SEIZURE IN CHILDREN
DEFINITION

• Seizure
  – Sudden paroxysmal transitory disturbance in brain function which starts suddenly, stops spontaneously and shows a tendency to recur. Manifestations can include motor, sensory, psychic, (or) autonomic disturbances with (or) without alteration in sensorium.

• Convulsion
  – Seizure with predominant motor manifestation

• Epilepsy
  – two or more recurrent seizures occur at an interval greater than 24 hr. apart.
CONDITIONS THAT MIMIC SEIZURES

• Syncope & Breath holding spell
• Psychological disorders
• Sleep-related episodes
• Paroxysmal movement disorders
• Migraine and related disorders
• Neurologic disorders
• Movements disorders
OCULOLOGYRIC SPASM
STEPS IN DIAGNOSIS

• Accurate seizure description
• Perinatal history
• Developmental history
• Family history of seizures
• Etiology
• Signs of raised ICT
• Signs of neurodegenerative, metabolic or congenital disorders
CLASSIFICATION OF CHILDHOOD SEIZURES

- Generalized seizures
- Partial seizures
GENERALIZED SEIZURES

1. Convulsive
   Tonic – Clonic
   Tonic
   Clonic
   Myoclonic
   Atonic

2. Nonconvulsive
   Absence
   Atonic
PARTIAL SEIZURES

• Simple

• Complex

• Secondary generalized
ABSENCE (PREVIOUSLY CALLED PETIT MAL)

- With staring only
- Can be induced by hyperventilation
EEG - 3/Sec Spike & Wave
GENERALIZED TONIC - CLONIC SEIZURES (GRAND MAL)

These seizures have 3 phases:

1. **Tonic phase** — the person cries out and falls to the ground. Some seizures have only this phase.

2. **Clonic phase** — there is repeated jerking. Sometimes occurs without the tonic phase, but with a short postictal phase.

3. **Postictal phase** — the period right after a seizure, which can include fatigue and limpness.
TONIC PHASE

1. Flexion Phase
Muscles contract,
eye lids open, eyes up
arms elevate abduct, externally
rotated, elbow semi flexed.

2. Extension Phase
Back & neck, Tonic cry
Arms extend; Legs extend, adduct &Externally rotate.
GTCS - CLONIC PHASE

• 30 sec - 1 min
• Begins when muscular relaxation completely interrupts tonic contraction.
• Brief violent flexor spasm of whole body.
• Autonomic
  
  It is maximum in the end of tonic & stops during clonic phase. There is an increase in heart rate, increase in BP, increase Urinary Bladder Pressure, decrease sphincter tone -> Incontinence, flushing, salivation, piloerection, bronchial secretions & apnea.

• Post ictal - Immediate 1-5 min
  long 2-10 min
PARTIAL SEIZURES

• Partial seizures are those in which the seizure activity is restricted to discrete areas of the cerebral cortex and are usually associated with structural abnormalities of the brain.

• Manifestations can include motor, sensory, psychic, autonomic with aura.
SIMPLE PARTIAL SEIZURES

• Rarely lasts longer than a minute.
• Typically begins in hand, foot, or face.
• Aura of numbness, tingling, crawling feeling.
• Without alteration in sensorium -> SIMPLE.
COMPLEX PARTIAL SEIZURES

• Alteration in consciousness, associated with complex distortion of feeling and thinking and partially coordinated motor activity.
• May continue an activity that was initiated before seizure (striking hand on table).
• With alteration in sensorium = complex partial seizures.
• +/- Automatism.
RIGHT ADVERSIVE  CPS
PARTIAL
(ARISING FROM A FOCAL OR LOCAL CORTICAL LESION)

Types of Partial seizures evolving to secondary generalised seizures

• Simple partial evolving to secondary generalised
• Complex partial evolving to secondary generalised
• Simple partial evolving to complex partial evolving to secondary generalised.
INFANTILE SPASMS (WEST SYNDROME)

• Age at onset: < 1 yr (peak 4 – 10m)
• Seizure types: Spasms, Partial.
• Neurological exam: Regression; Mental deterioration:
• Investigations: EEG
• Skin examination; Metabolic screening; MRI; Genetic studies
• Treatment: Steroids, Vigabatrin, Nitrazepam
• Prognosis: Etiology dependent
TRIAD OF WEST SYNDROME

- Mental deterioration
- Intractable spasms
- Hypsarrhythmia
ETIOLOGY

• **Infections Of The CNS**
  
  — Acquired bacterial meningitis, TB meningitis, aseptic meningitis, encephalitis, cerebral malaria, tetanus, mumps, encephalopathy, measles encephalopathy and Reye’s syndrome.
  
