Journal of Health Science Research, *Vol 7(2), 2022, 12-15*
ISSN (Online) : 2456-2688
DOI: https://doi.org/10.7324/jhsr.2022.723

Evaluation of Clinical, EEG, and Lumbar Puncture Findings of Patients with Complicated Febrile Seizure

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Abstract

Introduction: Febrile seizure (convulsion) (FC) is a type of seizure which is accompanied by fever, without a history of neurological disease and central nervous system infection. It occurs in approximately 2–5% of children aged between 6 months and 5 years. Complex FC is a type of convulsion which is often accompanied by focal seizures, occurs again within 24 h, and/or lasts longer than 15 min. About 20–25% of patients experience complex FC. **Materials and Methods:** Our study included 45 patients who applied to Aydın State Hospital Pediatric Neurology Clinic between July 2018 and July 2020 and Mersin City Training and Research Hospital between October 2020 and October 2021 with complex febrile seizures. Demographic and laboratory findings of the patients were evaluated retrospectively. **Results:** Two hundred and seven patients with FC applied to our clinic. Forty-five (21.7%) of these patients had complex FC. Forty-five patients, who were diagnosed with complex FC, were included in the study. The mean age was 16.6 months. LP was performed in 29 (64.4%) patients, EEG was performed in 40 (88.9%) patients. Pleocytosis was detected in three (6.7%) patients, *Streptococcus pneumonia* was detected in CSF culture in one patient. H1N1 encephalitis was also observed in one of our patients. EEG was taken in all patients within the first 7 days. EEG abnormalities were detected in 5 (11.1%) patients. **Conclusion:** The presence of postictal neurologic findings was considered as the most important risk factor for CNS infections in our study. It was thought that the detection of epileptiform abnormality in the EEGs of the patients might be related to the shorter period after the seizure.

Keywords: Complex Febrile Seizure, Electroencephalography, Lumbar Puncture

1. Introduction

Febrile seizure (convulsion) (FC) is a type of seizure accompanied by fever, without a history of neurological disease and central nervous system infection[1]. It is a relatively common condition in the general pediatric population. It occurs in approximately 2–5% of children aged between 6 months and 5 years[2]. FCs are divided into three groups: (1) Simple FC, (2) complex FC, and (3) febrile status epilepticus. Simple FC is a generalized seizure that reoccurs once in 24 h and lasts <15 min. About 70–75% of patients experience simple FC. Complex FC is type of seizure that is accompanied by focal seizures which reoccur within 24 h and/or lasts longer than 15 min. About 20–25% of patients experience complex FC. Febrile status is a type of seizure in which the duration of the seizure exceeds 30 min[3]. A Category 4 has emerged recently that describes a subset of complex FC called febrile seizure plus (FS+). FS+ includes simple febrile seizures occurring more than once in 24 h and underlying immunological events are suspected[4]. Among the new definitions, there is also genetic epilepsy with febrile seizures plus subgroup

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How to cite this article: Aslan M, Kirik S. Evaluation of Clinical, EEG, and Lumbar Puncture Findings of Patients with Complicated Febrile Seizure. J Health Sci Res 2022;7(2):12-15.

(GEFS+) which has a genetic origin and febrile infection related epilepsy syndrome (FIRES) subgroup with possible immunological origin triggered by any infection[5,6].

Although lumbar puncture (LP) is not a routine method applied to every patient in FC, it is a method that we frequently apply. LP procedure can be applied if the presence of meningeal signs and symptoms and/or the history of the child increases the possibility of intracranial infection, Hemophilus influenzae Type b or *Streptococcus pneumoniae* vaccines have not been administered in a 6–12-month-old baby or the immunization status is unknown, and if meningitis findings are thought to be shadowed in patients who have recently received antibiotic therapy[3]. Although electroencephalography (EEG) is not a routine method used in FC, it can be used in some patient groups to determine the presence of epilepsy, to determine the severity of encephalopathy and central nervous system infection. It is frequently preferred in complex FC and it is recommended to be taken 14 days after the seizure[7].

