Clues for Discovering Causes of Status Epilepticus (Pediatric)

Directs & Trends in Epilepsy Management

6 August 2021

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Today's Talk

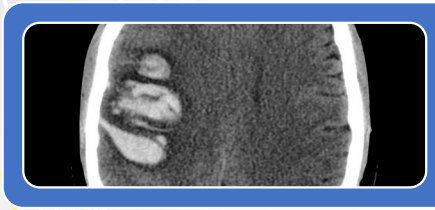
Cause

SE in children

Clues

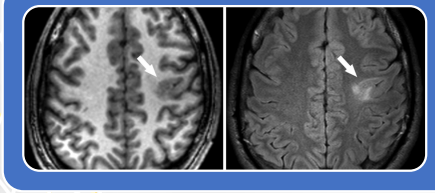
SE in children

Causes of Status Epilepticus



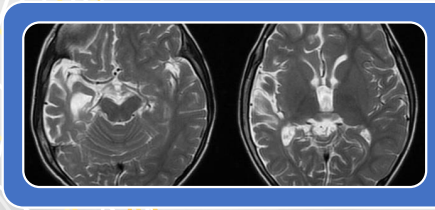
Acute Symptomatic

- HIE / Ischemic stroke / Hemorrhagic stroke / Cerebral sinovenous thrombosis / PRES
- CNS infection / Immune encephalitis / Febrile seizure



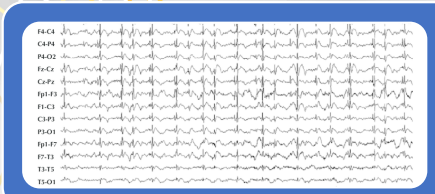
Remote Symptomatic

- FCD / CNS malformation / Genetic epilepsy / Chromosomal dis. / Metabolic epilepsy
- Previous brain tumor, encephalitis, stroke, HIE / Post-infectious hydrocephalus



Progressive Symptomatic

- Mitochondrial dis. / Rasmussen encephalitis / Inborn error of Metabolism (small mol., storage dis.)
- Neurodegenerative dis. (White matter / Grey matter)



Epilepsy Syndrome / Electroclinical syndrome

- Focal (idiopathic)
- Generalized (idiopathic)

Specchio et al. Pediatric SE. Epilepsia

Acute Symptomatic

- Previously neurologically normal child
- Within a week
  - CNS infection / inflammation
  - Cerebrovascular disease
  - HIE
  - Prolonged febrile seizures
  - Encephalopathy
  - Head trauma
  - Metabolic or toxic derangements

Gastaut, 1983; ILAE Commission on Epidemiology and Prognosis, 1993

Remote Symptomatic

- Absence of an identified acute insult
- History of a pre-existing CNS abnormality more than 1 week
  - FCD / CNS malformation
  - Genetic epilepsy / Metabolic epilepsy / Chromosomal dis.
  - Previous brain tumor, encephalitis, stroke, HIE
  - Post-infectious hydrocephalus

Gastaut, 1983; ILAE Commission on Epidemiology and Prognosis, 1993

Progressive Symptomatic

- SE in progressive neurologic disease
  - Mitochondrial disease
  - Rasmussen encephalitis
  - Inborn error of Metabolism (small molecule, storage disease)
  - Neurodegenerative disease (White matter / Grey matter)

