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Original Article

Demographics and Outcomes of Patients With Pediatric Febrile Convulsive Status Epilepticus

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ABSTRACT

BACKGROUND: Convulsive status epilepticus with fever is common and may be related to neurological sequela in children. However, there are limited data on the demographics and risk factors of this phenomenon. Thus, we aimed to describe the demographics and risk factors of neurological sequela among children with convulsive status epilepticus with fever. **METHODS:** We reviewed convulsive status epilepticus with fever cases in the pediatric intensive care unit at Kobe Children's Hospital between 2002 and 2013. We included patients with intrinsic neurological disease, and excluded those with obvious central nervous system infection. Cases of neurological worsening were categorized as poor outcome using the pediatric cerebral performance category scale. Possible risk factors for poor outcome included age, sex, neurological medical history, seizure duration, body temperature, and level of consciousness. **RESULTS:** A total of 253 patients (128 males), aged 1 month to 15 years (mean 45 ± 40 months), were enrolled. Three patients (1.2%) died during hospitalization, and 32 (12.6%) patients had a poor outcome. A univariate analysis identified male sex, absence of epilepsy history, body temperature above 40°C on admission, seizure duration longer than 120 minutes, impaired consciousness at 12 hours after onset, and presence of nonconvulsive seizure as potential predictors of poor outcome. A multivariate analysis, revealed that an absence of epilepsy history (odds ratio = 11.18), body temperature above 40°C on admission (odds ratio = 3.39), or impaired consciousness at 12 hours after onset (odds ratio = 41.85) was associated with poor outcome. **CONCLUSIONS:** Our study indicated that absence of epilepsy history, high temperature, and/or prolonged impaired consciousness were associated with brain injury.

Keywords: status epilepticus, febrile seizure, fever, consciousness, outcome, children, hyperthermia

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Introduction

Status epilepticus (SE), defined as continuous seizures for at least 30 minutes or repetitive seizures without full recovery of consciousness between episodes, is a major neurological emergency that is associated with significant morbidity and mortality.[1-4] The estimated incidence of convulsive SE (CSE) in children is reported to be 10-38 per 100,000/year and differs between races and countries.[1,5,6] It is obvious that causal factors are the main determinant of morbidity and mortality, with acute symptomatic causes such as hypoxia, head trauma, or meningitis all being associated with morbidity and mortality.[2] After excluding acute symptomatic causes, mortality accounts for only 0%-2% of children with CSE,[2] whereas morbidity accounts for 0%-13.6%; however, these percentages differ among reports.[2,7,8] The most common etiology of CSE is febrile SE in

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children, and Asian children are 13.5 times more likely to have an episode of prolonged febrile SE than Caucasian children.[6,9] Febrile CSE (FCSE) is known to be related with subsequent neurological conditions such as hemiconvulsion-hemiplegia-epilepsy syndrome,[10] acute encephalopathy with febrile convulsive SE,[11] febrile infection–related epilepsy syndrome,[12] and hippocampal abnormalities.[13,14] Although FCSE is common in children and causes morbidity to some extent, there are limited data regarding risk factors for prognosis (except for causal factors and seizure duration).[2,7,8] Moreover, there are few reports on the relationship between acute clinical symptoms, including impaired consciousness or fever, and outcome. This study was conducted to investigate the relationship between demographics or acute clinical findings and neurological morbidity among children with FCSE.

Methods

The study was approved by the ethics committee at Kobe Children's Hospital. We have created a database of patients aged 1 month to 15 years admitted to the pediatric intensive care unit at the tertiary referral hospital, Kobe Children's Hospital, because of convulsion or impaired consciousness with fever. Our cohort consisted of patients with intrinsic neurological disease and did not include traumatic injury or cardiopulmonary arrest. Of the original cohort, 317 events of FCSE were identified between October 2002 and December 2013. FCSE was defined as (1) a convulsive seizure or a sequence of intermittent seizures lasting 30 minutes or longer without fully regaining consciousness and (2) fever ($\geq$38.0°C) within 24 hours before and after seizure onset.[15,16] Individuals with incomplete data were excluded. To clarify the effect of seizure with fever itself, cases with obvious central nervous system infection such as encephalitis or meningitis (cerebrospinal fluid cell >8/μL) were excluded. When a patient had more than one FCSE episode, only the first episode was included for analysis. Consequently, 253 patients were the subjects of this study (Figure).

