Neonatal seizure

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Definition

- **Seizures** in newborn are emergencies requiring proper treatment because repeated seizures may lead to brain injury .
- Neonatal seizures are dissimilar from those in a child or adult because arborization of axons and dendritic processes as well myelination is incomplete in neonatal brain and delayed in development of inhibitory GABA .

Clinical manifestation and classification ;

- **1 – Focal seizures (clonic) ;** rhythmic , jerking or twitching of muscles groups of extremities and face associated with localized structural lesion , as well as , with infection and subarachnoid hemorrhage .This not associated with loss of consciousness .It common in full term .
- **2 – Multifocal clonic ;** similar to focal but differ in that many muscle groups are involved : occurs on extremities or another simultaneously or in sequence .

- **3 – Tonic :** rigid posturing of extremities and trunk & sometimes with fixed deviation of eyes .Commonly affect premature .
- **4 - Myoclonic seizures :** brief focal or generalized jerks of extremities or body that tend to involve distal muscle group .
- **5 – Subtle seizure :** consist of chewing motion , salivation and elevation in respiratory rate including apnea , blinking , nystagmus , bicycling or pedaling movement and change in colour.

Clinical features of non-epileptic activity :

- 1 – No autonomic changes as tachycardia or ↑ blood pressure .
- 2 – Suppressed by gentle restraint .
- 3 – Enhanced by sensory stimuli and no eye movement

EEG classification of neonatal seizures :

- **1 – Clinical seizure with a consistent EEG event ;** clinical seizure occur in relationship to seizure activity on EEG like focal tonic , focal clonic & some myoclonic . These are clearly epileptic and respond to an anticonvulsant .
- **2 – Clinical seizure with inconsistent EEG event ;** seizures without seizure-discharging on EEG e.g : generalized tonic seizure , subtle and some myoclonic .These likely to be non epileptic origin and may not require or respond to antiepileptic .
- **3 – Electrical seizures with absent clinical seizures :** electrical seizures with abnormal EEG in comatose infant who are not on anticonvulsant . Conversely ; EEG abnormalities persist in focal and clonic seizure without clinical signs after introduction of anticonvulsant .

Causes of neonatal seizures ;

- **1 – Hypoxic –ischemic encephalopathy :** most common cause = 50 – 60 % of patients occur within 12 hours of birth .
- **2 – Vascular events :** include intra-cranial bleeds & ischemic strokes account for 10 – 20 % of patients .Three types of hemorrhage ; subarachnoid , IVH , subdural hemorrhage .
- Strokes – venous or arterial → venous sinus thrombosis in need for MRi or CT venography .
- **3 – Infections = 5 – 10 % :** include bacterial & non bacterial infections . Include bacterial meningitis , TORCH infections .
- **4 – Brain malformations = 5 – 10 %**
- Aicarida ; agenesis of corpus callosum
- Lissencephaly
- Schizencephaly

- **5 – Drugs ;** drug withdrawal , injection of local anesthesia .
- **6 – Inherited ;**
- Benign familial epilepsy AD
- Tuberous sclerosis AD
- Zell wager syndrome AR
- Pyridoxine dependency AR
- **7 – Inborn error of metabolism** e,g (MSUD) .
- **8 – Metabolic disturbances :** ↓ RBS , ↓ Ca , ↓Mg , ↓ Na .
- **9 – Hypertension .**

Diagnosis

- A – History : FH , Maternal drug history & delivery .
- B – Physical examination :
- 1 – General ;
- A – Gestational age .
- B – Blood pressure .
- C – Presence of skin lesions .
- D – Hepatosplenomegaly .

- 2 – Neurological evaluation then feel for fontanels , exam for retina , hemorrhage , chorioretinitis , then do primitive reflexes .
- 3 – observe the seizure pattern , site of onset , spread , nature , duration and level of consciousness .

- C – Laboratory studies :
- 1 – Serum chemistries ; glucose , Ca , Na , urea , magnesium , blood gas analysis .
- 2 – Blood culture .
- 3 – Lumbar puncture is indicated in all neonates with seizure .
- 4 – Skull X-ray → calcification and Brain ultrasound
- 5 – EEG .
- 6 – MRI + CT scan .
- 7 – Blood ammonia & (sr and urine) amino acids .
- 8 – Chromosomal study → dysmorphic features .
- 9 – Serum long chain fatty acids → Adreno leuke dystrophy .

Treatment of neonatal seizure

- 1 - Treat the cause like hypoglycemia , hypocalcaemia , hypo magnesia .
- 2 – Anticonvulsant therapy (AEDs) :
- When no underlying metabolic cause .
- May need loading with bolus dose then on maintenance .
- A – Phenobarbital : drug of first choice ; usual loading dose 20 mg / kgm if not effective , then additional dose of 5 – 10 mg/ kgm can be given until dose of 40 mg / kgm is reached → patients may require assisted ventilation ; then maintenance dose started at 3 – 6 mg /day .

- B – Phenytoin and Fosphenytoin : if loading dose of 40 mg /kgm of phenobarbital not effective ; then loading dose of 15 – 20 mg/kgm of phenytoin = 0.5 – 1 mg/kgm /min as intravenously . It causes cardiac toxicity .
- Fosphenytoin → more save , water soluble given IV or IM .
- C – Diazepam and midazolam :

- Diazepam → distributes very rapidly into brain and cleared very quickly . Carrying risk of recurrence of seizure also carrying risk of apnea & hypotension . Dose 0.1 – 0.3 mg/kgm IV over 3 – 5 min . Given every 15- 30 min to maximum dose 2 mg .
- Midazolam → there`s ↑ experience with midazolam in dose of 0.05 – 0.1 mg/kgm IV with continuous infusion of 0.5 – 1 µg/kg/min ↑ gradually every 5 min → 2 µg/kg/min .
- Lorazepam → not clear out from the brain very rapidly .It act lasting 6 – 24 hr , Dose not cause ↓ Bp or apnea . The dose 0.02 – 0.10 mg/kg evry 4 – 8 hours .
- D – Many of other drugs are potentially toxic e.g ; valproate , carbamazepine. Toprimate or levetiracetam reported as 2nd or 3rd choice .

- **Prognosis**
- Hypoglycemia and hypocalcaemia→ prognosis is excellent . ***
- *** Sever hypoxic encephalopathy or cyto-architectural abnormalities →will have intractable seizure → death
- *** Avoid delayed in diagnosis → lead to irreversible neurological damage .