

OCCIPITAL INTERMITTENT RHYTHMIC DELTA ACTIVITY IN ABSENCE EPILEPSY

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ABSTRACT - Occipital intermittent rhythmic delta activity (OIRDA) is considered good prognostic factor in typical absences (TA). We report electroclinical evolution in 14 patients with TA and OIRDA, which performed video-EEG. Seven patients were female; 9 had childhood absence epilepsy and the others did not present electroclinical characteristics for syndromic classification according to ILAE's classification (1989). Pyknolepsy was referred to in 13; TA was the only seizure type in 13; one had generalized tonic-clonic seizures (GTCS) and three had myoclonic jerks during TA. VPA monotherapy controlled seizures in 11, diVPA and ESM, in one each. After seizure control EEG normalized in 10 while in three, spike-wave complexes (SWC) persisted, accompanied by OIRDA in one. Finally in another, seizures were not controlled and SWC and OIRDA persisted. In conclusion, we observed in this series of TA and OIRDA with onset before 10 years, pyknolepsy as common finding and few GTCS. VPA controlled seizures in most cases and EEG normalized in 76.92%. We suggest that OIRDA could be considered good prognostic factor in TA associated with SWC and of epileptiform nature leading to appropriate investigation.

KEY WORDS: typical absence, occipital intermittent delta activity, idiopathic generalized epilepsy, EEG, childhood absence epilepsy.

Atividade occipital delta rítmica intermitente em epilepsia ausência

RESUMO - Atividade occipital delta rítmica intermitente (AODRI) é considerada fator de bom prognóstico em crises de ausência típica (AT). Neste estudo relatamos a evolução eletroclínica de 14 pacientes com AT e AODRI que realizaram vídeo-EEG. Sete pacientes eram do sexo feminino; nove tinham epilepsia ausência da infância e os outros não apresentavam características eletroclínicas para classificação síndrome de acordo com a classificação da ILAE (1989). Picnolepsia foi relatada em 13; AT foi o único tipo de crise em 13; um tinha crises generalizadas TCG e três, abalos mioclônicos durante AT. Monoterapia com VPA controlou as crises em 11, diVPA e ESM, em um cada. Após o controle das crises, o EEG normalizou em 10; em três, complexos de espícula-onda (CEO) persistiram, acompanhados por AODRI em um. Finalmente em outro, as crises não foram controladas, persistindo CEO e AODRI. Concluindo, observamos nesta série de AT e AODRI, com início antes dos 10 anos, picnolepsia freqüente e poucas crises TCG. VPA controlou as crises na maioria dos casos e o EEG normalizou em 76,92%. Sugerimos que AODRI possa ser considerada um fator de bom prognóstico em AT associada a CEO e de possível natureza epileptiforme, levando por sua vez, à investigação apropriada.

PALAVRAS-CHAVE: ausência típica, atividade occipital delta rítmica intermitente, epilepsia generalizada idiopática, EEG, epilepsia ausência da infância.

Posterior slow activity on EEG was initially described in children with behavior problems¹, but these earlier studies, as stressed by Kellaway 50 years later (1990)², were limited by the fact of a small control group and by the dubious criteria of abnormality, not taking into account the age of the patients. Subsequent studies in fact confirmed a greater incidence of posterior slow activity in children with behavior problems when compared to controls of the same

age³. Nevertheless, after these groups of studies no other was performed to stress these evidences.

Differently from frontal intermittent rhythmic delta activity (FIRDA) observed in adults, occipital intermittent rhythmic delta activity (OIRDA) may not be associated to structural lesions. OIRDA was described in patients with absence seizures by Cobb in 1945⁴. Because of the difficulty distinguishing physiological from pathological posterior waves, Aird and Gastaut

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reviewed the subject in 1959⁵, describing four groups of posterior rhythms: slow alpha variant; slow posterior waves of youth; pathological posterior slow rhythm; and finally, slow posterior rhythm associated with petit mal. This latter type, slower than the others, with the frequency around 3 Hz, was seen only in children, and occurred in short sinusoidal high amplitude symmetrical and synchronic bursts, strongly blocked by eye opening and accentuated by hyperventilation. They found this pattern in 39 records of 23 patients out of 100 records performed on 36 patients with clinical petit mal. Recently (2003) Gullapalli and Fountain⁶ reported a series of 77 patients with OIRDA and found seizures to be more frequent (69/77) than in the control group (41/77), consisting of GTCS in 45%, partial in 40% and absences in 33% of them. Some authors consider OIRDA as a good prognosis factor in patients with absences^{7,8}.

