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EPILEPSY WITH CONTINUOUS SPIKE-WAVES DURING SLOW WAVE SLEEP

A CLINICAL AND ELECTROENCEPHALOGRAPHIC STUDY

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SUMMARY - We report four children with epilepsy with "continuous spike-waves during slow wave sleep" (CSWSS). The main clinical features were partial motor seizures, mental retardation and motor deficit. The EEG findings were characterized by nearly continuous (>85%) diffuse slow spike and wave activity in two patients, and localized to one hemisphere in two other cases during non-REM sleep. The treatment was effective in improving the clinical seizures, but not the EEG pattern. We believe that this epileptic syndrome has been overlooked and routine sleep EEG studies on epileptic children may disclose more cases of CSWSS.

KEY WORDS: epilepsy with continuous spike-waves during slow wave sleep, EEG, sleep.

Epilepsia com ponta-onda contínua do sono lento: estudo clínico e eletrencefalográfico

RESUMO - Relatamos quatro crianças epilépticas com "ponta-onda contínua durante o sono lento" (POCSL). Os principais achados clínicos foram crises parciais motoras,retardo mental e déficit motor. Os EEG se caracterizaram por complexos ponta-onda quase contínuos (>85%) difusos em dois pacientes e localizados em um hemisfério nos outros dois casos. O tratamento foi eficaz no controle das crises, mas não em relação ao EEG. Achamos que este quadro tem sido pouco relatado e estudos do sono em crianças epilépticas podem revelar mais casos de POCSL.

PALAVRAS-CHAVE: epilepsia com ponta-onda contínua do sono lento, EEG, sono.

The CSWSS was first described by Patry et al.(1971)[19] under the title subclinical "electrical status epilepticus" induced by sleep in children. Nowadays it is defined as "epilepsy with continuous spike waves during slow wave sleep" (CSWSS)[7]. This clinical entity is characterized by spike-and-wave complexes (SWC) that occurs most continuously (>85%) during slow or non-rapid-eye-movement (NREM) sleep. The close relationship between CSWSS and Landau-Kleffner syndrome (LKS) is suggested by several reports[2-4,5,10,14,21,23], as well as with the benign childhood epilepsy with centrotemporal spikes (BECTS)[1,3,6,8,22,23]. It is considered a rare syndrome[18], has received considerable attention in Europe and has a few reports from North America. We are not aware of any publication from South America. Since 1971, about 60 cases with generalized SWC and only 7 with focal distribution on EEG have been reported[17,20].

We describe two patients with "partial electrical status epilepticus during sleep" and two with the generalized form.

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PATIENTS AND METHODS

The four patients, observed at our EEG Laboratory during the past 3 years, all of them had a diagnosis of partial epilepsy and no family history of seizures. The age of diagnosis ranged from 3 to 8-years-old (mean 5.7 years) with a follow-up period of 1-2 years (mean 1.6 years).

Overnight EEG was performed on all patients and a conventional EEG (CEEG) was repeated every 1 or 4 months during the follow-up. Spikes and SWC localized to one hemisphere were recorded during at least 85% of NREM sleep in two hemiparetic mentally retarded children and were generalized in the other two quadriparetic patients. The waking EEG showed paroxysmal spikes or SWC in all four patients.

RESULTS

Table 1 summarizes profiles of the patients, waking and sleeping EEG findings. For the one female and three male patients, the onset of seizures occurred between 1 and 6 years of age and all of them had a suggestive history of brain damage.

The interictal EEG was abnormal in all patients: multifocal spikes and generalized SWC in Cases 3 and 4, left fronto-central spikes in Case 1, and left temporoparietal spikes in Case 2. The EEG background activity (BA) was abnormal in all cases.

The most characteristic EEG changes occurred during sleep in all cases. The EEGs showed nearly continuous focal discharges (>85% of NREM sleep time) at the left temporoparietal area in Case 2 and localized to one hemisphere in Case 1 (Fig 1). Diffuse SWC occupied >85% of slow wave sleep in Cases 3 and 4 (Fig 2).

The treatment was effective in improving the clinical seizures, but not the EEG pattern in all of them, with either phenobarbital or carbamazepine. Two patients had a normal computed tomography (CT) scan. It was abnormal in Case 3 (diffuse brain atrophy) and in Case 2 (arachnoid cyst).

The following case illustrates our studies that are reported in this article.

Case 4: WNS, a 8-years-old boy was first seen at the age of 3 when he was referred with a history of partial motor seizures (right arm) and psychomotor retardation. Pregnancy was abnormal with bleeding at the eigth month, when the child was delivered. At this time, he was cyanotic and

Table 1. Clinical and EEG characteristics of four patients with CSWSS.

