FEBRILE SEIZURES

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DEFINITIONS

- **Febrile Seizure** is defined by The International League Against Epilepsy (ILAE) as a seizure occurring in association with a febrile illness
- in the absence of a CNS infection
- or acute electrolyte imbalance
- in children older than 1 month of age
- without prior afebrile seizures

- **Simple FS**, the **most common** type, are characterized by seizures that are **generalized**, last less than **10 minutes**, and do not recur during the febrile illness .

- **Complex FS** are characterized by episodes that have a **focal onset**, last **longer than 10 minutes**, or occur **more than once** during the febrile illness.

Transient hemiparesis following a febrile seizure (Todd's paresis), usually of complex or focal type, is rare, occurring in 0.4 to 2 percent of cases

- **Febrile status epilepticus** : In up to one-third of cases of FSE, the actual seizure duration is underestimated in the emergency department.
- Important clinical clues that a seizure has ended include the presence of closed eyes and a deep breath. Children with persistently open and deviated eyes may still be seizing, even if convulsive motor activity has stopped.

- In the FEBSTAT cohort, the median peak temperature was 39.4ºC, most patients had a defined viral or bacterial illness, and there was a higher-than-expected family history of epilepsy.
- In another series, patients with FSE were more likely to have a family history of epilepsy ; they also had a higher prevalence of baseline neurologic disease and a personal history of epilepsy.

EPIDEMIOLOGY

- the most common form of childhood neurologic disease and seizures.
- The peak incidence is at the age of approximately 18 months.
- in 2% to 4% of all children in US and Western Europe , Japanese %7 and the Pacific Mariana Islands %14.
- 90% of seizures occur within the first 3 years of life
- 4% before 6 months, and
- 6% after age 3 years.

- 21% of the children experienced their seizure either **before or within 1 hour of the onset of the fever**,
- 57% had a seizure after **1 to 24 hours of fever**,
- and 22% experienced their febrile seizure **more than 24 hours after the onset of the fever.**

- **Risk Factors:**
  - family history of febrile seizures
  - a neonatal nursery stay of more than 30 days;
  - developmental delay
  - attendance at day care
- Children with two of these factors had a 28% chance of experiencing. Gastroenteritis as the underlying illness had a significant inverse (i.e., protective) association with febrile seizures.

- High fever
- Viral infection
- Immunization
- Genetic susceptibility
- Others - Prenatal exposure to nicotine, Iron insufficiency , Allergies and immune reactions

INITIAL EVALUATION

- The AAP has guidelines for evaluation of a first simple febrile seizure, and states that clinicians should work to identify the source of the fever when a child presents within 12 hours of a simple febrile seizure.

- **Lab TESTS**

- In the absence of suspicious findings in the history (e.g., vomiting, diarrhea) or on P/E, routine blood cell counts and determination of electrolyte, Ca, P, Mg, or BS are of limited value in the evaluation of a child older than 6 months with a febrile seizure.

- **Lumbar Puncture**

- The most common issue in the emergency department is whether a lumbar puncture is necessary to exclude CNS infection, particularly meningitis or encephalitis.

- In all of the reported series, however, a majority of the children with meningitis had identifiable risk factors.

- The low yield of LP in simple febrile seizure
- Strongly considered in the infant younger than 12 months of age.
- prolonged febrile seizure
- persistent lethargy
- already received prior antibiotic therapy
- In the child older than 5 years of age who presents with a apparent first febrile seizure
- febrile status epilepticus (not included in the AAP guidelines)

- **Neuroimaging**

- Skull radiographs are of no value

- CT scans also are of limited benefit

- MRI scans are not indicated in simple FS but are important in children with seizures with or without fever that have a focal signature

[Urgent neuroimaging (CT with contrast or MRI) should be done in children with abnormally large heads, a persistently abnormal N/E, particularly with focal features, or signs and symptoms of increased ICP- UTD]

- **EEG**

- EEGs are of limited value
- EEGs are more likely to be abnormal in the older child, family history of febrile seizures, complex febrile seizure, preexisting neurodevelopmental abnormalities
- Although EEG abnormalities may be present in these children, their clinical significance is unclear.
- There is no evidence at this time that an EEG will predict either recurrence of febrile seizures or the development of subsequent epilepsy.
- EEGs are indicated in the diagnostic evaluation of status epilepticus of all types, including febrile.

Genetic epilepsies with febrile seizures

- Genetic influences clearly play a major role in febrile seizures
- At this time, no one gene or locus has been found for febrile seizures
- generalized epilepsy with febrile seizures plus (**GEFS+**)
- Severe myoclonic epilepsy of infancy (**Dravet syndrome**)

PATHOPHYSIOLOGY

- remains unclear
- An age-specific increased susceptibility to seizures induced by fever is likely
- HSV-6 and 7 infections have had a high reported rate of association with febrile seizures.
- Prolonged febrile seizures (>20 minutes), are associated with long-lasting changes in h-channels. The h-channel is known as the pacemaker channel, which can be either “excitatory”or “inhibitory”. These changes are associated with increased susceptibility to seizures.