The aim of this paper is to report clinical and EEG evolutions in 14 patients with absence epilepsy who presented OIRDA.

METHOD

We analyzed by video-EEG 14 out-patients consecutively referred between October 1996 and November 1998 from

the Neurology Department of Clinics Hospital of the University of São Paulo, with documented typical absences (TA) that had OIRDA and electroclinical evolution after treatment. All patients signed an informed consent to participate in the study⁹.

TA were defined based on ILAE classification¹⁰ as seizures characterized by "sudden onset, with interruption of ongoing activities, a blank stare, possibly a brief upward rotation of the eyes lasting from a few seconds to half a minute". All patients had normal neurological and neuroimaging examinations and interictal bursts of spike-wave complexes (SWC) higher than 2.5Hz in the routine EEG.

The sex ratio was 1:1. The mean age at the time of the study was 7.89 yrs. (ranging from 1 yr. 5 m to 15 yrs.) and the age of seizure onset was 5.57 yrs. (range 1-10 yrs.).

A Telefactor 32 channel system was used in all patients. The video-EEG monitoring consisted of a minimum of three hours of recording, with sleep samples, in the morning after sleep deprivation and without any change in the current medication.

All the patients had routine (30 minutes) control EEG after adjustment of AED, and in 13 of them after control of the seizures. They also had muscular electrodes in the deltoid muscles and were submitted to intermittent photic stimulation. These patients performed several periods of hyperventilation with the eyes open while counting aloud the number of respiratory incursions, as suggested by Panayiotopoulos et al.¹¹.

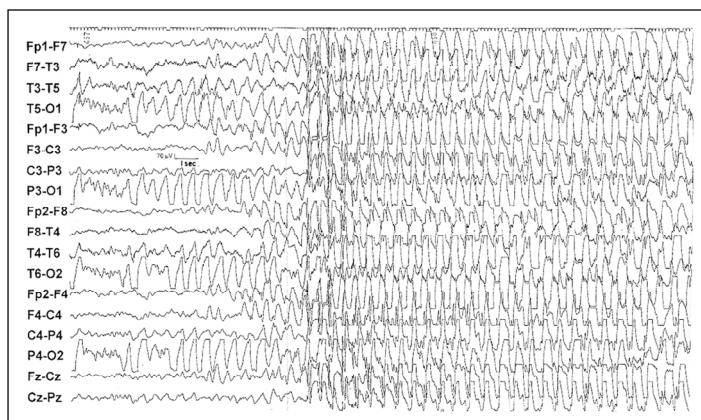


Fig 1. EEG showing OIRDA during hyperventilation followed by absence seizure accompanied by generalized SWC.

Fig 2. EEG showing OIRDA during hyperventilation.