Case	Age (years)	Sex	Seizures	EEG	
				Awake	NREM (SW index > 85%)
1	3	M	PMS[c]	Left FC[a] spikes	Focal spikes
2	4	M	PMS	Left TP[b] spikes	Focal Spikes
3	5	F	PMS	Multifocal	Diffuse SWC
4	8	M	PMS	Multifocal	Diffuse SWC

a, left frontocentral; b, left tempoparietal; c,partial motor seizures.

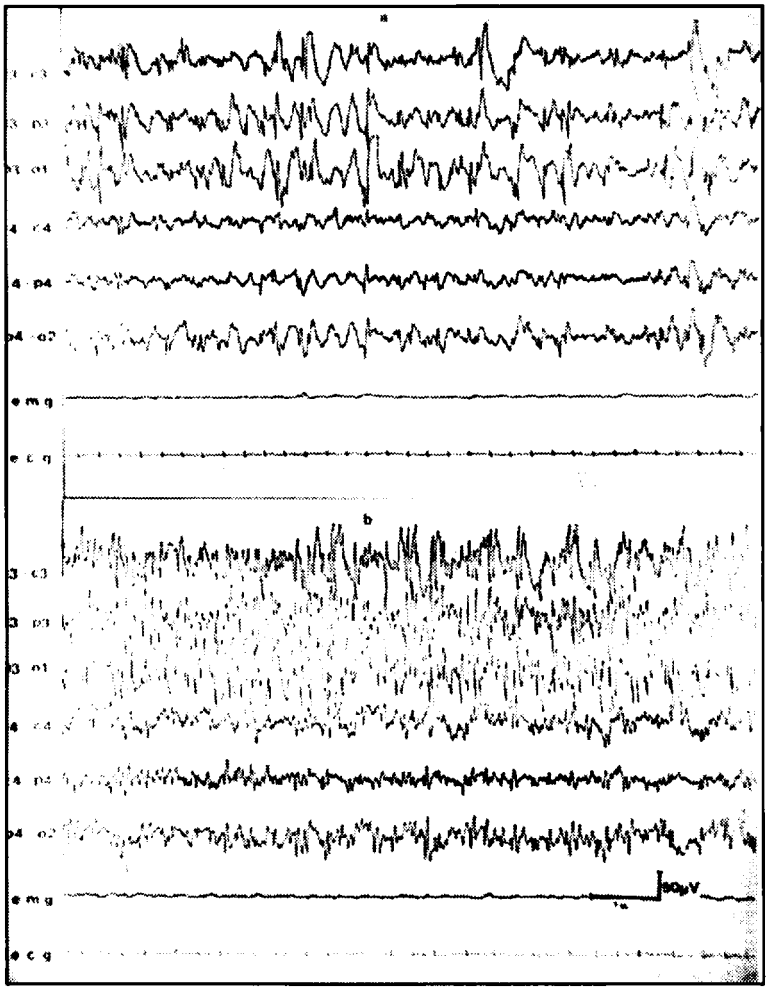

Fig1. Overnight EEG from patient with CSWSS (Case 1). A (above): EEG in REM state with focal spikes. B (below): EEG in NREM sleep shows continuous left focal spikes.

oxygen therapy was needed. He was hospitalized for 21 days. Now he does not walk and speech did not develop adequately. His vocabulary is restricted and conversational abilities are lacking. He has been unable to learn, to write or to count. CT scan was normal. When he was 3 years old, a CEEG was done for 30 min, with the child awake and during sleep. It showed rare spikes over the left frontal and parietal regions. The BA was slow during wakefulness. A second CEEG at the age of 4 showed focal spiking in the right fronto-temporal leads. Further EEGs done at age 5 and age 7 showed multifocal discharges of spikes and SWC. This paroxysmal activity markedly increased during NREM sleep, but without continuous discharges (<50%). When he was 8 year old, valproic acid was associated with phenobarbital. Another EEG was performed for 60 min, after having been seizure-free for 4 months. This recording was now considered diagnostic of CSWSS. During the awake state, isolated SWC were seen over the occipital regions, as well as generalized 2-4Hz SWC paroxysms. The record was dominated by nearly continuous generalized SWC activity during quiet sleep. A CEEG was performed 2 months later and showed the same features. At age 81/2 and age 9,

