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Benign infantile convulsions associated with mild gastroenteritis: An electroclinical study of 34 patients

Tingsong Li [a], Siqi Hong [a], Xing Peng [b], Min Cheng [a], Li Jiang [a,c,*]

[a] Department of Neurology, Children's Hospital of Chongqing Medical University, Chongqing, China
[b] Maternal and Child Health Hospital of Changshou District, Chongqing, China
[c] Ministry of Education Key Laboratory of Child Development and Disorders, Key Laboratory of Pediatrics in Chongqing, Chongqing International Science and Technology Cooperation Center for Child Development and Disorders, China

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ABSTRACT

Purpose: To analyze the electroclinical features and evolution of patients diagnosed with convulsions with mild gastroenteritis (CwG) from southwest China.
Methods: We reviewed and analyzed the medical records of 34 patients (13 males) diagnosed with CwG and followed-up for at least 12 months.
Results: The age of onset was 6–29 months and the female/male ratio 1.62. Seizures were generalized in 32 cases. Single seizures in 15 cases were <5 min and multiple seizures 24–48 h after seizure onset were seen in 18 cases. Seizure duration was <1 min in 32.35%, between 1 and 5 min in 55.88%, and between 5 and 10 min in 8.82% of seizures. The average interval between the onset of gastroenteritis and seizures was 2.47 days. Rotavirus antigen was positive in stools in 26.47% of cases. During the acute phase, diazepam and phenobarbital as first-line treatment were effective in 25% and 83.33% of cases, respectively. Fourteen patients showed non-specific anomalies in the interictal electroencephalography. During 12–36 months follow-up, 33 cases showed normal psychomotor development and no seizures.
Conclusions: CwG occurred mostly in toddlers. During the acute phase, phenobarbital is more effective in controlling seizures. For a good prognosis, it is unnecessary to administrate long-term anticonvulsants.

1. Introduction

Benign convulsions associated with mild gastroenteritis (CwG) were first described by Morooka et al. in 1982 in Japan.[1] Since then, several case reports involving hundreds of patients have been published. Based on the favorable prognosis and distinct relationship between convulsions and diarrhea, it has been proposed that CwG be termed as "situation-related seizures" and may find a place as an "epileptic syndrome" within "benign infantile seizures"[2,3] in the classification set by the International League Against Epilepsy (ILAE). However, until now, it has not been fully recognized as an epileptic syndrome by the ILAE.[4]

Here, we analyzed the evolution of the clinical and electroencephalographic characteristics of patients diagnosed with CwG from the southwest region of China. We wanted to facilitate the diagnosis and treatment of CwG, and to provide more clinical data of CwG to deepen understanding of this disease.

2. Methods and patients

The medical records of 34 patients with CwG hospitalized in the Neurology Department of the Children's Hospital of Chongqing Medical University (Chongqing, China) from 1st October 2009 to 31st December 2011 were studied retrospectively. All patients were followed-up for ≥12 months with thorough neurological examinations and assessments of psychomotor development at the last evaluation. This study was approved by the Ethics Committee of the Children's Hospital of Chongqing Medical University and informed consent was obtained from the legal guardians of each patient.

The inclusion criteria were identical to those described previously.[5,6] That is: (1) CwG occurs in previously healthy subjects aged 6 months to 3 years and young children who

Abbreviations: CwG, benign convulsions associated with mild gastroenteritis; ILAE, International League Against Epilepsy; AEDs, anti-epilepticus drugs; CSF, cerebrospinal fluid; EEG, electroencephalography.

* Corresponding author at: Department of Neurology, Children's Hospital of Chongqing Medical University, No. 136 Zhongshan Er Road, Yuzhong District, Chongqing 400014, China. Tel.: +86 023 63624424; fax: +86 023 63632756.
E-mail address: neurojiang@gmail.com (L. Jiang).

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present with afebrile convulsions; (2) CwG is associated with mild dehydration (<5% of body weight); (3) seizures tend to occur in the course of gastroenteritis; (4) interictal electroencephalography (EEG) shows no paroxysmal discharge; (5) normal laboratory examinations (normal cerebrospinal fluid (CSF), serum electrolytes, and blood glucose levels) are observed.

Patients with (1) mental or neurological deficits or (2) an apparent personal history of epilepsy were excluded from the study even though they had symptoms similar to those of CwG.[6,7] Subjects with stool-positive cultures of enteropathogenic bacteria were also excluded.

