

**FEBRILE SEIZURES  
AND  
STATUS EPILEPTICUS**



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NO CONFLICTS



## OBJECTIVES



- To review Febrile Seizures
- To review latest treatment guidelines for Status Epilepticus
- Using a case-based approach



## CASE



- 4 year old female, previously healthy, developmentally normal
- August 1 – began having non-specific abdominal pain and emesis
- August 2 – became febrile, Rx Advil
- August 3 @ 8:30 am - ~5min episode staring and limp, followed by 2-3min of bilateral stiffness and jaw clenching, febrile 38.1
  - EMS called and brought to emergency department

## CASE



- August 3 @ 14:20 – 2<sup>nd</sup> episode in the emergency department
  - ✦ Again blank staring evolving into jaw clenching and then followed by generalized tonic clonic movements
  - ✦ Temperature 38.7
  - ✦ At 3 minutes – patient was given 5mg of diazepam which terminated the seizure
  - ✦ Vitals stable through episode
  
- Patient was then admitted

## CASE



- **Review of Systems**
  - Negative for URTI symptoms, rashes, or conjunctivitis
  - No neck stiffness, headache, visual changes, balance issues or focal deficits
  - No trauma
  - Some fatigue and decreased U/O
  - No recent travel, no sick contacts
- **Fully immunized, no allergies, no medications**
- **Pregnancy history unremarkable. Term, normal ultrasounds, protective serologies, no resuscitation, BW 3500g. Normal newborn screen.**

## CASE



- **Past Medical History**
  - Constipation
  - AOM at 2 1/2 years, Rx with abx
  - No previous episodes of seizure, hospitalization, or Sx
- **Developmentally on track**
- **Family History**
  - Remarkable for patient's father having febrile seizures in childhood
  - No epilepsy, syndromes, or developmental delay
  - No cardiac arrhythmia or sudden death

## CASE



- **Physical Exam**
  - Alert, oriented, and appropriate, GCS 15
  - Vital signs unremarkable – now afebrile (37.2)
  - Appropriately grown
  - Respiratory/CVS/Abdominal exam unremarkable aside from II/IV functional murmur
  - No rashes
- **Head & Neck**
  - Shotty LAD, neck supple – no meningeal signs
  - Bilateral erythema to TM, R > L
  - No papilledema
- **Neurologic**
  - Normal CN, 5+ Strength, normal tone and sensation, 2+ reflexes, co-ordination intact

## CASE



- Investigations

- ✦ CBC – slightly elevated WBC 16.7, Neut 11.01 with atypical lymphocytes on peripheral smear
- ✦ CRP 13
- ✦ Lytes, BUN, and Cr normal
- ✦ Glucose 5.0
- ✦ Blood Cultures eventually negative
- ✦ Urine Culture negative
- ✦ Lumbar puncture was not performed

## CASE



- Patient was observed for 24hours (August 4)
- Started on P.O. Amoxicillin
- No further events
- Improvement to overall symptoms
- Patient remained febrile
- Discharged home with f/u arranged for early the next week

## CASE



- Patient re-presented **August 7<sup>th</sup>**
  - Worsening PO intake, fever, and headache
  - Now very unsteady on her feet and refusing to walk
  - Increasingly irritable alternating with lethargy (GCS as low as 12 – points lost in Verbal category)
- Aside from above, exam remained relatively unchanged. Patient was afebrile.
  - Negative brudzinski and kernig signs
  - Somewhat difficult neurologic exam – **only noted abnormality is slightly decreased tone**
  - No rash indicative of HSV

## CASE



- Lumbar Puncture performed in ER
  - ✦ Nucleated cells: 145, Lymphocytes: 144, Neutrophils: 1, normal chemistry
- CT head August 7
  - ✦ No focal lesions or bleeds
- Started on Cefotaxime and Vancomycin

## CASE



- On admission – increasingly more irritable
- August 7<sup>th</sup> ~ **23:00 hour lasting ~1 hour**
  - Patient went into status epilepticus with tonic posturing
- Seizure Management:
  - Ativan x 3 doses
  - Dilantin load 20mg/kg
  - Phenobarbitol 20mg/kg
  - Paraldehyde 8mg
- Intubated secondary to decreased airway protection
  - Ketamine and Rocuronium as RSI medication
- Acyclovir added

## CASE



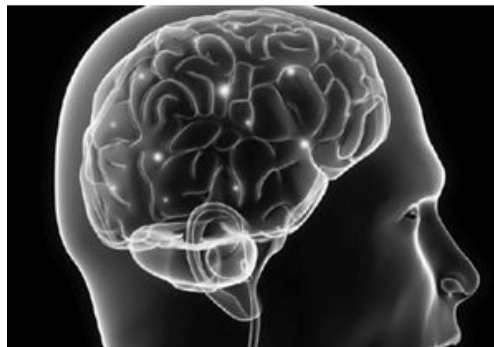
- EEG showed no subclinical seizures and diffuse slowing consistent with encephalopathy
- **MRI** – cerebral edema
- Eventual RESPLEX of CSF was PCR positive for EBV, along with +IgM EBV serologies

