted for at least 20 min and were performed with the patient awake and asleep. Hyperventilation and intermittent photic stimulation were obtained in cooperative patients. Chloral hydrate (10%, 50–75 mg/kg) was used to induce sleep when necessary.

We used a digital EEG machine with 32 channels to perform all examinations.

We used referential montages with vertex and average, longitudinal and transverse bipolar montages, as well as transverse bipolar montages using zygomatic electrodes (anterior temporal electrodes – T_1 and T_2), following the recommendations of the American Clinical Neurophysiology Society (ACNS, 2006).

The EEG data analyzed were:

- *Horizontal dipole:* characterized by dipolar topography of the electrical field distribution with discharges occurring tangentially to the cortical surface with a generator in the deep portion of the rolandic sulcus, i.e., maximum negativity in the centrotemporal regions and simultaneous positivity in the frontal regions (Blume, 1982).
- *Double spike phenomenon:* characterized by a small amplitude spike of which the negative maximum was smaller and earlier than the negative maximum of the prominent rolandic spike, that is, the rolandic spike has a preceding spike in its ascending phase (Van der Meij et al., 1992).
- *Extension of the epileptiform discharges:* we observed whether the discharges were restricted to the rolandic area (epileptiform discharges in the centrotemporal or centroparietal regions) or if they would extend beyond the rolandic area.
- *Background activity:* abnormal background activity was considered if there was an absence of normal posterior rhythm and/or absence of physiological sleep rhythms appropriate for age (Dalla Bernardina et al., 1991, 2005).

2.2. Data analysis

We used SYSTAT 12 (San Jose, California, USA, Systat Software Inc. – SSI) to analyze clinical variables from patients and controls. We used the *T*-test with Bonferroni's correction to compare continuous data between patients and controls. For categorical variables we used Pearson χ^2 and Fisher's exact test.

3. Results

Of the 45 EEGs analyzed, 21 were from patients with BCECTS (Group I) and 24 were from patients with SPE (Group II). In Group I, the mean age was 9.2 years (±2.6) and in Group II it was 10.7 years (±3.5). The two-sample *T*-test was applied to compare both age groups and the results showed that they were homogeneous.

Fig. 1 shows a classical example of horizontal dipole found in patients with rolandic epilepsy, with maximum negativity at the central and parietotemporal regions, and with positivity in the frontal regions.

The double spike phenomenon is shown in Fig. 2.

Table 1 shows the variables in the two selected groups. The background activity was the only variable with a statistically significant difference. This table shows that in spite of a predominance of horizontal dipole in patients with BCECTS when compared with patients with SPE, no statistically significant difference was found. There was also no statistical significance between the two groups when the double spike phenomenon and the extension of discharges beyond the rolandic area were considered. The extension of the epileptiform discharges beyond the rolandic area was observed during both wakefulness and sleep.

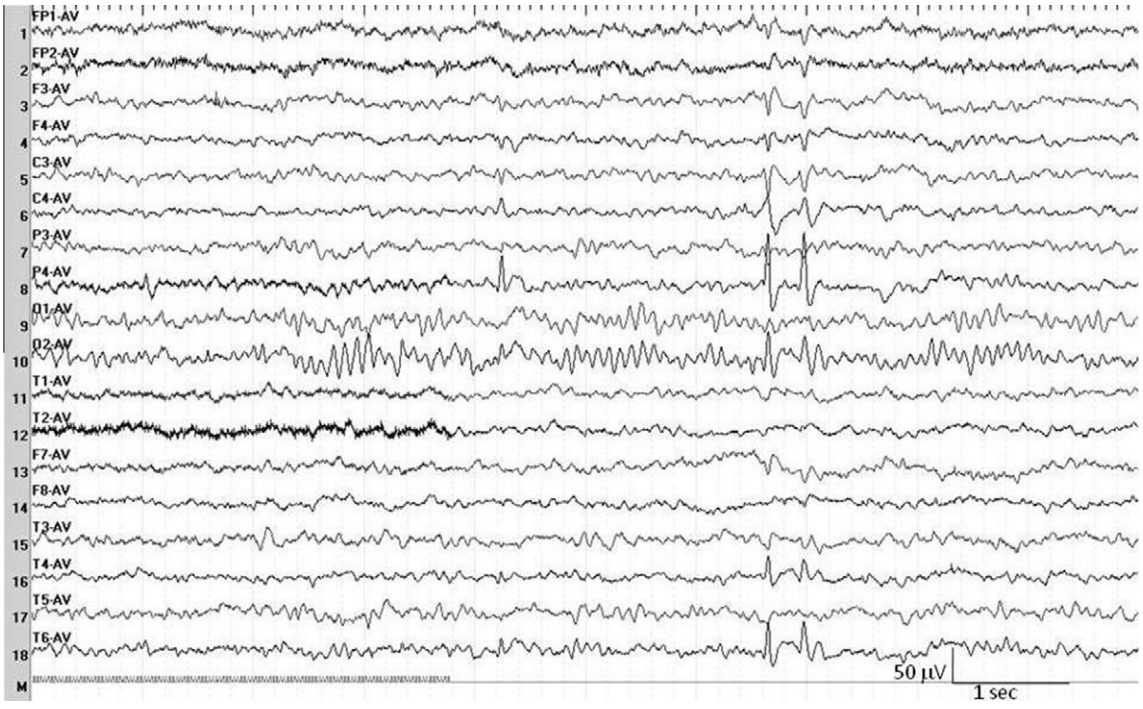

Fig. 1. The horizontal dipole in a patient with BCECTS.