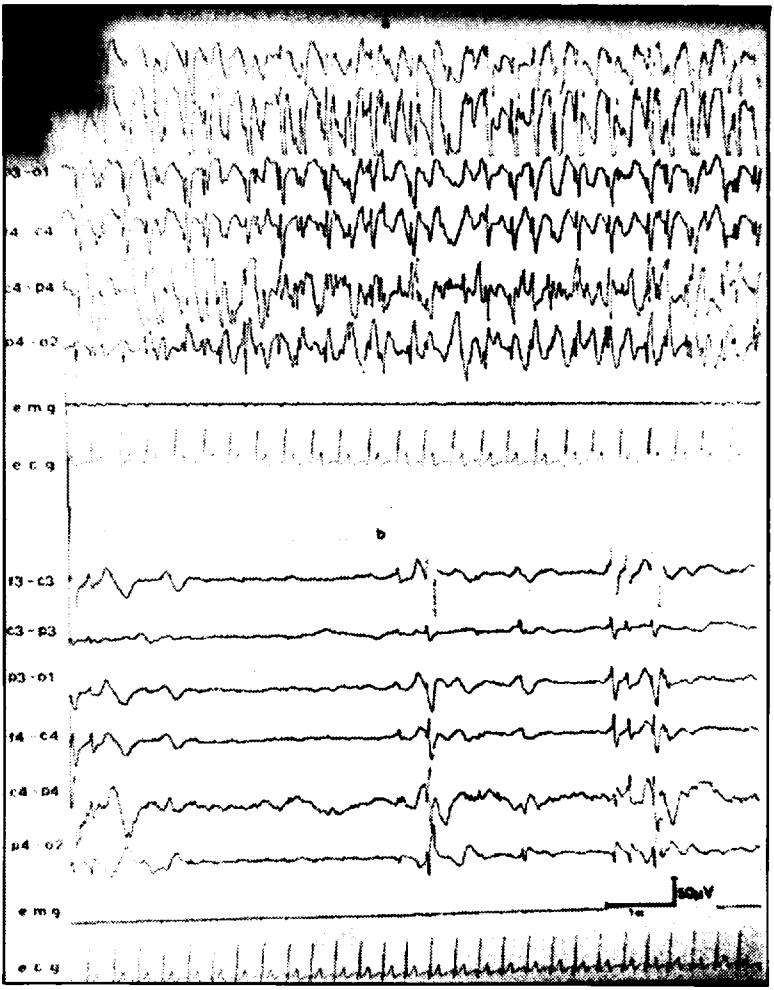

Fig 2. Case 4. A (above): EEG in NREM state; SWC are continuous. B (below): EEG in REM sleep.

he was seizure-free and the overnight EEG were again characteristic of CSWSS (Fig 2). Despite the bioelectric epileptic status, there were no clinical symptoms of a seizure.

COMMENTS

The CSWSS is primarily an EEG diagnosis and secondarily a clinical one. The principal diagnostic criterion is the occurrence of SWC nearly continuously during NREM sleep but not during the awake state or during REM sleep, and must involve more than 85% of NREM sleep[18]. More recently, it was divided into two categories: typical and atypical [13]. The typical with an SWC index of above 85% and the atypical with an SWC index of below 85%. CSWSS occurs with a male to female ratio of 2:1. Onset appears to be age-related, occurring between the ages of 5 to 12 years[4, 9, 19, 23]. In our patients we observed the onset of CSWSS after the clinical signs and between the ages of 4 to 8 years. Three of them were male and the other was a female.

The differential diagnosis of CSWSS includes BECTS and LKS. In the first condition, sleep activation may be important to show up interictal abnormalities, however it never reaches the 85% threshold required for the diagnosis of CSWSS[18,23]. In LKS there is activation of paroxysmal abnormalities during sleep onset and during each REM period, a distinguishable feature from CSWSS[24].

There is no specific association of neurological findings with CSWSS. Eight out of 18 patients reported by Tassinari et al.[23] had "encephalophathy" before the CSWSS, like our four patients.

Specific etiologies have not been completely defined but include birth asphyxia, like two of our patients, meningitis, encephalophathy of unknown origin[18,19], congenital cytomegalovirus infection[10] and cryptogenic category[18,23].

We are not aware of magnetic resonance imaging studies, but CT scan has shown bilateral diffuse brain atrophy[18], as in our Case 3.

Regarding EEG findings, in 2 of our 4 cases the distribution of the activity was generalized with SWC discharges without any clinical manifestations during NREM sleep, and were completely suppressed during REM sleep and wakefulness state. However, cases have been described with discharges, either relatively focal in distribution[17,20], like our Case 1 and 2, or characterized by nearly continuous diffuse bisynchronous sharp waves and not SWC[11]. In general, these discharges are generalized SWC[16-18,19,22,23].

There is no specific anti-epileptic treatment for this disorder because clinical seizures have not posed a management problem and have responded to a variety of drugs, like our 4 cases. On the other hand, the EEG abnormality is generally refractory. Few reports concerning treatment of CSWSS are found in the literature. Patry et al.[19] reported nitrazepan to be effective in improving the EEG pattern but not the clinical manifestations. Yasuhara et al.[25] showed that clonazepam gradually improved the clinical features and EEG pattern in five patients. Nitrazepan and clobazan have apparently abolished the characteristic SWC activity and improved neuropsychological function[2,3,10,15]. In our opinion it may have been a coincidental remission.

We believe that this epileptic syndrome has been overlooked and routine EEG sleep studies on epileptic children may disclose additional cases of CSWSS.

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