

INTERICTAL ELECTROENCEPHALOGRAPHIC FINDINGS IN CHILDREN AND ADULTS WITH TEMPORAL LOBE TUMORS

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ABSTRACT - Objective: To characterize clinical and interictal electroencephalographic aspects of children and adults with temporal lobe epilepsy (TLE) due to tumoral lesions. **Method:** We performed a retrospective analysis of the clinical and interictal electroencephalographic aspects of 16 children (64 exams) and 12 adults (78 exams) with lesions in the temporal lobe. **Results:** The most frequent etiologies were gangliogliomas, DNETs, followed by astrocytomas. Auras occurred in both groups, the most common being epigastric sensation. Other findings such as myoclonias, behavioral arrest and vomiting were more frequent in children. Temporal epileptiform and nonepileptiform activities, mostly unilateral, were found in both groups. Extratemporal epileptiform activities (frontal, parietal, central, occipital and generalized) were also found equally in both groups. **Conclusion:** Our data show that children and adults with TLE due to expansive lesions present with similar EEG findings.

KEY WORDS: epilepsy, childhood, temporal lobe, EEG, tumors.

Eletrencefalograma interictal em crianças e adultos com tumores de lobo temporal

RESUMO - Objetivo: Avaliar os aspectos eletrencefalográficos interictais e clínicos de crianças e adultos com epilepsia do lobo temporal secundária a lesões tumorais. **Método:** Análise retrospectiva dos aspectos clínicos e eletrencefalográficos interictais de 16 crianças (64 exames) e 12 adultos (78 exames) com lesões tumorais no lobo temporal. **Resultados:** As etiologias mais frequentes foram gangliogliomas e DNETs, seguidos por astrocitomas. As auras ocorreram em ambos os grupos, sendo a sensação epigástrica a mais comum. Outros achados tais como mioclônias, parada comportamental e vômitos foram mais frequentes em crianças. Atividade epileptiforme e não epileptiforme temporal, principalmente unilateral, foi encontrada nos dois grupos. Atividade epileptiforme extra temporal (frontal, parietal, central, occipital e generalizada) foi também igualmente detectada em ambos os grupos. **Conclusão:** Crianças e adultos com epilepsia do lobo temporal secundária a lesões tumorais apresentam padrão eletrencefalográfico semelhante.

PALAVRAS-CHAVE: epilepsia, lobo temporal, EEG, tumores.

Due to a wider use of magnetic resonance imaging (MRI), neurodevelopmental tumors have been diagnosed with increasing frequency as a cause of refractory temporal lobe epilepsy (TLE), especially in children. In some studies, they are considered the main cause of refractory TLE in children^{1,2}. The tumors most frequently found are neuronal or glioneuronal tumors (gangliogliomas, gangliogliocytoma, ganglioglioma, dysembryoplastic neuroepithelial tumor - DNET), oligodendrogliomas and astrocytomas, includ-

ing pleomorphic xanthoastrocytoma. Gangliogliomas are the main tumors responsible for the occurrence of epileptic seizures which are difficult to control with medications, and which have an onset before the age of fifteen³. They are tumors of slow growth and there is an absence of clinical signs of localization and also the absence of signs of intracranial hypertension⁴.

The growth of those tumors and their pathological findings suggest that they, particularly gangli-

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ogliomas and DNET, might either originate from a cortical malformation or be the final end of the spectrum of the cortical dysplasias⁵⁻⁹. In children with TLE of different etiologies there is a wide clinico-electroencephalographic diversity^{2,10-13}.

Knowing that tumoral lesions lead to a variable electroencephalographic pattern, particularly in children, we aimed to compare interictal EEG findings of children with those of adults with TLE due to tumoral lesions.

METHOD

We performed a retrospective analysis of 16 patients (9M:7F) younger than 17 years of age (mean age: 10 years) with an expansive lesion in the temporal lobe, who were followed at the childhood epilepsy clinic of the HC/Unicamp and of the Institute of Psychiatry/USP, from 1998 to 2005 (Group 1).

The interictal electroencephalographic findings were compared to those of 12 adult patients (6M:6F), from 21 to 51 years of age, followed at the ambulatory clinic of epilepsy of difficult medical control of the HC/Unicamp (Group 2).

Two to 11 routine EEGs were recorded in each patient, following the international rules for electrodes placement: "system 10-20". Two EEG devices were used, one with 14 channels (analog) and another with 32 channels (digital), both from Nihon Kohden Company. The montages were in accordance with the American EEG Society, using montages with zygomatic electrodes besides bipolar montages (longitudinal and transverse) and referential with the vertex. The minimal duration of the tracings was 20 minutes. The examinations were performed during sleep, somnolence and while awake. Methods of activation (hyperventilation and intermittent photic stimulation) were routinely used. In younger children and in those less collaborative, whenever necessary, the sleep phase was induced with chloral hydrate.