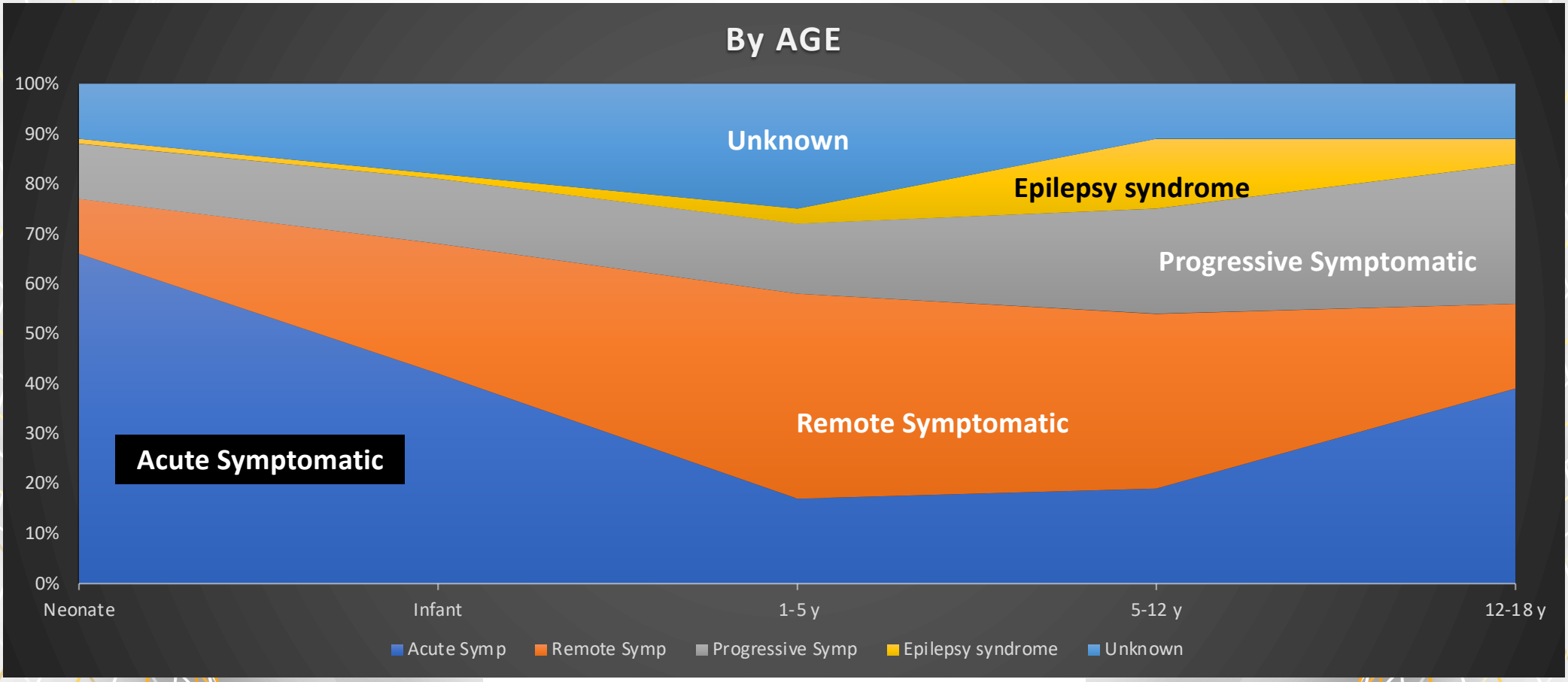
Epilepsy (Electroclinical) Syndrome

- Prior diagnosis of idiopathic (focal or generalized) epilepsy

  or

- When the episode of SE is the second unprovoked seizure that has led to a diagnosis of epilepsy syndrome

Causes of Status Epilepticus



Specchio et al. Pediatric SE. Epilepsia 2019;60:2486–2498.

Why is it important to know CAUSE of SE?