## CASE



- Initially on Midazolam infusion – weaned
- Dilantin and phenobarbital were eventually switched to maintenance Keppra
- Antibiotics and Acyclovir were discontinued
- Patient GCS recovered from a low of 8 to consistently 15
- General function improvement with some mild residual balance issues and occasional word finding difficulties

## DISCUSSION



## DISCUSSION



1. Investigations in Simple Febrile Seizures
2. Investigations in Complex Febrile Seizures
3. Time of observation post complex Febrile seizure
4. CT prior to LP
5. Treatment with Acyclovir in cases of suspected meningitis/encephalitis
6. Management of Status Epilepticus

## FEBRILE SEIZURES



**Definition:** Seizure accompanied by fever without CNS infection, occurring 6mo – 5y of age  
 Incidence 2-5% of general population  
 The most common convulsive event in children younger than 5 years

Simple	Complex
<ul style="list-style-type: none"> <li>• Generalized</li> <li>• &lt; 15min in duration</li> <li>• One event in 24 h</li> </ul>	<ul style="list-style-type: none"> <li>• Focal</li> <li>• &gt; 15 min duration</li> <li>• &gt; One event in 24 h</li> </ul>

## Investigations in simple febrile seizures



- **Hypothetical case:** 4 year old boy, previously healthy, positive family history of febrile seizures, presents with first seizure – 3 min, GTC, in context of fever and viral URTI
- Would you obtain:
  - Bloodwork?
  - EEG?
  - CSF?
  - Imaging?



## Investigations recommended after first **simple** febrile seizure



In the >18 month old child with no meningeal signs, not on antibiotics prior to presentation:

- No routine bloodwork
- No EEG
- No LP for CSF
- No neuroimaging

Practice parameter: The neurodiagnostic evaluation of the child with a first simple febrile seizure. American academy of pediatrics. Provisional committee on quality improvement, subcommittee on febrile seizures. Pediatrics. 1996;97:769-72; discussion 773-5.

## When is LP indicated in simple febrile seizures?

- **BCCH Febrile Seizures Guidelines recommends an LP:**

- Should be done if meningeal signs are present
- Should be done if the child was on antibiotics prior to the seizure
- Should be strongly considered if child < 12 mo
- Should be considered if child < 18 mo

## meningitis in a child presenting with febrile seizure?

- **Bacterial meningitis has been demonstrated in 1.8 – 5.4 % of children presenting with a febrile seizure**

Practice parameter: The neurodiagnostic evaluation of the child with a first simple febrile seizure. American academy of pediatrics. provisional committee on quality improvement, subcommittee on febrile seizures. Pediatrics. 1996;97:769-72; discussion 773-5.

## Are there cases where CSF is more likely to be abnormal?



1. suspicious findings on physical and/or neurologic examinations (particularly meningeal signs);
2. complex febrile seizures;
3. physician visits within 48 hours before the seizures;
4. seizures on arrival to emergency departments;
5. prolonged postictal states (typically most children with simple febrile seizures recover quickly);
6. initial seizures after 3 years of age.

## Investigations in **complex** febrile seizures



- Increased diagnostic uncertainty
- DDX:
  - Meningitis, encephalitis
- Most sources recommends admission to hospital (even if <15min in duration but stopped with pharmacologic agent)

Supplement – Italian League against epilepsy. Recommendations for the management of “febrile seizures: Ad hoc Task Force of LICE Guidelines Commission. Epilepsia 50 (Suppl 1) 2008

## Investigations for complex febrile seizures



- Blood tests – *Should be considered BLOOD SUGAR IF SEIZURE > 15MINS*

(Joint Working Group of the Research Unit of the Royal College of Physicians and the British Paediatric Association, 1991) (class of evidence I).

- EEG – *Recommended if focal sz >30mins, or encephalopathic*
- Imaging - *Highly recommended*
- Lumbar puncture – *Should be considered*  
Joint Working Group of the Research Unit of the Royal College of Physicians and the British Paediatric Association, 1991) (class of evidence I).

## How long should a child be observed after a complex febrile seizure?



- a) 6 hours
- b) 24 hours
- c) Until back to neurological baseline
- d) Until afebrile and back to neurological baseline

How long should a child be observed after  
a complex febrile seizure?



Our case:

- 24 hours no recurrent seizure
- Normal neurologic examination on discharge
- Ongoing fevers
- Commenced on antibiotic therapy for AOM → home, with follow up

CT prior to LP



Should all children undergoing LP for meningitis  
workup receive CT?

