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Ictal Midline Epileptiform Discharges in Benign Familial Neonatal Convulsions

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Abstract：We herein present an ictal electroencephalogram recording of a patient with benign familial neonatal convulsions. The seizures started on day 4 of life, and the electroencephalogram recording was performed on day 5. An abrupt onset of background attenuation and ictal midline epileptiform discharges were recorded from a scalp electroencephalogram. These midline epileptiform discharges probably reflect the secondary propagation of a remote source of epileptogenic activity. These electro–clinical observations suggest that benign familial neonatal convulsions are classified under epilepsies and syndromes that have not been determined to be either focal or generalized.

Key words：**Neonatal seizure, Monogenic epilepsy, Ictal electroencephalogram, Midline spikes, Partial seizures**

Introduction

Benign familial neonatal convulsions have been recognized as a distinctive epileptic syndrome since 1964.[1)2)] Benign familial neonatal convulsions are monogenic epilepsy inherited via an autosomal dominant trait with high penetrance and characterized by clusters of generalized and partial seizures exclusively afflicting neonates, which tend to subside spontaneously. However, the incidence of subsequent epilepsy later in life is also high in individuals demonstrating benign familial neonatal convulsions.[3)]

This syndrome is classified as generalized epilepsy.[4)] We herein present an ictal electroencephalogram recording of a patient with benign familial neonatal convulsions at 5 days of life. The ictal midline epileptiform discharges were recorded from scalp electroencephalogram.

Case Reports

The patient was born at term after an uneventful pregnancy and delivery. The mother was 34 and the father was 33 years old at the time of birth. The Apgar score was 9 at one minute after birth. On day 2, he was admitted to our hospital for the treatment of hyperbilirubinemia. Phototherapy was performed and his serum bilirubin level became normal. From day 4, the baby had seizures with apnea, cyanosis and tonic motor activity of bilateral upper and lower extremities, with head rotation. Then after 10 to 15 seconds, he developed clonic convulsion of the right lower extremity, which sometimes became generalized. Complete blood count, serum electrolytes, blood glucose, calcium studies, lumbar puncture, and head computed tomography were all normal. The patient's paternal great–grand mother, paternal grand father, father, father's younger brother, and this younger brother's son all had convulsions

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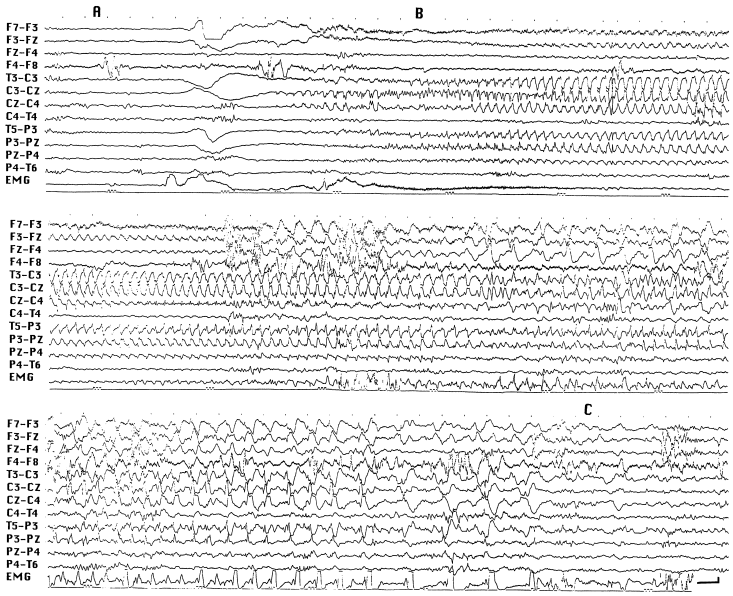

Fig. 1. Ictal electroencephalogram of the patient. (A) indicates the onset of the seizure with a tonic seizure of the bilateral upper and lower extremities. (B) indicates onset of clonic seizure of right lower extremity. (C) The seizures have stopped. The total duration of the seizure was about 85 seconds. An abrupt onset of background attenuation started with the tonic seizure. The electroencephalogram changes consisted of midline epileptiform discharges. The electroencephalogram changes preceded the onset of the clonic seizure.

during the neonatal period. There was no further family history available because the parents rejected any further inquiry.

The seizure occurred 15 times on day 4 and then continued over the following 6 days, although seizure frequency decreased to 11, 8, 3, 1, 2, 1 times, respectively. Diazepam injection and Vitamin B6 injection failed to stop the seizures. Phenobarbital was given rectally and orally until 11 days after birth, but the phenobarbital treatment was stopped by the parents' request. Three days after the seizures stopped the infant was discharged.

Discussion

Benign familial neonatal convulsions are a monogenic epilepsy characterized by a cluster of seizures occurring during neonatal life and inherited as an autosomal dominant trait with high penetrance. Previous linkage analyses mapped two gene loci for benign familial neonatal convulsions to human chromosomes 20q13.3 and 8q24,[5)–8)] thus indicating a genetically heterogeneous disorder. Accordingly, benign familial neonatal convulsions have been classified into two groups, benign familial neonatal convulsions 1 (MIM121200), which is linked to chromosome 20 and thought to be the major phenotype, and benign familial neonatal convulsions 2 (MIM121201), which is linked to chromosome 8. Recently, mutations of two KQT–like K^+ channel genes, KCNQ2 and KCNQ3, have been identified as underlying the abnormalities of benign familial neonatal convulsions 1 and benign familial neonatal convulsions 2, respectively.[9)–12)] Moreover, the presence of another phenotype has also been indicated recently.[13)]

Benign familial neonatal convulsions have an autosomal mode of transmission. Clonic seizures, focal or multifocal, were the most frequent type of seizure reported in seven studies. In 1989, the revised international classification of epilepsies and epileptic syndromes defined idiopathic generalized epilepsies as epilepsies,[4)] in which "all seizures are initially generalized, with an electroencephalogram expression that is a generalized, bilateral, synchronous, symmetric discharge". Benign familial neonatal convulsions are classified as idiopathic generalized epilepsies according to this international classification despite the fact that information on seizure types in benign familial neonatal convulsions remain extremely limited. Aso and Watanabe presented a 3–year–old girl with benign familial neonatal convulsions who had an ictal electroencephalogram performed at 3 months of

age[14]. They suggested that benign familial neonatal convulsions should be classified under "epilepsies and syndromes that have not yet been determined to be either focal or generalized." Hirsch and colleagues[15] described the results of an electroencephalographic-video study of 14 seizures in 3 children from two family of benign neonatal familial convulsions. Ictal electroencephalography explained electroencephalographic flattening, along generalized discharge of spikes and focal sharp waves. They suggest that the convulsion of benign neonatal familial convulsions are a form of generalized tonic-clonic seizure whose expression may be asymmetrical, probably because of the immaturity of the corpus callosum or other structures ensuring seizure synchronization. Bye reported a neonate with benign familial neonatal convulsions in whom generalized and focal seizures were recorded.[16]

Our patient was diagnosed to have benign familial neonatal convulsions cluster of seizures occurring during neonatal life, which were inherited as an autosomal dominant trait with high penetrance. The patient's electroencephalogram showed the characteristics of focal epilepsy. Our conclusion is that benign familial neonatal convulsions may be categorized as epilepsies and syndromes that have not yet been determined to be either focal or generalized. The international classification of epilepsy should thus be based on documentation of ictal recordings during neonatal seizures and syndromes however more data are needed in order to establish a more precise classification system.

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