Status Epilepticus Treatment

Stop prolonged seizure ASAP

Before T2

Work up & Rx etiology

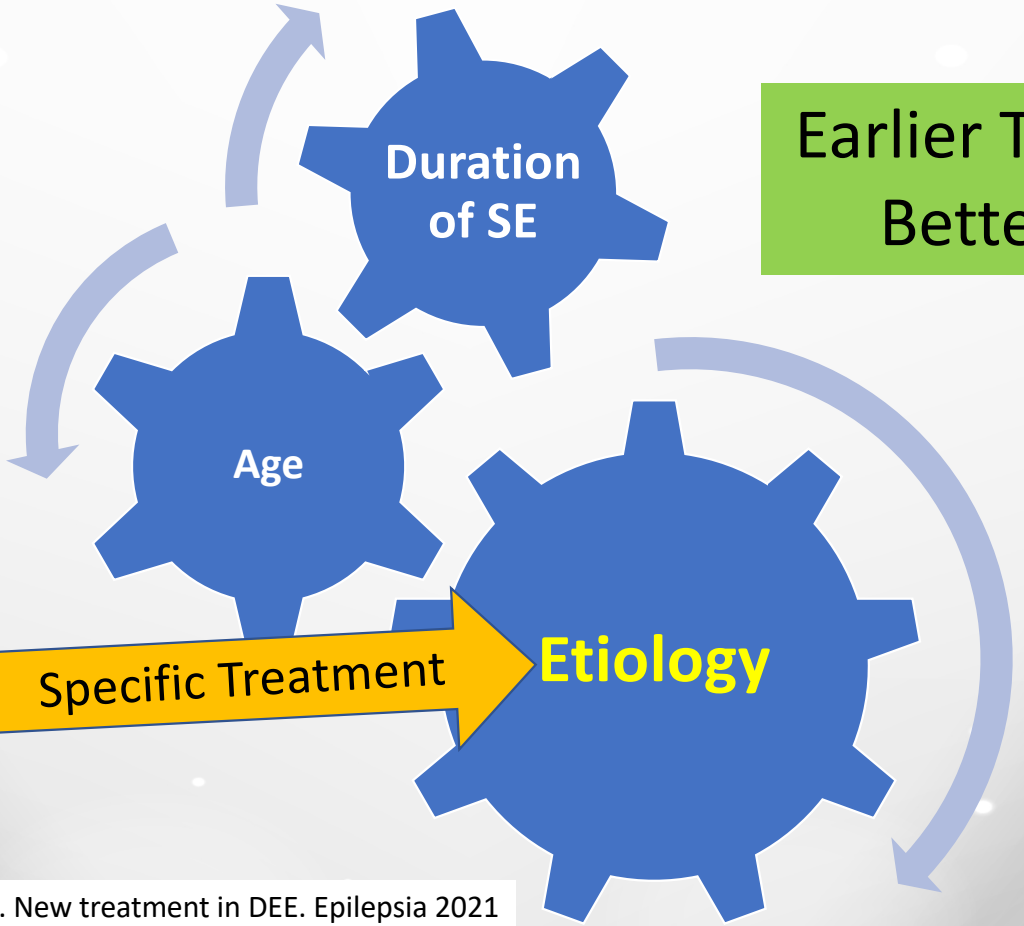
Better outcome

Prevent recurrent seizure

Maintenance dose

Monitor complication from SE!

Prognosis of pediatric SE



Earlier Terminating SE
Better Outcome

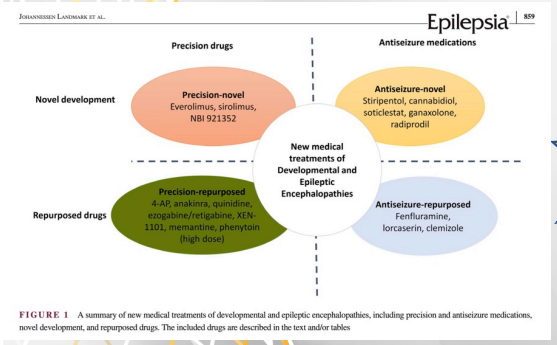


FIGURE 1 A summary of new medical treatments of developmental and epileptic encephalopathies, including precision and antiseizure medications, novel development, and repurposed drugs. The included drugs are described in the text and/or tables

Johannessen Landmark et al. New treatment in DEE. Epilepsia 2021

Specchio et al. Pediatric SE. Epilepsia 2019;60:2486–2498.