## Recommendation

- Routine CT before LP is not indicated

Level of evidence I  
(based on grading by Infectious Diseases Society of America)

*Review: Diagnostic lumbar puncture: minimizing complications. J Williams. Internal Medicine Journal 38 (2008) 587-591*

Evidence level	Based on
I (A- E)	> 1 RCT
II	> 1 Clinical Trial
III	Expert opinion

## Why?

- #1: Herniation can occur, despite normal CT scan result.
  - Study: In 14 cases (adults) where herniation occurred within 12 hours of LP, a CT was normal in 36% of cases

*Diagnostic Imaging Clinical Effectiveness fact sheet: Suspected meningitis – role of lumbar puncture and computed tomography. J de Campo and EV Villanueva. Australasian Radiology (2005) 49, 252–253*

## Why?



- #2: A normal neurological exam makes finding an abnormality on CT extremely unlikely (negative predictive value of 97%)

### Criteria:

- Not immunocompromised
- No recent seizure
- No decreased consciousness
- No focal neurological deficit

*Review: Diagnostic lumbar puncture: minimizing complications. J Williams. Internal Medicine Journal 38 (2008) 587-591*

## So, when is a CT indicated then?



### If the patient:

- has a history of central nervous system (CNS) disease
- is immunocompromised
- is unconscious
- has **focal neurological deficit**
- has papilledema

*Diagnostic Imaging Clinical Effectiveness fact sheet: Suspected meningitis – role of lumbar puncture and computed tomography. J de Campo and EV Villanueva. Australasian Radiology (2005) 49, 252–253*

## AAP POLICY STATEMENT on TREATMENT OF FEBRILE SEIZURES

- **Long term Rx with anticonvulsants not recommended:**

- excellent prognosis
- side effects of AEDs

- **Short term treatment**

**Diazepam**(0.3mg/kg tid po or pr -)–for recurrent seizures–for 48hrs at start of fever

**Clobazam**-intermittent with fever for 48hrs 0.3 – 1mg/kg max 10mg bid

**Midazolam** Buccal/Inasal (0.5mg/kg max 10mg)for Sz lasting>5mins

- **Antipyretics** not indicated

## RISK OF DEVELOPING EPILEPSY

- No long-term effects of simple febrile seizures have been identified.
- The risk of developing epilepsy in these patients is extremely low.
- Probability of NOT developing epilepsy: Simple FS 98%, complex FS 85-95%
- However, children who have had -multiple simple febrile seizures, - are younger than 12 months at the time of their first febrile seizure, - have a family history of epilepsy are at higher risk, with generalized afebrile seizures developing by 25 years

## The risk of recurrence varies with age



- < 12 months at the time of their first simple febrile seizure have an approximately 50% probability of having recurrent febrile seizures.
- >12 months at the time of their first event have an approximately 30% probability of a second febrile seizure
- Those who do have a second febrile seizure, 50% have a chance of having at least 1 additional recurrence

## KEY POINTS



- Fever and Seizure----Important to R/O Intracranial Infection
- Children with FS do as well academically as their sibs who do not have FS
- Risk of developing epilepsy is low for simple and complex Seizures
- Use of prophylactic long term AEDs not recommended
- EEG and Neuroimaging not recommended in simple FS
- Reassurance and counseling of caregivers of paramount importance

## Who should be treated with Acyclovir?



### **Recommendation:**

Empirical therapy with Acyclovir should be initiated in all patients with suspected encephalitis, pending results of diagnostic studies

- Encephalitis = Fever + Encephalopathy/ focal neurol  
Δ

*The Management of Encephalitis: Clinical Practice Guidelines by the Infectious Diseases Society of America. Clin Infect Dis. (2008) 47 (3): 303-327.*

## HSV Encephalitis



- Serious illness with significant risks of morbidity and mortality
- Early treatment improves mortality
- Occurs as 2 distinct entities:
  - In children older than 3 months and in adults, HSE is usually localized to the temporal and frontal lobes and is caused by HSV-1.
  - In neonates, brain involvement is generalized, and the usual cause is HSV-2, which is acquired at the time of delivery.
- Prognosis without treatment is poor

## HSV Encephalitis



- Investigations:
  - Temporal lobe slowing on EEG
- Clinical characteristics of HSV encephalitis:
  - History of rash of/or exposures to oral ulcers
  - Focal neurological deficit for example dysarthria, aphasia, dysphasia, hemiparesis, ataxia
  - Focal seizures
  - Decreased LOC
  - 90% of patients with HSV encephalitis will have fever plus one of the above
  - Temporal changes on MRI
  - PCR for HSV

## Management of Status Epilepticus



## Definition of Status Epilepticus:

- Seizure > 30 min or
- Recurrent seizures with no full recovery in between

## KEY POINTS

- Convulsive Status Epilepticus is a medical emergency requiring early treatment
- ABCs
- Seizures lasting > 5mins should be Rx as SE
- Benzodiazepines are the first line of pharmacological Rx
- Treatment with phenytoin should be initiated immediately following benzodiazepines

## KEY POINTS



- Initial Investigations directed to identify causes that require immediate Rx and metabolic derangements
- Management of refractory SE may be associated with cardiac and respiratory complications and consultation with PICU staff is recommended

## GUIDELINES



- <http://www.childhealthbc.ca/guidelines>

QUESTIONS?

