

Case Report

Clustered Tonic Spasms Developed after Disappearance of Hypsarrythmia in West Syndrome

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SUMMARY

We report an infant case of West syndrome with clustered tonic spasms seen after the disappearance of hypsarrythmia. This time lag until the development of tonic spasms implies that their development is not directly related to hypsarrythmia. In other words, this clinical evidence suggests that the hypsarrythmia and tonic spasms did not directly originate from the same mechanism in West syndrome. In this report, we describe the patient's demonstrable neuro-radiological imaging with CT, MRI, ^{99m}Tc-ECD SPECT, and EEG changes over her clinical course before and after low-dose ACTH therapy for West syndrome. In addition, the mechanisms of hypsarrythmia and infantile spasms are discussed with a literature review.

Key Words : West syndrome, hypsarrythmia, ACTH, mechanism, single photon emission computed tomography

INTRODUCTION

We experienced a significant case with regard to consideration of the developmental mechanism of hypsarrythmia and tonic spasms with clustered formation in West syndrome. In this case report, we report an infant case of West syndrome with tonic spasms seen after the disappearance of hypsarrythmia. This time lag until the development of tonic spasms implies that their development is not directly related to hypsarrythmia. In other words, this clinical evidence suggests that hypsarrythmia and tonic spasms did not directly originate from the same mechanism in her West syndrome. Here, we report the clinical course of this case and discuss the mechanism of hypsarrythmia in West syndrome.

CASE REPORT

The patient was a female infant born by cesarean section at 38 weeks of gestation, with a 3,112 g body weight. No asphyxia was noted at delivery. Her mother had no infection during pregnancy. The patient had no sibling, and there was no consanguineous marriage. Family history showed no neurological or metabolic disorders. At 2 months after birth, her parents brought her to our hospital because she never cried and hardly moved or smiled. Neurological examination showed hypotonic muscle tonus. Brain magnetic resonance imaging (MRI) showed left subdural hematoma and atrophy of the cerebrum (Fig. 1). Even at 5 months, she had poor visual pursuit. Deep tendon reflexes were increased and the Babinski reflex was positive. A blood test showed normal results for lactic acid, pyruvic acid, amino acids, organic acids, and trace elements. Chromosome analysis showed a normal karyotype. Electroencephalography (EEG) recorded for a prolonged period while awake in the presence of parental care showed continuous typical hypsarrythmia (Fig. 2A).

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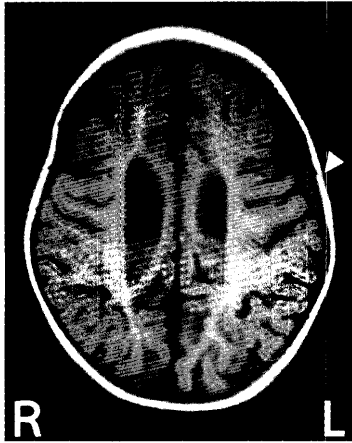


Fig. 1 Brain T1-weighted (spin echo : TR = 545.0, TE = 15.0) MRI of axial image features at 2 months of age disclosed mild brain atrophy predominantly in the frontal to temporal cortex area and demonstrated left subdural hematoma (arrows).

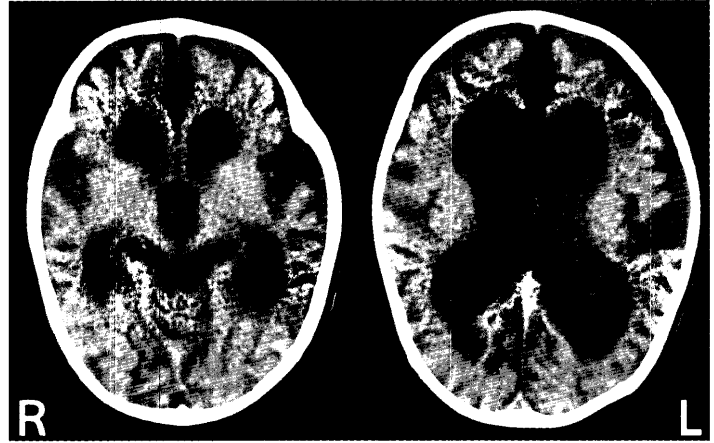


Fig. 3 At 6 months of age, brain CT showed severe brain atrophy and bilateral ventriculomegaly.

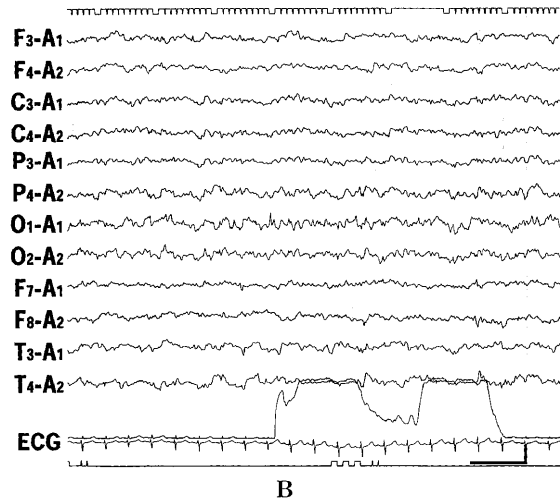
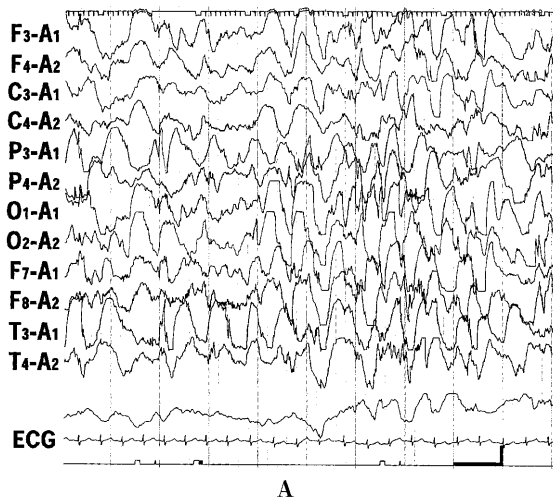