Poorer Cognitive and Neurological Outcome

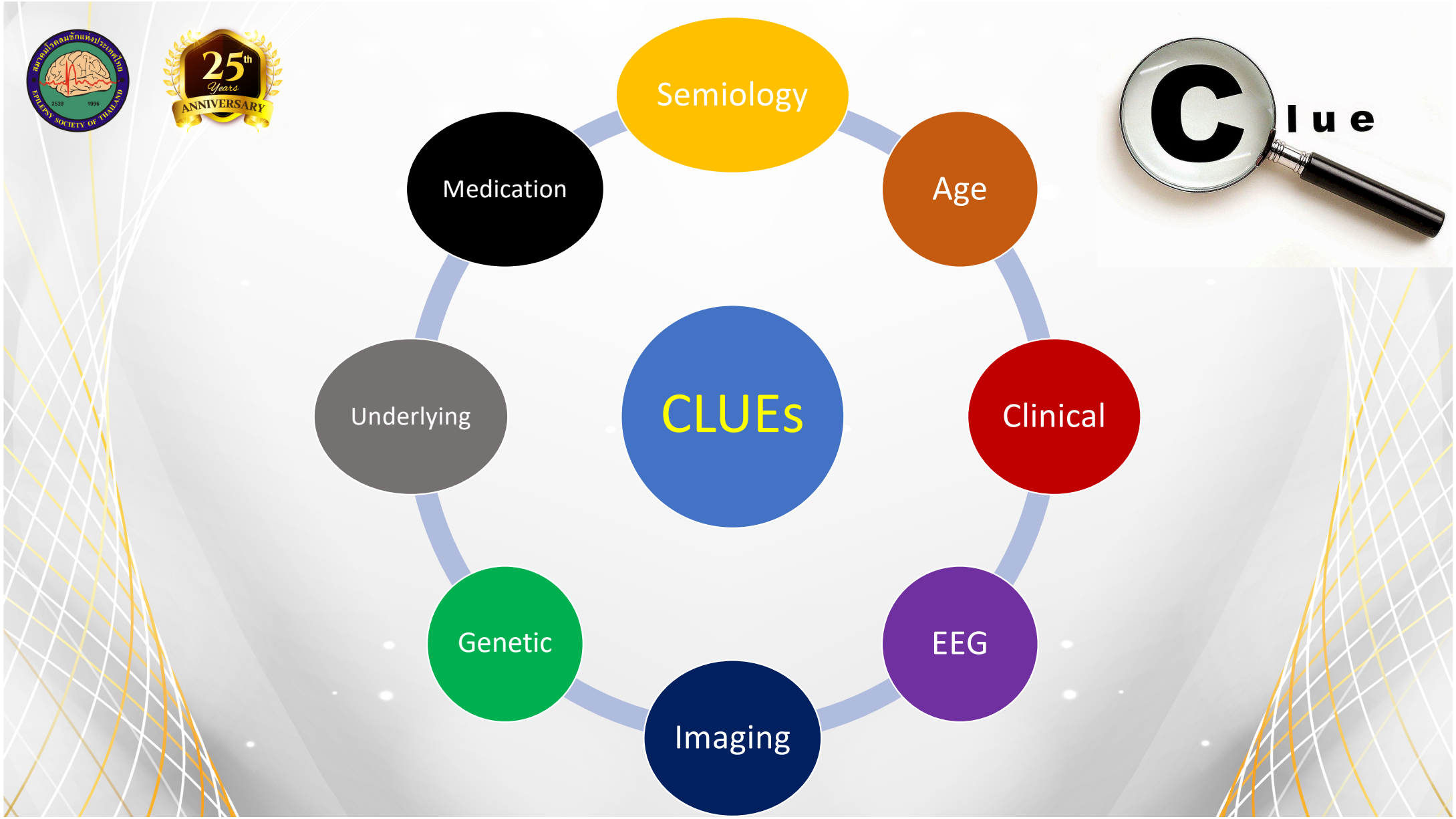
Neonatal onset

Longer duration of SE

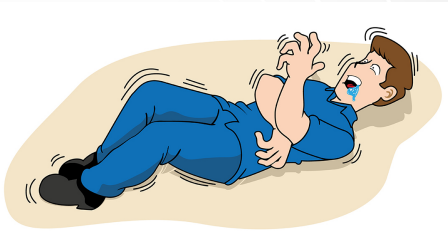
Acute symptomatic

Specchio et al. Pediatric SE. Epilepsia 2019;60:2486–2498.

What is the CLUEs to discover CAUSE of SE?


Semiology
Age
Clinical
EEG
Imaging
Genetic
Underlying
Medication
CLUEs
Clue

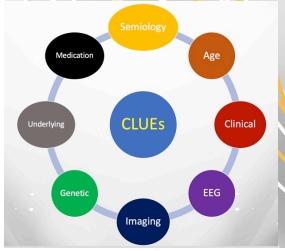
Semiology Clues



- Myoclonic SE → Progressive symptomatic (OR 6.14, 95% CI 2.09, 18.04)
  - ➢ Metabolic disorder

  Higher mortality rate and risk of recurrent SE
- Epilepsia partialis continua (EPC) → Hemispheric etiology