2. Materials and Methods

Our study included 45 patients who applied to Aydın State Hospital Pediatric Neurology Clinic between July 2018 and July 2020 and Mersin City Training and Research Hospital between October 2020 and October 2021 with complex febrile seizures. Our study was carried out as a retrospective patient file scan. Patients with a previous diagnosis of epilepsy, regular use of antiepileptic agents or febrile seizure prophylaxis, followed up with neurometabolic and neurogenetic diagnoses, and patients with a history of trauma were excluded from the study. Patients presenting with complex FC were included in the study. Patients presenting with febrile status epilepticus and simple FC and patients diagnosed with metabolic disease as a result of investigations were not included in the study. Patients presenting with febrile status epilepticus were not included in the study.

3. Results

Two hundred and seven patients with FC were admitted to our clinic. Forty-five (21.7%) of these patients had complex FC. Forty-five patients diagnosed with complex FC were included in the study. The mean age of the patients was 16.6 months and the age range was between 6 and 58 months. Twenty-five (55.5%) of our patients were male and 20 (44.5%) were female. There was a family history of FC in 9 (20%) of 45 patients. Eight (17.7%) patients underwent cranial imaging. Cranial CT was performed in five patients and the results were normal. Cranial MRI was performed in five patients. LP was performed in 29 (64.4%) patients, EEG was performed in 40 (88.9%) patients. Among our patients, 10 (22.2%) patients had focal seizures, 15 (33.3%) patients had seizures longer than 15 min, and 25 (55.5%) patients had recurrent seizures within 24 h (Table 1).

If the CSF cell count was >5/mm^3, it was considered as pleocytosis. Pleocytosis was detected in three (6.7%) patients, *S. pneumonia* was detected in CSF culture in one

Table 1. Demographic and laboratory findings of the patients

Age	
Mean age (ay)	16.6
Age range (ay)	6–58
Gender	
Male (*n*/%)	25 (55.5)
Female (*n*/%)	20 (44.5)
Lumbar puncture	
Performed	29 (64.4)
Not performed	16 (35.6)
EEG	
Performed	40 (88.9)
Not performed	5 (11.1)
Cause of complex FC	
Focal seizure (n/%)	10 (22.2)
Seizure longer than 15 min (*n*/%)	15 (33.3)
Recurrent seizures within 24 h	25 (55.5)

patient. H1N1 encephalitis was also observed in one of our patients. Sign of encephalitis due to H1N1 infection was observed on cranial imaging in one patient (Figure 1). In all three patients, seizure recurrence within 24 h and recurrent seizures lasting longer than 15 min were present. Besides the patient, who was diagnosed with *S. pneumonia*, had meningeal irritation findings on repeated examinations and the patient who was diagnosed with H1N1 encephalitis had postictal neurological findings. Forty (88.9%) patients underwent EEG within the 1st month. EEG abnormalities were detected in 5 (11.1%) patients. Three of the five patients with EEG abnormalities were patients in whom pleocytosis was detected in the CSF. The other two patients were considered to have epilepsy and were followed up with antiepileptic therapy.

4. Discussion

FCs, which are the most common seizure type in childhood, are more common in boys than girls and the M/F ratio is 1.2–1.41. Tsuboi reported the M/F ratio as 1.42 in children with FC[8,9]. In our study, this ratio was detected as 1.25. Its high prevalence in male individuals has been associated with being more prone to infections[10]. Özaydın *et al.* followed up 1245 (89.8%) patients with simple FC and 140 patients (10.2%) with complex FC among a study group including 1385 patients[11]. Aygün *et al.* observed in their study group that the ratio of simple FC was 69% and complex FC was 31%[12]. While this ratio was 66/34% in the study of Yılmaz *et al.*, Şen *et al.* determined this ratio as 76.2/23.8% in their study[13,14]. In our study, 45 (21.7%) of 207 patients were followed up with complex FC. It is reported in the literature that the children with FC have a history of FC in their families and in their siblings with a ratio of 25–40% and 9–22%, respectively[15]. In our study, 20% of the patients had a family history. The fact that this rate was relatively low compared to the literature was attributed to the fact that we accepted the complex FC as our study sample.