  — Intrauterine infections

• **Metabolic Causes**
  
  — Dehydration, dyselectrolytemia, acidosis, alkalosis
  
  — Hypoglycemia, Hyperglycemia and inborn errors of metabolism
ETIOLOGY – CONT.

• Post Infectious (Or) Post Vaccinal Encephalopathy
• Space Occupying Lesions
  — Neoplasm of brain, Brain abscess, Tuberculoma, Cysticercosis.
• Vascular
  — Arteriovenous malformations, Intracranial Thrombosis (or)
  — Haemorrhage and Consumptive Coagulopathies.
• Genetic
  — Congenital Malformations, Migration defects,
• Trauma
ETIOLOGY – CONT.

• Miscellaneous Causes
  — Anoxic / Hypoxic Ischemic Encephalopathy stage, heat stroke, Hypertensive encephalopathy, grey matter degeneration, and storage disorders.

• Drugs And Poisons
  — Toxic doses of Phenothiazine, Salicylate, Diphenylhydantoin, Strychnine
LOOK FOR NEURO CUTANEOUS MARKERS

Ash leaf macule

Adenoma sebaceum of tuberous sclerosis
**LAB:**
- CBC, electrolyte, Sr.Ca, Sr.Mg, sugar, LFT, RFT, urine routine, toxicology screen

**Metabolic / Infection**

**Negative Metabolic screen**

**LP, CSF examination and C/S, Endocrine studies CT/ MRI if Focal neurological signs**

**MRI, EEG**

**?focal neurological history, lab, neurological exam**

**Mass, CVA, Infection, degenerative, Trauma**

**Idiopathic**

**NO**

**Yes**
PREVIOUS HISTORY OF SEIZURE / EPILEPSY

• **Assess**
  – Adequacy of AED
  – Side Effects
  – Serum levels

• **Consider**
  – Electrolytes
  – CBC
  – LFT
  – Toxicology screen
CHOICE OF FIRST DRUG

• **Partial seizures**
  – Carbamazepine (Drug of choice)
  – sodium valproate, and
  – phenytoin
  – all are equally effective

• **Generalised seizures**
  – Sodium valproate is effective for all generalised seizure types.
  – Ethosuximide or Sodium valproate is recommended for absence seizures.
## DOSAGE REGIMEN

<table>
<thead>
<tr>
<th>DRUG</th>
<th>DOSE (mg/kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenobarbitone</td>
<td>3-5</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>5 – 8(10)</td>
</tr>
<tr>
<td>CBZ</td>
<td>10 – 20</td>
</tr>
<tr>
<td>Ethosuximide</td>
<td>20 – 30</td>
</tr>
<tr>
<td>Valproate</td>
<td>30 - 50</td>
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</table>
TOXICITY

<table>
<thead>
<tr>
<th>Drug</th>
<th>System</th>
<th>Effect</th>
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</thead>
<tbody>
<tr>
<td>Phenobarbitone</td>
<td>CNS</td>
<td>Hyperactivity</td>
</tr>
<tr>
<td>PHENYTOIN</td>
<td>CNS</td>
<td>Ataxia</td>
</tr>
<tr>
<td>CBZ</td>
<td>Blood</td>
<td>Agranulocytosis</td>
</tr>
<tr>
<td>VALP</td>
<td>GIT</td>
<td>Hepatic</td>
</tr>
<tr>
<td>BDZ</td>
<td>RS</td>
<td>Arrest</td>
</tr>
<tr>
<td>Topiramate</td>
<td>RENAL</td>
<td>Renal stone</td>
</tr>
<tr>
<td>CBZ</td>
<td>Skin</td>
<td>Steven Johnson syndrome</td>
</tr>
</tbody>
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STOPPAGE OF AED

• Seizure freedom for $\geq 2$ years.

• Gradually taper in 2-3 months and then stop.
RECENTLY DEVELOPED AEDS

1. Gabapentin
2. Lamotrigine
3. Topiramate
4. Clobazam
5. Felbamate
6. Vigabatrin
7. Tiagabin
8. Pregabalin
9. Oxcarbazepine
10. Levetiracetam
11. Zonisamide
THERAPEUTIC OPTIONS- WHEN DRUGS FAIL

1. New AEDs
2. Surgery
   1. MTL {medial temporal lobectomy}
   2. Resection
   3. Hemispherectomy
   4. Multiple subpial resection
   5. Commissurotomy, Corpus Callosotomy
3. Vagus Nerve Stimulation
5. Relaxation Training
6. No Drugs!
MANAGEMENT OF NEONATAL SEIZURE

Step 1. Stabilize the vital functions

Step 2. Correct transient metabolic disturbance
   - Hypoglycemia, Hypocalcemia & Hypomagnesemia.

