

# PEDIATRIC NEUROLOGY BRIEFS

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### FEBRILE SEIZURES

#### HIPPOCAMPAL SCLEROSIS AND FEBRILE STATUS EPILEPTICUS

The FEBSTAT study team of investigators determined whether febrile status epilepticus (FSE) produces acute hippocampal injury that evolves to hippocampal sclerosis. FSE was defined as a febrile seizure (FS) lasting 30 minutes or longer or repetitive FSs, lasting at least 30 minutes without regaining alertness. Acute MRI performed after FSE in 226 children aged 1 month to 6 years showed hippocampal T2 hyperintensity in 22 (10%) children, maximum in Sommer's sector, and in association with increased hippocampal volume. Follow-up MRI obtained ~1 year later on 14 of the 22 with acute hyperintensity showed hippocampal sclerosis (HS) in 10 and reduced hippocampal volume in 12. In contrast, follow-up of 116 children without acute hyperintensity showed abnormal T2 signal in only 1 (after another episode of FSE). Compared to controls with simple FS, FSE subjects with normal acute MRI had abnormally low right to left hippocampal volume ratios, small hippocampi initially, and reduced hippocampal growth. Impaired growth of normal-appearing hippocampi suggests subtle injury after FSE, even in the absence of T2 hyperintensity. The relationship of these findings to temporal lobe epilepsy requires longer follow-up. (Lewis DV, Shinnar S, Hesdorffer DC, et al. Hippocampal sclerosis after febrile status epilepticus: The FEBSTAT study. *Ann Neurol* 2014 Feb;75(2):178-85).

COMMENTARY. The combined MRI findings of increased hippocampal signal and atrophy are considered reliable indicators of HS [1]. In 1964, Falconer MA,

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neurosurgeon, and associates at Maudsley Hospital, London, UK, recorded the pathological findings in 100 consecutive surgical patients with temporal lobe epilepsy and found a possible association between mesial temporal sclerosis and febrile convulsions in childhood [2]. Sixty years later we are still uncertain of the exact relationship between temporal lobe epilepsy and febrile seizures. Multiple epileptogenic factors may be involved, including HHV6/HHV7 viremia, developmental delay, and pre-existing congenital abnormalities. It is difficult to determine whether HS predates or is the consequence of febrile seizure. As concluded in an invited commentary (Can febrile status cause HS?), the chicken or egg controversy remains unsettled [3]. Of the 9 patients (4% of 226) who developed changes suggestive of HS, 5 had other MRI abnormalities. Longer follow-up should determine the outcome and occurrence of TLE in this cohort.

#### References.

1. Jackson GD, et al. *Neurology*. 1990 Dec;40(12):1869-75.
2. Falconer MA, et al. *Arch Neurol*. 1964 Mar;10(3):233-48.
3. French JA, Kuzniecky R. *Ann Neurol*. 2014 Feb;75(2):173-4.

## EMERGENCY TREATMENT OF FEBRILE STATUS EPILEPTICUS

The FEBSTAT study investigators reviewed the charts of 199 patients with FSE, age 1 month to 6 years, recruited from multiple centers from 2002 to 2010. More than one AED was required to terminate FSE in 140 patients (70%). Median time from seizure onset to first AED administered by emergency medical services (EMS) or emergency department (ED) was 30 min. Mean seizure duration was 81 min for subjects who received AED prior to arrival at ED and 95 min for those who did not ( $p=0.1$ ). Median time from the first dose of AED to the end of seizure was 38 min. Initial dose of lorazepam or diazepam was suboptimal in 32 (19%) of 166 patients. Respiratory support was required by 95 subjects (48%). Median seizure duration in the respiratory support group was 83 min whereas for the nonrespiratory support group, seizure duration was 58 min ( $p<0.001$ ). Reducing the time from seizure onset to AED initiation was significantly related to shorter seizure duration. A standard prehospital treatment protocol is recommended with education of EMS responders. (Seinfeld S, Shinnar S, Sun S, et al. Emergency management of febrile status epilepticus: Results of the FEBSTAT study. *Epilepsia* 2014 Mar;55(3):388-95).

COMMENTARY. EMS care of children participating in FEBSTAT studies varied considerably, some being allowed to administer treatment only when ordered by an ED physician. Delay in AED administration may lead to prolonged FSE and an associated increased risk of respiratory distress. Early treatment of seizures with benzodiazepines does not increase the need for prehospital or ED intubation and respiratory support [1] but rather, results in shorter total seizure duration [2].

#### References.

1. Alldredge BK, et al. *Pediatr Neurol*. 1995 Apr;12(3):213-6.
2. Seinfeld S, et al. *Epilepsia*. 2014 Mar;55(3):388-95.