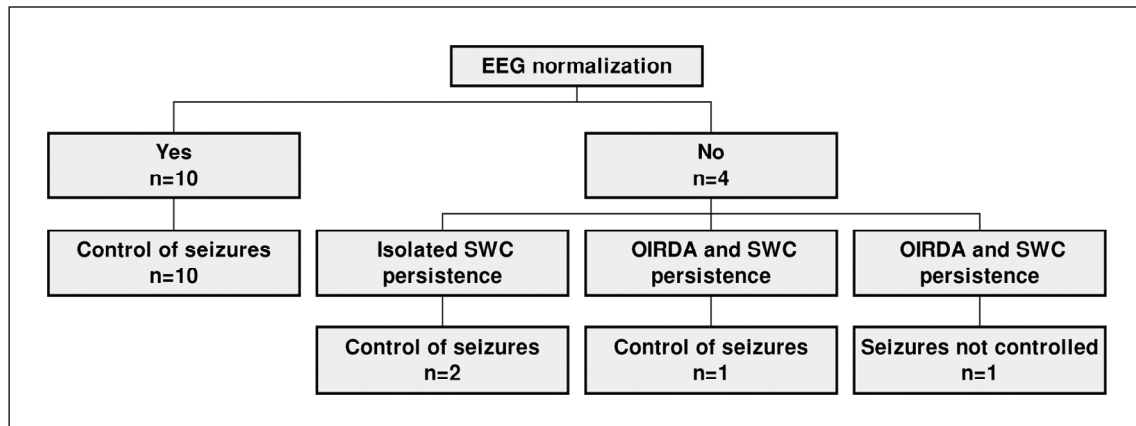


Diagram 1. EEG evolution after treatment.

The patients were followed up in the outpatient unit for a period ranging from two to four years and three months (mean 40 months).

RESULTS

Pyknolepsy was referred to in 13 patients (92.85%). TA was the only seizure type in 13 children (92.85%) and in three (21.42%) there were myoclonic jerks during the absences. One patient (7.14%) had also generalized tonic-clonic seizures (GTCS).

According to ILAE's syndromic classification (1989)¹², nine patients (64.18%) could be classified as having childhood absence epilepsy and the remaining ones did not present electroclinical characteristics that allowed syndromic classification¹³. When we used Panayiotopoulos' criteria¹⁴ for absence seizures, nine patients (64.18%) could be classified with the childhood type.

In 13 patients (92.85%) the seizures could be controlled: 11 in monotherapy with valproate (VPA), mean dose of 22.7 mg/kg/d; one with divalproate (diVPA), another one with the association of VPA and ethosuximide (ESM) and in one (7.14%), the seizures persisted despite the use of VPA (34 mg/kg/d). This was probably due to no compliance to treatment.

In 10 patients (71.42%) EEG became normal after control of seizures. In nine of them OIRDA disappeared simultaneously with SWC in mean time of 11 months (range 0-31) after treatment and in one patient, 8 months before them. In three, there were persistent discharges regarding control of the seizures as described by the family: in two of these isolated SWC and in one, OIRDA and SWC. In one patient seizures were not controlled and SWC, as well as OIRDA, still persisted. Diagram 1 shows EEG evolution in these patients. Figures 1 and 2 illustrate 2 cases.

DISCUSSION

Differently from FIRDA, posterior EEG slowing may be present either in physiological or pathological conditions. Physiological conditions are age related and have different morphological characteristics, such as slow alpha variant group and slow posterior waves of youth⁵. Among the pathological conditions, basilar migraine may show signs of dysfunction of brain areas supplied by the vertebralbasilar arteries during an attack with resolution during follow-up¹⁵. Posterior fossa tumors, specially those of the 4th ventricle, may show EEG abnormalities, such as posterior arrhythmic slow waves and transmitted rhythms, which are probably correlated with acute or subacute dilatation of the 3rd ventricle¹⁶. Head trauma was described as also associated to OIRDA in the past^{5,17}.

Since the first studies in the 30s^{18,19} abnormal slow waves were seen after closing the eyes in patients with "petit mal seizures". As those authors described "these slow waves may continue for a short time, and then develop a rapid alternation between fast and slow waves which is characteristic of petit mal (that is, the 3 per second wave and spike), and a clinically characteristic petit mal seizure may occur".

None of our patients had any other neurological symptom besides seizures. All our patients were children and 13 out of 14 had absences as the only seizure type, with mean age of seizure onset 5.57 yrs. (range 1-10 yrs.) and control of seizures in 13 of them (92.85%). Cobb et al. described OIRDA in patients that had an early age of onset of absences, cessation at age 10-12 and a lesser tendency to develop grand mal⁷.