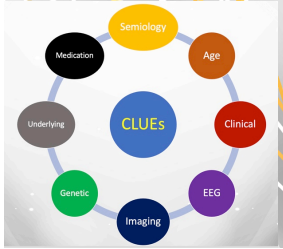
- Tonic CSE → Epilepsy (LGS)



Specchio et al. Pediatric SE. Epilepsia 2019;60:2486–2498
Arzimanoglou et al., 2004

Age Clues

- Preterm → IVH
- Term → HIE (first 24 hr), IEM (abnormal odor), genetic/metabolic epilepsy
- < 2 years → Febrile SE, Other acute symptomatic
- Adolescent → Immune-mediated encephalitis

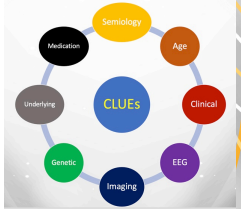


Neonatal

- Self-limited neonatal seizures (fifth day fit)
- Self-limited familial neonatal epilepsy (KCNQ2, KCNQ3)
- Ohtahara syndrome (more structural)
- Early myoclonic encephalopathy (more metabolic)

Infant

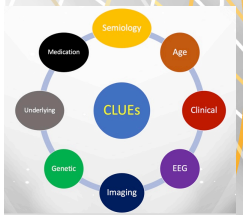
- Dravet syndrome
- GEFS+
- Epilepsy of infancy with migratory focal seizures



Clinical Clues (1)

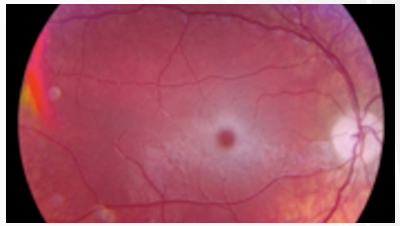
- History
  - ✓ Hypoxia / cardiac arrest → HIE
  - ✓ Fever → Febrile SE > CNS infection
  - ✓ Onset fever to Onset seizure < 24 hr → Febrile SE > FIRES (febrile infection-related epilepsy syndrome)

Sculier et al. Epilepsia 2021

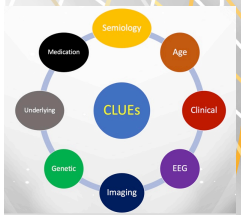


- ✓ Progressive weakness, cognitive decline → Progressive symptomatic

Clinical Clues (2)



- Examination
  - ✓ Orofacial dyskinesia + abnormal movement → Anti-NMDAR encephalitis
  - ✓ Neonate with hiccups → Non-ketotic hyperglycinemia (NKH)
  - ✓ Infant with rash / abnormal urinary odor → IEM
  - ✓ Microcephaly / Macrocephaly → Cerebral malformation / hydrocephalus
  - ✓ Skin (hypopigmented macules / port-wine stain) → TSC / SWS
  - ✓ Fundi (optic atrophy, RP, Cherry-red spot) → Progressive symptomatic



EEG Clues

- Extreme delta brush → Anti-NMDAR encephalitis (4.5% - 30%)
  more severe (malignant)

Yeshokumar et al. Seizure in AE, systematic review. Epilepsia 2021
Vogrig et al. Seizure specificities in autoimmune encephalitis. Epilepsia 2019