According to Camfield *et al.*, FCs lead to 15% of childhood-onset epilepsy[16]. In our study, the diagnosis of epilepsy was considered in two patients and they were followed-up[4,5]. In the study of Biçer *et al.*, a pathology was observed in the EEG in 53.8% of patients with complex FC, and in 37.4% of patients with simple FC[17]. In a study of Akbaş *et al.*, EEG abnormality was observed in 24% of the patients. Focal epileptic discharges were observed in all patients with abnormal EEG. No generalized or multifocal discharge was observed[18]. In our study, EEG abnormalities were observed in 5 (12.5%) of 40 patients whose EEG was performed.

Application of LP procedure is controversial. Although the association of fever and convulsion in meningitis is <5%; LP should be performed in patients with focal seizures, raised fontanel, rash (petechiae, purpura), hypotension, cyanosis, and abnormal neurological

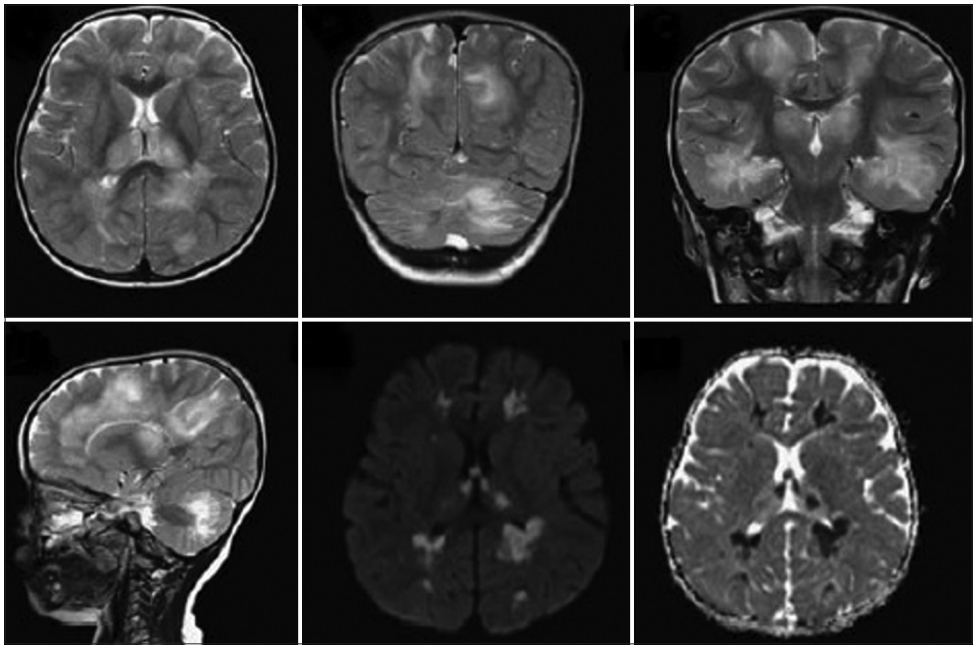

Figure 1. Hyperintense areas on MRI of the patient diagnosed with H1N1 encephalitis.

findings. LP should be performed especially in babies younger than 12 months of age, presenting with fever and convulsions, since clinical signs of meningitis will not be evident, and it should not be routinely performed in children older than 18 months[19,20]. In our study, LP was performed in 29 (64.4%) patients, and pleocytosis was detected in 3 (6.7%) patients. *S. pneumonia* was detected in CSF culture in one patient, and H1N1 encephalitis was observed in one patient.

5. Conclusion

The presence of postictal neurologic findings in our study were considered to be the most important risk factor for CNS infections. It was thought that the detection of epileptiform abnormality in the EEGs of the patients might be related to the shorter period after the seizure.

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