Although pyknolepsy was described in the ILAE's classification¹² as a characteristic of childhood absence epilepsy and it was referred to in 13 patients (92.85%) of this study, only nine could be classified as having

this syndrome. Panayiotopoulos' criteria permitted to classify the same number of patients. In fact, this author considers that OIRDA favors the diagnosis of childhood absence epilepsy.

Three patients had myoclonic jerks during the absences and probably had myoclonic absence epilepsy as described by Tassinari et al.²⁰. In this syndrome, instead of polyspikes, an EEG pattern similar to that seen in childhood absence epilepsy is described. It seems therefore that the same age dependent mechanism may be involved.

The majority of patients who had their seizures controlled (10/13) had normalization of the EEG and only three had their seizures controlled with persistence of SWC, one with associated OIRDA. The fact that one patient whose seizures were not controlled presented OIRDA as well as SWC may indicate that these two types of abnormalities are linked. Actually, one of our patients presented one episode of absence just after bursts of OIRDA. Aird and Gastaut described one patient with "petit mal" who showed marked occipital rhythmic slowing before a typical spike-wave burst (called larval or subclinical)⁵.

Cobb described two epileptic patients with abnormal activity distributed over the occipital regions, one with spike-wave activity and the other with a continuous delta rhythm which showed reaction to visual stimuli⁴. This author described the distribution of grading among "single spikes, single spike-and-wave, bursts of spike-and-wave; bursts in which the spikes were barely discernible, bursts of 'sine' waves, and finally, rhythmic waves which were continuous or changed in amplitude only slowly...". The mechanisms involved in this activity have been discussed by several authors. Experimental stimulation of thalamus promoted cortical discharges similar to those seen in petit mal²¹⁻²³. The cortical theory by Gibbs and Gibbs that proclaimed the cortex as the main site of the abnormalities in generalized epilepsies contradicted this concept^{18,19}.

The theory of a "cerebral pacemaker" sustained that a system of subcortical pacemaker would control normal cortical rhythms like alpha and beta frequencies and also abnormal activities (slow waves, wave and spikes, diffuse spikes)²⁴. Hence, dysfunction either in this system, probably located in the brainstem and diencephalon, or in its nonspecific diffuse cortical projections would explain the coexistence of spike-wave activity and OIRDA in patients with typical absence seizures. The principle of interaction between thalamus and cortex was studied lat-

er culminating to the more recent physico-chemical abnormalities reported in thalamocortical circuitry and its interconnections, which were suggested to be the possible pathophysiological substrates of the electrophysiological dysfunction in patients with absence seizures²⁵⁻²⁸.

These thalamic influences upon physiologic and pathologic cortex could explain the fact of simultaneous disappearance of OIRDA and SWC in 10 out of 14 patients in this study. Therefore we propose that OIRDA should be considered and investigated as an epileptiform pattern.

Some authors consider OIRDA as a good prognosis factor in patients with absences^{7,8}. This finding probably implies a clue for the diagnosis of the childhood type of absence epilepsy in their papers. The fact that the thalamocortical dysfunction is age dependent was raised in 1995 by Noebels and Tharp who discussed the interactions of neurobiological, genetic and developmental aspects of absence seizures²⁹. A "seizure-prone" cortex that undergoes oscillatory thalamic influence was also described in experimental work on spike-wave activity³⁰. Although we could not compare patients with TA without OIRDA with our patients, most of them had control of the seizures and only one was refractory to AED, probably due to no compliance to treatment.

In conclusion, in this series of typical absences and OIRDA we observed mean age of seizure onset before 10, a common finding in pyknolepsy (92.85%) and also low incidence of GTCS (7.14%). Seizures could be controlled in 92.85% of the patients and from this group, in 71.42% there was EEG normalization. Therefore, in this series, OIRDA could be considered a good prognostic factor in TA being associated with the presence of generalized SWC. We propose that in patients with TA, OIRDA should be considered an epileptiform EEG pattern that would lead to individual appropriate investigation.

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