

NEONATAL SEIZURES

DEFINITION

A seizure is an abnormal electrical discharge in the CNS resulting in alteration of function

- Neonatal seizures occur as a reaction to a systemic or CNS event

INCIDENCE

- Seizures are more common in the neonatal period than any other period of life
- Newborn brain is more immature and susceptible to electrical misfires
- Incidence is higher in preterm with more immature brain
- 10-130/1000 preterm births
- 1-3/1000 full term births

COMMON CAUSES OF NEONATAL SEIZURES

METABOLIC	INBORN ERRORS OF METABOLISM	CNS
<ul style="list-style-type: none"> • Hypoglycemia • Hypocalcemia • Hypomagnesemia • Hyponatremia • Hypernatremia 	<ul style="list-style-type: none"> • Maple syrup urine disease • Urea cycle abnormalities • Non-Ketotic Hyperglycinemia • Galactosemia • Hyperprolinemia • Propionic acidemia • Organic acidopathies • (NEED TO DO NEWBORN SCREEN) 	<ul style="list-style-type: none"> • Hypoxic Ischemia Encephalopathy (HIE) <ul style="list-style-type: none"> ▪ Most common in term infants ▪ Onset 0-3 days • Intracranial Hemorrhage <ul style="list-style-type: none"> ▪ IVH – Preterm ▪ Intracerebral ▪ Subarachnoid ▪ Subdural • Stroke • Infections <ul style="list-style-type: none"> ▪ Meningitis ▪ Cerebral abscess ▪ Herpes encephalitis ▪ CMV ▪ Toxoplasmosis ▪ Syphilis • Malformations
TOXINS	OTHER	
<ul style="list-style-type: none"> • Neonatal drug withdrawal • Local anesthetic intoxication • Kernicterus (Bilirubin encephalopathy) 	<ul style="list-style-type: none"> • Pyridoxine (B6) deficiency • Benign familial epilepsy • Genetic syndromes • Idiopathic 	

SEIZURE OR NOT A SEIZURE?

BENIGN NEONATAL SLEEP MYOCLONUS

- Rhythmic myoclonic jerks seen only during sleep
- Common and frequently misdiagnosed as seizures
- Distinguished from myoclonus seizure because it only occurs in sleep and stops abruptly and consistently when the infant is aroused.

JITTERINESS vs. SEIZURE

CLINICAL FEATURE	JITTERY	SEIZURE
Abnormality of gaze or eye movements (eye deviations or stare)	No	Yes
Movements are easily elicited with stimulus (voice, motions)	Yes	No
Predominant movement	Tremor	Clonic/Jerking
Gentle restraint of the involved body part halts the activity	Yes	No
Autonomic changes present (Apnea, elevated BP, pupil changes, tachycardia)	No	Yes

HYPOXIC-ISCHEMIC ENCEPHALOPATHY (HIE)

DEFINITIONS:

- HIE occurs in 1 to 2 of every 1000 births
- Antepartum Events
 - Maternal hypertension
 - IUGR
 - Maternal diabetes
- Intrapartum Events
 - Cord prolapse
 - Abruption
 - Traumatic delivery



MANAGEMENT

- Considered a medical emergency to prevent brain injury
- Seizures with hypoglycemia and hypoxia can be detrimental to the brain
- Remember: seizures are a **symptom** associated with systemic or CNS disturbances, therefore, investigating underlying cause is essential in managing treatment

SEIZURE TYPES

SEIZURE TYPE	OCCURS IN	CLINICAL SIGNS
Subtle—most frequent	Preterm & Term	<ul style="list-style-type: none"> • Eye deviation (term) • Blinking, fixed stare (preterm) • Lip smacking • Tongue thrusting • Pedaling or swimming limb movements • Apnea, changes in HR, BP or respirations
Tonic	Primarily Preterm	<ul style="list-style-type: none"> • Abrupt change in tone • Described as “stiffening”, “posturing” & “rigidity” • Apnea • Eye movements
Clonic (Focal & Multifocal)	Primarily Term	<p><u>FOCAL</u></p> <ul style="list-style-type: none"> • One limb or area • Well-localized; rhythmic, repetitive jerking <p><u>MULTI-FOCAL</u></p> <ul style="list-style-type: none"> • Rhythmic, repetitive jerking movements of several body parts simultaneously or in a non-ordered fashion • Not usually associated with apnea or eye movements • May resemble jitteriness but movements not stopped by restraining or repositioning limb
Myoclonic -- Rare	Preterm & Term	<ul style="list-style-type: none"> • Rapid (faster than clonic) jerking of both arms +/- legs • May occur individually or in brief series

Steps to take:

1. Ensure adequate ventilation and perfusion
2. Call for help
3. Correct Metabolic disturbances
 - Check glucose
 - May need D10 Bolus
4. Consider cooling eligibility if HIE suspected
5. Anticonvulsant Therapy
 - Phenobarbital – Loading dose 20 mg/kg IV

References

- Leuthner, S.R. & Das, U.G. (June 2004). Low Apgar scores and the definition of birth asphyxia. *Pediatr Clin North Am*, 51(3), 737-745.
- Sarnat, H.B. & Sarnat, M.S. (1976). Neonatal encephalopathy following fetal distress: A clinical and electroencephalographic study. *Arch Neurol*, 33 (10), 696-705. PMID: 987769.
- Shellhaa, R. (2015). Etiology and prognosis of neonatal seizures. In: UpToDate, Nordli, D.R. & Garcia-Prats, J.A. (Eds), *UpToDate*, Waltham: MA. (Accessed on June 20, 2015.)
- Sivaswarm, L. (May 2012). Approach to neonatal seizures. *Clin Pediatr*, 51, 415-425.
- Verklan, M. T., & Lopez, S. M. (2011). Neurologic disorders. In Gardner, S.L., Carter, B.S., Enzman-Hines, M., & Hernandez, J.A. (Eds.), *Merenstein & Gardner's handbook of neonatal intensive care* (pp. 765-774). St. Louis, MO: Elsevier Saunders.
- Verklan, M. T., Walden, M., NANN, & AACN. (2010). Neurologic disorders. In *Core curriculum for neonatal intensive care nursing* (4th Ed.) (pp. 771-774). St. Louis, MO: Elsevier Saunders.
- Volpe, J.J. (2008). Neonatal seizures. In *Neurology of the newborn* (pp. 203-244). Philadelphia, PA: Saunders Elsevier.
- Volpe, J.J. (2008). Hypoxic-ischemic encephalopathy: Neuropathology and pathogenesis. In *Neurology of the newborn* (pp. 347-399). Philadelphia, PA: Saunders Elsevier.
- Volpe, J.J. (2008). Hypoxic-ischemic encephalopathy: Clinical aspects. In *Neurology of the newborn* (pp. 400-480). Philadelphia, PA: Saunders Elsevier.