Clinical variables were collected for each patient including age, sex, medical history such as epilepsy or intellectual disability, body temperature at admission, seizure duration, prevalence of impaired consciousness at 6 and 12 hours of onset, prevalence of head computed tomography abnormality at admission, presence of nonconvulsive seizure, management within 24 hours of onset, including continuous electroencephalograph monitoring, intubation, anticonvulsive drugs, or targeted temperature management, final diagnosis, and outcome. The seizure onset was defined as the beginning of any neurological symptoms, including convulsion. Impaired consciousness was defined as a score of <15 on the Glasgow Coma Scale. Baseline computed tomography abnormalities were defined as chronic abnormal lesions, including congenital anomalies or periventricular leukomalacia. Acute computed tomography abnormalities were defined as lesions indicating brain edema such as effacement of a sulcus or loss of gray–white matter differentiation. Nonconvulsive seizure was identified by the existing criteria.[17] Regarding management, although we had a few incidents of patients with FCSE during the study period, the common regimen began with intravenous administration of benzodiazepine, followed by another intravenous treatment of antiepileptic drugs (AED). If a response to a few types of AED was lacking, continuous barbiturates were infused (intravenously) until convulsions stopped. Electroencephalograph monitoring was performed if the attending emergency physician or pediatric neurologist determined the patient had prolonged impaired consciousness. Because the objective of this study was to investigate the relationship between clinical symptoms or acute examination findings and outcome, we performed statistical analyses on all clinical variables and

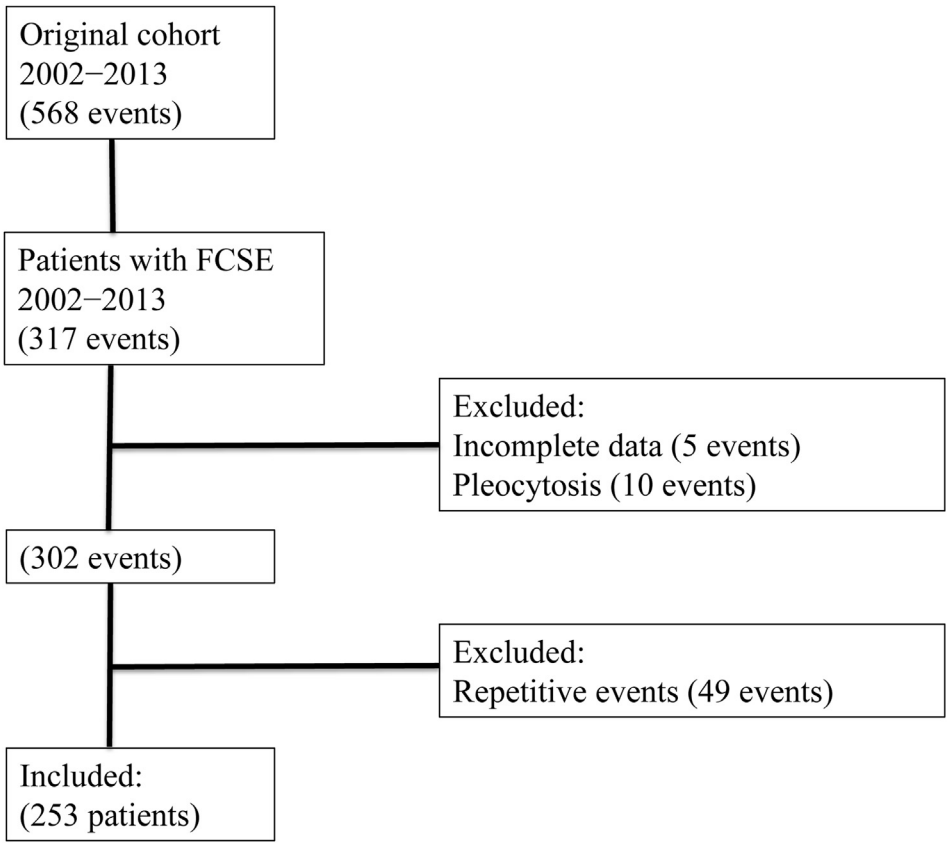

FIGURE.
Study population.