Telemetry was performed in nine children and six adults.

We used the t-student and Fisher tests for statistical analysis.

RESULTS

The mean age of onset of the epileptic seizures was 16.1 years in the adult patients and 6.4 years in the children, which is statistically significant ($p=0.01$).

Simple partial seizures occurred in nine children and in 11 adults, being predominantly epigastric and visual aura. There were complex manual automatisms in nine patients of the groups 1 and 2 (56% and 75%, respectively). Other findings, such as myoclonias (two children), behavioral arrest at the beginning of the ictus (six children and two adults), and vomiting (four

Table 1. Etiology-neuropathological data.

Neuropathological findings	Children	Adults
Ganglioglioma	6	3
DNET	4	0
Astrocytoma	0	1
Pilocytic astrocytoma	1	0
Cavernoma	1	1
Ruptured epidermic cyst	0	1
Without definition	4	6

Table 2. Interictal EEGs with temporal discharges (in numbers).

	Children	Adults	p
Temporal EA	15	9	0.285
Contralateral temporal EA	3	5	0.230
Bilateral temporal EA	6	4	1
Temporal NEA	13	7	0.230
Bilateral t NEA	5	5	0.697
Contralateral temporal NEA	0	3	0.067
Normal	4	9	0.020

EA, epileptiform activity; NEA, nonepileptiform activity.

Table 3. Interictal EEGs with extratemporal discharges (in numbers).

	Children	Adults	p
Frontal	4	2	0.673
Parietal	4	2	0.673
Occipital	2	0	0.492
Central	4	3	1
Generalized	3	0	0.238

children and two adults) were more frequent in children, and there was no significant difference between the two groups in signs and symptoms.

The neuropathological data of the patients who had already undergone surgery are shown in Table 1 (12 children and six adults).

The most frequent etiologies were ganglioglioma, DNET, followed by astrocytoma. We found six temporal mesial lesions in the children and six in the adults, and there were 10 lateral lesions in the children and six in the adults. The lesions occurred most frequently in the right hemisphere: 10 children and eight adults.

Table 2 shows the temporal EEG findings of groups 1 and 2. The childhood group (Group 1) underwent 64 exams (mean: 4 exams per patient) and the adult group (Group 2) had 78 exams (mean: 6.5 exams per patient).

Table 3 shows the extratemporal EEG findings of groups 1 and 2.

DISCUSSION

Our data show that temporal interictal epileptiform and nonepileptiform activity occur equally in all age ranges. Normal EEGs were significantly more frequent in the adults in this study. However, according to Harvey et al.¹⁴, in the pediatric age range, 15.9% of the patients with TLE may have persistently normal EEGs. Interictal extratemporal epileptiform activity was also found in both groups, which was unexpected, as TLE in childhood usually presents with a greater clinico-electroencephalographic diversity¹.

Pre-operative studies performed in adults with temporal lobe tumors have demonstrated electrophysiological variability: temporal focal discharges, bilateral temporal activity, contralateral activity, extratemporal activity and the presence of "mirror focus"¹⁵⁻²².

Interictal EEGs of children with TLE may show extratemporal (especially frontal) discharges more frequently than those seen in adults with mesial sclerosis¹². In the present study we observed that the EEGs of adult patients with tumoral lesions also displayed extratemporal discharges. That suggests that this neurophysiological characteristic might be related to the etiology, independent of the age range. In other words, there was no significant difference between the extratemporal findings of children and adults because both age groups seem to have a similar neurophysiological behavior when the etiology is an expan-

sive lesion of the temporal lobe. In patients with TLE caused by hippocampal sclerosis, however, there is a difference between the age ranges^{12,23}.

Our data show that seizure onset was significantly earlier in children than in adults, despite the same pathology and similar EEG findings. This may reinforce that EEG features in temporal lobe tumors are not age-dependent.

The clinical features of adults with tumoral lesions in the temporal lobe can be differentiated from those with mesial temporal sclerosis by the initial ictal pattern, by the behavioral sequence and by the time of its appearance during the seizure²⁴. Other authors found that seizures of neocortical origin are significantly shorter in duration²⁵. In spite of these clinical differences, there is difficulty in making a distinction in an individual patient²⁶. Our clinical findings were suggestive of mesial TLE with the presence of typical auras and automatisms, even in the lateral lesions. These findings may either reflect a rapid propagation to the mesial structures or simply occur by the activation of cortical areas distant from the epileptic focus. Few patients presented auras with suggestive of neocortical involvement.

To conclude, this study suggests that interictal discharges in children and adults with TLE due to expansive lesions present with a polymorphic electroencephalographic pattern. Although children with TLE have frequent extratemporal epileptiform discharges, independent of the etiology, there is no significant difference when one compares children and adults with tumoral lesions. In TLE due to mesial sclerosis, there seems to be a difference between the two age groups.

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