Fig. 2 **2A** : In the awake stage of EEG, typical and continuous-type of hypsarrhythmia was noted. But at that time, convulsion and cluster formation were not recognized. **2B** : After ACTH therapy, background activities of her EEG demonstrated that compressed and typical hypsarrhythmia had disappeared.

Although no tonic spasm was seen during the recording, we considered atypical West syndrome. Administrations of vitamin B6, nitrazepam, and zonisamide were started, but hypsarrhythmia did not disappear. Then, the patient was given a low dose of ACTH (0.01 mg/kg/day) therapy for 2 weeks. The disappearance of hypsarrhythmia on EEG was noted on day 12 of ACTH treatment, when symmetric tonic spasms developed with cluster formation (Fig. 2B). No hypsar-

hythmia recurred on EEG thereafter. We considered that ACTH treatment was effective based on the improvement of EEG. However, tonic spasms occurred for over a month. Brain computed tomography (CT) detected severe brain atrophy at 6 months of age (Fig. 3). ^{99m}Tc -ECD-single photon emission computed tomography (SPECT) on inter-ictal features detected decreased blood perfusion in the predominantly frontal to temporal region (Fig. 4).

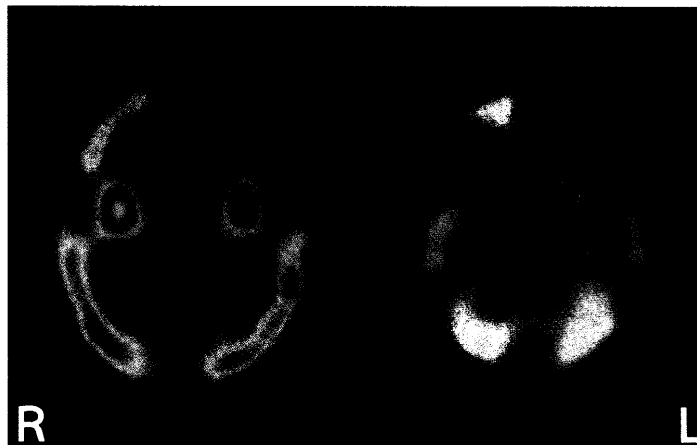


Fig. 4 ^{99m}Tc -ECD SPECT showed a decreased cerebral blood flow in the predominantly frontal to temporal region, coincident with the brain MRI in Fig. 3.

DISCUSSION

It was assumed that West syndrome developed during the prenatal period in this patient, but the cause was unknown. No clustered tonic spasm formation occurred during the period with hypsarrythmia before ACTH treatment. Since electromyography was not performed in this patient, the possibility of the occurrence of subtle infantile spasms cannot be ruled out, but infantile spasms were not confirmed on the EEG recorded for a prolonged period. Clustered tonic spasms developed later with the improvement of EEG findings during the ACTH treatment period. The patient never had tonic spasms and hypsarrythmia simultaneously. Hypsarrythmia disappeared at the moment of the development of tonic spasms. Chugani *et al.*^{1,2)} investigated the mechanism involved in West syndrome using positron emission tomography (PET), with a focus on epilepsy of the cerebral cortex. According to their study, 4 months or more after birth, cerebral cortex lesions comprised a nerve circuit with the brain stem. However, when epileptic discharge involved the entire cerebral cortex, hypsarrythmia was detected on EEG. They also indicated that simultaneous transmission of epileptic discharge to the corpus striatum and brain stem caused spasms. In the present patient, there was a time lag between the detection of hypsarrythmia on EEG and the clinical onset of spasms, supporting the mechanism proposed by Chugani *et al.*¹⁻³⁾. In addition, Chugani *et al.*⁴⁾ also sug-

gested, based on PET with 2-deoxy-2 [18F] fluoro-D-glucose (FDG), that spasms are the result of secondary generation from cortical foci, and maturational factors result in the recruitment of basal ganglia and brain stem serotonin mechanisms that lead to secondary generalization and the unique semiology of the spasms in infantile spasms. Furthermore, Juhasz *et al.*³⁾ reported that Raphe-cortical projections could mediate the hypsarrythmic changes seen on EEG, and the prominent serotonergic raphe-striatal pathway and descending spinal pathways may be responsible for secondary generalization of the cortical discharges to result in the relatively symmetric spasms. The characteristic clinical course of our patient demonstrated that hypsarrythmia and clustered tonic spasms were divided due to different causes in this case of West syndrome. The clinical course of this case provides very important information when considering causal theories of West syndrome. Clarification of the developmental mechanisms of hypsarrythmia and infantile spasms in West syndrome based on this patient alone is difficult because it is only one case. Accumulation of similar cases may clarify the detailed mechanisms of hypsarrythmia and infantile spasms in West syndrome.

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