Step 3. Phenobarbitone 20 mg/kg iv load, 5mg/kg iv (may repeat to total dose of 40mg/kg), consider EEG monitoring, ventilation

Step 4. Lorazepam 0.05mg/kg iv (may repeat to total dose of 0.1mg/kg),
ACUTE MANAGEMENT OF NEONATAL SEIZURE CONT.

Step 5. Phenytoin bolus dose- 20mg/kg slow iv ,
5mg/kg iv (may repeat to total dose of 30mg/kg),

Step 6. Pyridoxine 50-100mg/kg

Step 7. Midazolam 0.06-0.4mg/kg/hr. given as infusion
STATUS EPILEPTICUS

More than 30 minutes of continuous seizure activity
Or
Two or more sequential seizures spanning this period without full recovery between seizures

Operational Definition for Children over 5 years and adults:
– Any seizure lasting more than 5 minutes or two or more discrete seizures between which there is incomplete recovery of consciousness. (Epilepsia 1999; 40: 120-124.)
<table>
<thead>
<tr>
<th>Time post onset</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>Ensure adequate ventilation/O&lt;sub&gt;2&lt;/sub&gt;</td>
</tr>
<tr>
<td>2-3 min</td>
<td>IV line with NS, rapid assessment, blood draw</td>
</tr>
<tr>
<td>4-5 min</td>
<td>Lorazepam 4 mg (0.1 mg/kg) or diazepam 10 mg (0.2 mg/kg) rate 1 mg/minute or rectal diazepam.</td>
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</tbody>
</table>
STAGE OF ESTABLISHED STATUS

Phenytoin (15-20 mg/kg IV/IO) – max. 1000mg

Rate of infusion 1mg/kg/min

Fosphenytoin (15-20 mg/kg (PE) IV/IO) - 1000mg loading doses

Phenobarbital (10-20 mg/kg IV/IO) 700mg
REFRACTORY STATUS

General Anesthesia:
• Pentobarbital (5-10 mg/kg IV/IO (loading dose → 0.5-3 mg/kg/min) or.
• Midazolam (0.2 mg/kg IV/IO loading dose followed by 0.75-10 mcg/kg/min).
• Propofol 2mg/kg IV bolus repeat prn → 5-10mg/kg/hr. infusion → 1-3mg/kg/hr.
FEBRILE SEIZURES

**Definition** - Convulsion associated with fever of extra cranial origin in infant and children in the age group of 6 months to 5 years (6mo-60mo)

- Peaks in 14 – 18 months
- 90% occurs before 3 years
SIMPLE FEBRILE SEIZURE

Generalized
Duration <15 minutes
No recurrence in 24 hrs.
No postictal neurological deficit
ATYPICAL FEBRILE SEIZURE

- Duration > 15mins
- Family h/o epilepsy
- Neurodevelopment retardation
- Partial/focal seizures
- High risk of recurrence
SYMPTOMATIC FEBRILE SEIZURE

- Children with previous neurologic insults,
- Known central nervous system abnormalities, or
- A history of afebrile seizures.
MANAGEMENT

• Control Seizure
• Control fever
• Rule out CNS infection
• Find and treat cause of fever
• Counsel parents & teach home management
• 1st episode of febrile convulsions < 12 months- Then do LP to rule out meningitis
HOSPITALIZATION

- Very young
- Very ill
- Parent frightened
- Will not come for follow up
- Medical complication
TREATMENT – PROPHYLAXIS

• **Intermittent (preferred)**
  – Oral diazepam 0.2 – 0.4 mg /kg/dose, BD, for 3 days
  – Clobazam 1mg/kg q BD X3days

• **Continuous**
  – Indication – afebrile seizure
  – Phenobarbitone – 3 – 5 mg / kg / day, od,
  – Side effects – hyper active & aggressive behavior
  – Sodium valproate – 10 – 20 mg / kg / day, bd
  – Side effects – hepatic toxicity
  – This have to be given for 2 seizure free years
AN APPROACH TO THE CHILD WITH A SUSPECTED CONVULSIVE DISORDER.

Printed from: Nelson Textbook of Paediatrics
AN APPROACH TO THE CHILD WITH A SUSPECTED CONVULSIVE DISORDER (CONTD..)
PRINTED FROM: NELSON TEXTBOOK OF PEDIATRICS

Classify Seizure Type

Good Control
- Regular follow-up
- Antiepileptic drug levels
- Monitor toxicity (CBC, liver function, behavioral, learning)
- EEG as indicated

Poor Control
- Consider hospitalization
- Prolonged EEG recording and video monitoring
- Readjust medication
- Reconsider underlying pathology with reinvestigation with CT or MRI
- Frequent follow-up
THANK YOU