Certain parameters were evaluated by pediatric neurologists during follow-up: sex; age of onset of seizures; personal and family history of epileptic disorders; psychomotor development; duration and manifestation of seizures; frequency of seizures; EEG features; laboratory data; findings of brain imaging; efficacy of antiepileptic drugs (AEDs) treatment; and recurrence of CwG or other epileptic disorders. Seizure types were judged based upon feedback from parental interviews as well as observations by the pediatrician, and were classified using ILAE terminology.[8]

3. Results

3.1. Epidemiological characteristics

Thirty-four subjects (13 males) diagnosed with CwG formed the study cohort. Fifteen cases were recruited from rural areas. The age at onset was 6–29 months (median, 15 months). The female:male ratio was 1.62 (Table 1). The highest prevalence of CwG was in the winter and spring (between September and February, $n = 26$ cases). All patients showed normal psychomotor development prior to the diagnosis of CwG. No patients had been vaccinated against rotavirus.

3.2. Personal and family history of epileptic disorders

One patient had suffered from a single afebrile seizure previously. One patient had suffered from febrile seizures for one occasion until 14 months after the onset of CwG. As shown in Table 1, out of 34 patients, five patients had a family history of seizures.

3.3. Clinical characteristics

The interval between the onset of gastroenteritis and the onset of convulsions was 1–4 days (median, 2 days). Two of 34 patients presented with severe vomiting and no obvious diarrhea. Diarrhea preceded seizures by 1, 2, 3, and 4 days in three (9.37%), 13 (40.63%), 14 (43.75%), and two (6.25%) patients, respectively.

Fifteen patients (46.88%) had only one seizure, whereas 18 (52.94%) had ≥2 seizures with the same semiological characteristics within 24–48 h: seizure frequency of two times was noted in 33.3% (6/18) of subjects, three or four times in 50% (9/18) of subjects, and over five times in 16.7% (3/18) of subjects. Only one patient presented with a recurrent seizure, which occurred on the third day after the onset of seizures.

All seizure types were classified by reference to parents or observations of the attending physician. Thirty-two patients presented with generalized seizures: tonic ($n = 16$; 47.06%), and tonic–clonic ($n = 16$; 47.06%). The seizure type of the other two individuals was difficult to classify: one subject showed atonic-like seizures, and the other subjects had glazed eyes and loss of responsiveness to stimulation without limb movement.

The mean duration of a seizure was 3 min. Duration <1 min was noted in 32.35% (11/34) of subjects; between 1 and 5 min (median, 2.5 min) in 55.88% (19/34) of subjects; and between 5 and 10 min in 8.82% (3/34) of subjects. One patient (2.94%, 1/34) had only one seizure, and the duration was >30 min.

Table 1
Epidemiological data.

Item	n (%)
Sex	
Female	21
Male	13
Febrile seizures	
Personal	1 (after the onset of CwG)
Familiar	2 (both first degree)
Afebrile seizure	
Personal	1
Familiar	3 (all benign seizures, 2 first-degree relative; 1 third-degree relative)
Total	7
Age at diagnosis (months)	6–29 (median, 15)
Gastroenteritis duration before seizure onset (days)	2.47 ± 0.76
Positive test of rotavirus in stool	9/34 (26.47%)
Follow-up period (months)	12–36 (median, 23)

3.4. Laboratory findings

Rotavirus antigen was positive in the stools in nine out of 34 (26.47%) cases. Serum electrolytes and glucose were normal in all children. The white cell count and level of C-reactive protein were slightly increased in 13 patients (38.24%) and three patients (8.82%), respectively.

Lumbar puncture was carried out in 10 patients (29.41%). CSF cell count as well as levels of glucose, and proteins were normal. CSF cultures, herpes virus, mumps virus, and the Epstein–Barr antigen test in the CSF were negative.

3.5. Neuroimaging

Neuroimaging studies were accomplished in 28 patients (82.35%): cranial CT in 15 patients and MRI in 13 subjects. All CT results were normal. MRI results showed that two cases presented with an enlarged extracerebral space in the temporal lobe and one case presented with hypointense images in the T2WI in centrum semiovale.

3.6. Treatment of seizures

Anticonvulsants were administrated in 14 patients (41.18%) in the acute phase. Two patients were given anticonvulsants during the first seizure episode that exceeded 3 min (the case of status epilepticus included), and another 10 patients had cluster seizures that lasted for short periods (seventy percent of seizures (7/10) not exceed 3 min) only. Detailed information about the anticonvulsants given to two patients in other hospitals was not available. In all 14 cases, diazepam, phenobarbital, midazolam and chloral hydrate were given alone or in combination. No patient had to undergo long-term treatment with an anticonvulsant. The anticonvulsants used and their respective efficacy are summarized in Fig. 1.

3.7. EEG

Interictal electroencephalographic studies were accomplished in 32 patients. The EEG was normal in 18 patients (56.25%). Two types of abnormalities were recorded. That is, slow background activity ($n = 12$, 37.5%) and suspected sharp wave complexes with predominance in the occipital region ($n = 1$) and sharp wave discharge in the frontal parietal region ($n = 1$).