NEONATAL SEIZURE
INTRODUCTION

• One of the important neonatal neurological emergencies requiring immediate medical care.
• Contribute to significant morbidity and mortality
• Incidence is around 0.5 to 0.8% in term and about 5 to 15% in babies less than 1500gms
• Most distinctive indicator of neurological problem
• Therefore it is important to
  – Recognise
  – Determine the cause
  – Treat appropriately
DEFINITION

• Abnormal paroxysmal, stereotypic clinical events i.e. behavioral, motor and/or autonomic.

• Associated with hyper synchronous neuronal activity.
CLASSIFICATION

• Clinical classification
  – Subtle (most common)
  – Focal clonic
  – Multifocal or migratory clonic
  – Tonic
  – Myoclonic
WHY DO SEIZURE HAVE DIFFERENT MANIFESTATIONS?

• Poor cortical organization
• Poor myelination
• Less efficient synapses
• Predominance of excitatory neurotransmitter receptors (E.g.: Glutamate)
• Decreased GABA channel
• Advanced development of limbic structure
• It is important to recognize seizure vs. non seizure phenomenon as it needs treatment.

• Following points will help in differentiation.

<table>
<thead>
<tr>
<th></th>
<th>Seizure</th>
<th>Non seizure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulus sensitive</td>
<td>Absent</td>
<td>Present</td>
</tr>
<tr>
<td>suppressible</td>
<td>Absent</td>
<td>Present</td>
</tr>
<tr>
<td>Autonomic changes</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Eye movement</td>
<td>Present</td>
<td>Absent</td>
</tr>
</tbody>
</table>
SUBTLE SEIZURES

• Also called Automatisms and bucco-lingual movements.

• Most common type both in term and preterm babies

• May be difficult to recognize clinically
  – Staring, nystagmus, eye deviation, blinking
  – Sucking, chewing, protruding tongue
  – Swimming, pedaling, stepping, rowing movements
  – Apnea
CLONIC

• Rhythmic movements of body parts that consist of a rapid flexion phase followed by a slower extensor movement

• Can be focal or multifocal

• Usually seen with birth trauma or hypoxic ischemic encephalopathy
Tonic Seizure

• These are generalized stiffening similar to decerebrate or decorticate posturing associated with breathing and eye signs.

• Associated with intraventricular hemorrhage and kernicterus.

• Prognosis is poor.
MYOCLONIC SEIZURES

• Myoclonic movements are rapid, isolated jerks that can be generalized, multifocal, or focal

• Common in babies with developmental defects including anencephaly
CAUSES

• Perinatal complications
  – Birth asphyxia
  – Intracranial injuries

• Metabolic causes
  – Hypocalcemia
  – Hypoglycemia

• CNS infections

• Inborn errors of metabolism
CAUSES (CONT.)

• Developmental defects
  – Microcephaly
  – Hydrocephalus
  – Neuronal disorganization or migration

• Pyridoxine dependency

• Dyselectrolytemia
  – Hypo or hypernatremia
BENIGN SEIZURES

• Benign neonatal sleep myoclonus
  – Myclonic jerks during REM sleep
  – Seen in first week, disappears by 2 months

• Benign familial neonatal convulsions
  – Autosomal dominant, clonic seizures seen on 2 or 3 day
    disappears by 2 months

• Benign idiopathic fifth day seizures
  – Multifocal seizures seen on day 5, spontaneously
    disappears
AGE OF ONSET OF CONVULSIONS

• First day - HIE, Cerebral contusion, first day hypocalcemia, pyridoxine dependency.

• 1st- 3rd day - Intracranial hemorrhage, hypocalcemia, IEM.

• 4th – 7th day - Meningitis developmental malformations, TORCH Infections, Benign neonatal seizures.

