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Epilepsy syndromes associated with hypothalamic hamartomas

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Summary

Purpose: Hypothalamic hamartoma (HH) related epilepsy presents with gelastic seizures (GS), other seizure types and cognitive deterioration. Although seizure origin in GS has been well established, non-GS are poorly characterized. Their relationship with the HH and cognitive deterioration remains poorly understood. We analyzed seizure type, spread pattern in non-GS and their relationship with the epileptic syndrome in HH.
Methods: We documented all current seizure types in six adult patients with HH-epilepsy with video-EEG monitoring, characterized clinical—electrographic features of gelastic and non-gelastic seizures and correlated these findings with cognitive profile, as well as MRI and ictal SPECT data.
Results: Only four seizure types were seen: GS, complex partial (CPS), tonic seizures (TS) and secondarily generalized tonic—clonic seizures (sGTC). An individual patient presented either CPS or TS, but not both. GS progressed to CPS or TS, but not both. Ictal patterns in GS/TS and in GS/CPS overlapped, suggesting ictal spread from the HH to other cortical regions. Ictal SPECT patterns also showed GS/TS overlap. Patients with GS—CPS presented a more benign profile with preserved cognition and clinical-EEG features of temporal lobe epilepsy. Patients with GS—TS had clinical-EEG features of symptomatic generalized epilepsy, including mental deterioration.
Conclusions: Video-EEG and ictal SPECT findings suggest that all seizures in HH-related epilepsy originate in the HH, with two clinical epilepsy syndromes: one resembling temporal lobe epilepsy and a more catastrophic syndrome, with features of a symptomatic generalized epilepsy. The epilepsy syndrome may be determined by HH size or by seizure spread pattern.

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Introduction

Gelastic seizures (GS) are the hallmark of hypothalamic hamartoma (HH) related epilepsy.[1] Other seizure types may also occur, which are often refractory to medical treatment.[2] Most video-EEG studies of HH related seizures focus on GS,[3] which are not the most disabling seizure type.[4] Video-EEG features of non-GS have received less attention. A more precise description of the multiple seizure types, with detailed ictal EEG correlation should be useful not only to characterize these seizures, but also to allow a better understanding of the underlying mechanisms of seizure origin and spread patterns in non-GS and to clarify the role of the cerebral cortex structures in seizure origin.

Most studies of HH related epilepsy included both children and adults.[2,5–7] However, seizure types in children may vary in an age-dependent manner.[2,8] Hence, studying a more homogeneous series of adult patients with stable seizure types may offer an advantage to determine seizure origin and spread.

We studied video-EEG features of GS and non-GS in a series of adult patients with HH and correlated seizure patterns, as well as ictal SPECT, to discuss possible underlying seizure origin and spread patterns and epilepsy syndromes in HH-epilepsy.

Patients and methods

Six adult patients with refractory epilepsy and MRI documented HH underwent continuous video-EEG monitoring with a 64-channel BMSI-Nicolet 5000 video-EEG equipment (Madison, WI), with standard electrode placement (10—20 system) and additional anterior temporal and subtemporal electrodes (total of 27 electrodes) to record all current seizure types. We analyzed clinical features: seizure types and number of seizures, seizure patterns, i.e. how seizures evolved to different seizure types for each seizure, and ictal EEG correlates of all seizures.

All patients had undergone 1.5 T MRI scans of the brain, consisting of T1-weighted sequences in coronal, sagittal and axial views and additional T2-weighted and FLAIR sequences, including at least one coronal view. Brain MRIs were retrospectively reviewed in all cases by a neuroradiologist who characterized HH features according to size, lateralization and localization (middle or posterior).[6]

When possible, interictal and ictal single photon emission computed tomography (SPECT) were performed with an intravenous injection of approximately 740MBq (20mCi) of 99mTc-ECD followed by image acquisition with a dual head gamma camera with dedicated collimator for brain studies (fan beam), E.CAM (Siemens, Hoffman Estate Il). Rotation time was determined through counts per frame (at least 100,000 counts per frame) and 128 projections were acquired. SPECT images were processed on a workstation E-soft (Siemens) with Butterworth filter (with 0.75 of cutoff and order 5). Reconstruction yielded 4.8 mm voxels with a 128 × 128 matrix and 128 slices. In-plane spatial resolution was 10.6/6.7 mm full width at half maximum (FWHM) in the center of view. SPECT studies were reviewed by a nuclear medicine specialist who characterized increased regional blood flow abnormalities.

Lastly, we analyzed combined data of seizure types and spread patterns, MRI as well as ictal and interictal SPECT findings to define epilepsy syndromes in these patients.

Results

We studied six adult patients with HH (Table 1). Four were men. Ages ranged from 18 to 39 years (mean, 26.8; median, 25). Only patient 6 had a history of precocious puberty, at age 2. Age at epilepsy onset ranged from newborn period to 8 years. All patients had medically refractory seizures and stable seizure types for long periods (from 3 up to 24 years without new seizure types) before the video-EEG studies.

All patients had sessile HHs, measuring (largest diameter) 7—33 mm, with volumes ranging from 0.1 to 9.9 cm^3 (Fig. 1). MRI showed right lateralization in four patients and left in two. Four HHs were posterior, one was middle and one was unclassifiable[6] (Table 2).

Table 1 Gender, age, epilepsy onset and cognitive function of six patients with hypothalamic hamatoma and epilepsy

Patient	Gender	Age (years)	Epilepsy onset (age)	Cognitive function (IQ)*
1	F	38	5 years	Normal (126)
2	F	23	2 years	Normal (IQ not measured)
3	M	18	6 months	Severe impairment (22)
4	M	39	8 years	Severe impairment (11)
5	M	18	5 years	Mild impairment (64)
6	M	25	Newborn	Severe impairment (15)

M, male; F, female. *Wechsler Adult Intelligence Scale.