TABLE 65-1 Risk Factors for Recurrent Febrile Seizures and for Epilepsy after a Febrile Seizure

Recurrent Febrile Seizures	Epilepsy
Definite risk factor	
Family history of febrile seizures	Neurodevelopmental abnormality
Age less than 18 months	Complex febrile seizure
Height of peak temperature	Family history of epilepsy
Duration of fever	Duration of fever
Possible risk factor	
Family history of epilepsy	More than 1 complex feature
Not a risk factor	
Neurodevelopmental abnormality	Family history of febrile seizures
Complex febrile seizure	Age at first febrile seizure
More than 1 complex feature	Height of peak temperature
Gender	Gender
Ethnicity	Ethnicity

(Data from [1,2,6,7,9,10,12,14,17,18,63,65–67,68].)

TREATMENT

- **Prehospital and hospital treatment**

- antipyretic agents do not reduce the risk of a febrile seizure or a seizure recurrence

- prolonged episodes should be treated similar to seizures of any other etiology.

- All seizures, regardless of etiology, should be treated after 5 minutes.

- **IV diazepam or lorazepam, IM or buccal Midazolam, Rectal Diazepam,**

- If the seizure activity continues after an adequate dose of a benzodiazepine, then a *full status epilepticus treatment protocol* should be used
- In a prospective study of children presenting to the emergency department with prolonged febrile seizure (>15 minutes), 11 % of those receiving **rectal diazepam** in the ambulance responded, compared with 58 % of patients treated with intravenous diazepam

- Candidates for **home treatment** include children at high risk for **prolonged or multiple febrile seizures and those who live far from medical care**
- It should be used with caution, however, and only with reliable caregivers who have been trained in its use.

- **DISCHARGE DISPOSITION**

- Most children with simple febrile seizures do not require hospital admission and can be discharged safely to home once they have returned to a normal baseline and parents have been educated about the risk of recurrent febrile seizures.

- Children with focal or prolonged seizures may require a more extended period of observation, they are at higher risk of having multiple seizures within the index illness

- Additional factors to consider when deciding whether to admit a child include the confidence with which outpatient follow-up can be arranged (for focal or prolonged seizures), comfort level of the parents, and severity of the underlying febrile illness (eg, hydration status, ability to take oral fluids).

Preventing a Febrile Seizure

- Intermittent Medications at Time of Fever

- **Antipyretic agents:** do not reduce the risk of febrile seizure or seizure recurrence (avoid creating undue anxiety and feelings of guilt in the parents.)
- **Diazepam**: given orally or rectally, at the time of onset of a febrile illness will reduce the probability of a febrile seizure. Although the effect is statistically significant, it is clinically modest.

- In one large randomized trial comparing placebo with oral diazepam (0.33 mg/kg every 8 hours with fever), seizure recurrence by 36 mo was noted in 22% of the diazepam , compared with 31% of the placebo treatment group.
- This modest reduction in seizure recurrence must be weighed against the side effects of sedating children every time they have a febrile illness.

- **Barbiturates:** Intermittent therapy with phenobarbital at the onset of fever is ineffective in reducing the risk of recurrent febrile seizures.

- **Daily antiseizure therapy**

- There is general consensus that risks of antiseizure drug treatment outweigh potential benefits for most patients.
- While treatment with phenobarbital, valproate, or intermittent oral or rectal diazepam was associated with reduced risk of recurrent seizures in the short term (six months to two years), this was also associated with a risk of adverse effects in 30 to 40% of children.
- The use of chronic antiseizure drugs or the prevention of recurrent febrile seizures is not associated with a reduced risk of epilepsy.

- A clinical practice guideline developed by the A AP concludes that neither continuous nor intermittent anticonvulsive therapy is recommended for children with one or more simple febrile seizures.
- The guideline also recognizes that recurrent episodes of febrile seizures can create anxiety in some parents and their children and as such, appropriate educational and emotional support should be provided.

- This guideline does not address children with complex febrile seizures in whom the risk of future afebrile seizures is higher than in those with simple febrile seizures.
- In some children, a febrile seizure may represent the first presentation of epilepsy.
- Treatment decisions in such cases should be individualized. careful clinical history and review of EEG in cases of complex FS or FSE may reveal characteristics of an underlying epilepsy syndrome or risk factors for later development of TLE, such as acute focal slowing on EEG or subsequent MTS on MRI.

- The benefits of antiseizure drug therapy may outweigh risks in such cases, particularly if caregiver concern about recurrent seizures is high and the risks of antiseizure drug therapy are carefully considered.

PROGNOSIS

- The prognosis for children with febrile seizures is favorable.
- The small excess in mortality among children with febrile seizures is restricted to those with complex febrile seizures (preexisting neurologic abnormalities and subsequent epilepsy)
- Cognitive abilities and school performance of children with febrile seizures were found to be similar to those of controls in three large studies

- **Subsequent epilepsy**
- In a normal child with a simple febrile seizure, the risk is approximately 1 to 2 percent, only slightly above that of the general population. For children with complex febrile seizures, an abnormal developmental history, or a family history of epilepsy, the risk is closer to 5 to 10 percent.

THE END