• 1st- 4th weeks - Late onset hypocalcemia, sepsis, IEM, cerebral dysgenesis, epileptic syndromes.
APPROACH TO NEONATAL SEIZURES

• History

• Seizure details – Onset, type, inter-ictal state

• Gestation

• Antenatal – Infection, PROM, foul smelling liquor, diabetes, drug addiction, fetal distress.
APPROACH TO NEONATAL SEIZURES

• History

  ▪ Intranatal - Difficult or instrumental delivery, injection of LA, resuscitation, cord pH
  ▪ Postnatal - Feeding pattern, type of feed, fever, lethargy, poor feeding, respiratory distress.
  ▪ Family history
APPROACH TO NEONATAL SEIZURES (CONT'D…)

• Examination
  – OFC, AF, Sutures
  – Cephalhematoma, fracture, needle mark
  – Mid-facial anomalies
  – Cataract, petechiae, organomegaly
  – Neuro-cutaneous markers
  – Abnormal odor – body and body secretion
INVESTIGATIONS

• Metabolic – Blood glucose, Ca$^{2+}$, PO$_4$, Mg$^{2+}$, Na$^+$

• Hb% / PCV, Blood counts and CRP

• Blood culture

• CSF - Analysis and C/S

• Cranial USG / CT Scan brain / MRI

• EEG

• Others - Urine RS, serum ammonia & lactate, ABG, TORCH serology
NEONATAL SEIZURE

- Identify and characterize the seizure
- Secure airway and optimize breathing, circulation, and temperature
- Start oxygen if seizures are continuous
- Secure IV access and take blood samples for baseline investigations including sugar, calcium, magnesium, sodium, potassium, arterial blood gas, hematocrit, sepsis screen
- If hypoglycemic (blood sugar <40 mg/dL): administer 2 mL/kg of 10% dextrose as bolus followed by a continuous infusion of 6-8 g/kg/min.
- If blood sugar is in normal range, sample for blood calcium should be withdrawn; if abnormal, 2 ml/kg of calcium gluconate (10%) should be given IV under cardiac monitoring.
Seizure persists

Administer phenobarbitone 20 mg/kg IV stat over 20 minutes

Repeat phenobarbitone in 10 mg/kg/dose aliquots until 40 mg/kg dose is reached

Administer phenytoin 20 mg/kg IV slowly over 20 minutes under cardiac monitoring

Repeat phenytoin 10 mg/kg/dose

Consider lorazepam /midazolam bolus and midazolam infusion if needed

Consider other antiepileptic drugs, pyridoxine,

Wean AED slowly to maintenance phenobarbitone
PHENOBARBITONE

• Dose and Route : 20 mg/kg I.V. over 10-15min
• Repeat : 5 mg/kg (up to 40mg/kg)
• Watch for : Hypotension, Apnea
• Disadvantages : Sedation, Hypotonia
PHENYTOIN

• Dose : 20 mg/kg I.V. over 20 min
• Repeat : 5mg/kg /day
• Look for : Heart rate / rhythm and extravasation
• Fosphenytoin : Increased solubility, fast infusion, safe IM, no tissue necrosis.
PYRIDOXINE

• 50-100mg I.V. under EEG monitoring.
• Repeat - 100 mg every 10 minutes till seizures are controlled in pyridoxine dependent seizures.
• Maintenance - 5mg/kg day or 50mg /day of oral dose.
• Adverse effects - Apnea and Hypotonia.
OTHER DRUGS...

- Midazolam
  - 0.15 to 0.1 mg/kg IV bolus.
  - 0.5 to 1 micrograms /kg/min increase every 2 min up to 18 micrograms till seizures control.
- Lorazepam
  - 50 to 100 microgram/kg IV slow.
- Lidocaine
  - 2 mg/kg in 10 minutes followed by IV infusion at 6 mg/kg/hr. for 6 hours.
WEANING OF ANTICONVULSANTS

Newborn on anti convulsant therapy

Wean all anti epileptic drugs except phenobarbitone when seizures controlled

Perform neurological examination prior to discharge

Normal

Stop phenobarbitone

Abnormal

Continue phenobarbitone

Repeat neurological examination at 1 month

Abnormal Examination

Evaluate EEG

NORMAL EEG
Taper drug over next 2 weeks

NORMAL EEG
Reassess after 3 months

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# PROGNOSIS

<table>
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<tr>
<th>ETIOLOGY</th>
<th>OUTCOME (%)</th>
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<tbody>
<tr>
<td>Hypoxia-ischemia</td>
<td>50</td>
</tr>
<tr>
<td>Meningitis</td>
<td>50</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>50</td>
</tr>
<tr>
<td>SA hemorrhage</td>
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<tr>
<td>Early hypocalcaemia</td>
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<tr>
<td>Late hypocalcaemia</td>
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<tr>
<td>IVH</td>
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<tr>
<td>Dysgenesis</td>
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<tr>
<td>Unknown</td>
<td>75</td>
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