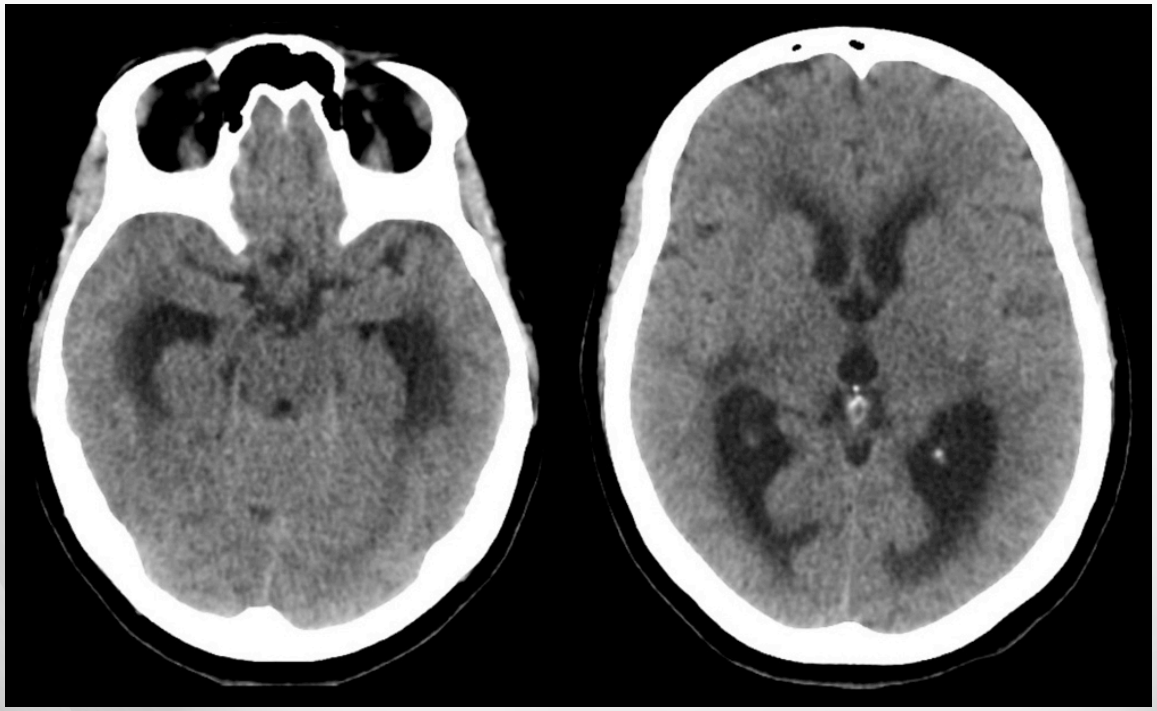
- PLEDs → Acute symptomatic (stroke, encephalitis – HSV)

- Repetitive spikes bifrontal followed by slow activities → Ring chr. 20

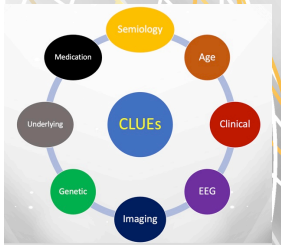
Peron et al. Ring chromosome 20. Front Neurol 2020

Imaging (CT) Clues

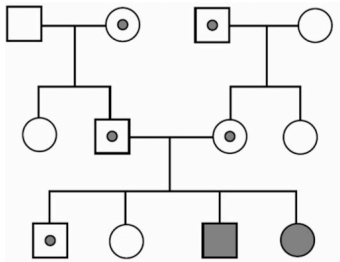
- Communicating hydrocepalus (early) → TB meningitis



https://radiopaedia.org/cases/tuberculous-meningitis-6

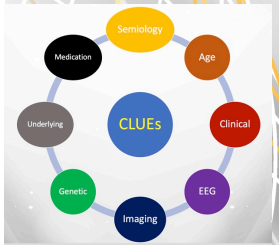


Genetic Clues



- Consanguinity → IEM / Neurodegenerative dis.
- Family history of FS, FS+ → Dravet syndrome with SE

Clues for sending appropriate Genetic / Metabolic testing



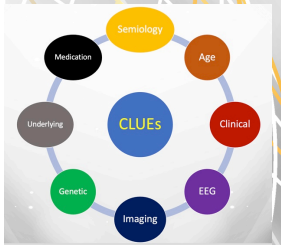
Underlying Clues

- Epilepsy → ASM discontinuing

  Epilepsy syndrome with SE is usually not refractory

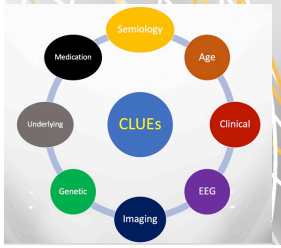
- SLE → PRES

- .....



Medication Clues

- Failed or Aggravated by IV Phenytoin → Dravet syndrome



Summary

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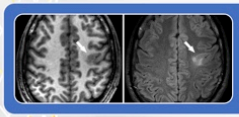

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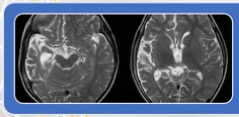

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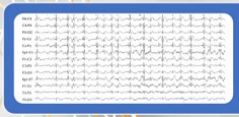

Epilepsy Syndrome

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- Generalized (idiopathic)