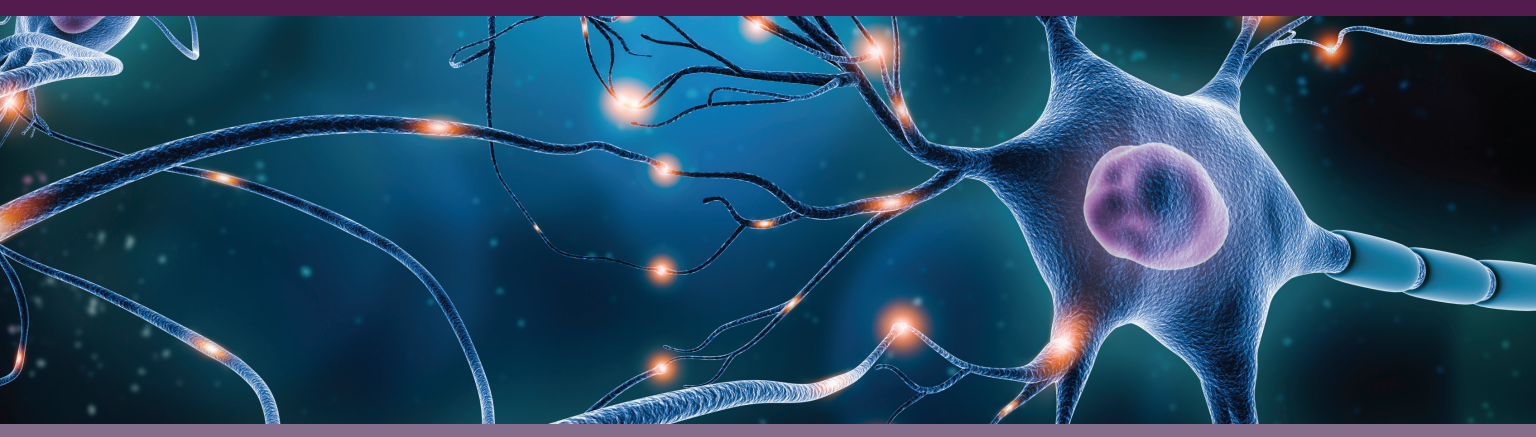
PERINATAL STROKE

A Practical Approach to Diagnosis and Management



Definition

- Focal vascular brain injury
- Fetal period to 28 days of postnatal age

Key Features

- Primarily, a disorder of term infants
- Acute symptoms in 60% present
- Most common cause of hemiparetic cerebral palsy

Classification Based on

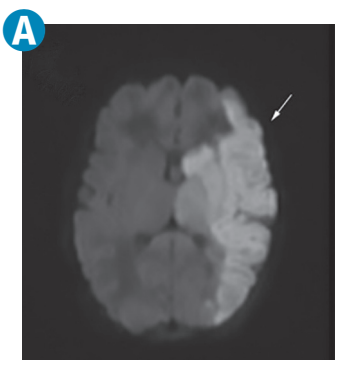
- Timing of Injury (Fetal or neonatal)
- Postnatal Presentation (Neonatal vs. delayed)
- Mechanism of Injury (Ischemic)

Initial Investigations and Management

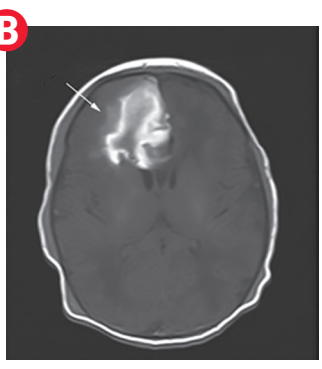
- **Neuroimaging:** MR protocol to include DWI/ADC, TI/f2, GRE/SWI and MRA/MRV. US or CT if MR not immediately available and suspect hemorrhage
- **Neuroprotective Care:** Maintain normothermia, normovolemia, normoglycemia; avoid direct pressure over occiput; consider EEG monitoring; treat clinical and electrographic seizures

Types of Perinatal Stroke

	Type	Key Features and Management
A	Neonatal arterial ischemic stroke (NAIS)	Neonatal presentation as focal seizures with or without encephalopathy Most common type of perinatal stroke MCA most commonly affected (thrombotic occlusion)
B	Neonatal hemorrhagic stroke (NHS)	Neonatal presentation as seizures or non-focal signs (raised ICP, decreased consciousness) May be attributed to coagulopathy, severe thrombocytopenia, vascular malformations, or hemorrhagic transformation of infarcts
C	Cerebral sinovenous thrombosis (CSVT)	Neonatal presentation more diverse than NAIS (lethargy, poor feeding, encephalopathy, raised ICP) May involve the superficial or the deep venous system Slightly more predominant in males, may be predisposed by infection, dehydration, coagulopathy
D	Arterial presumed perinatal ischemic stroke (APPIS)	Similar to NAIS but presentation later in infancy or childhood with focal epilepsy or focal neurological deficits
E	Periventricular venous infarction (PVI)	In-utero germinal matrix hemorrhage leading to compression of the medullary veins (may have a genetic etiology; e.g. COL4A1 mutation) Presentations later in infancy or childhood with early hand preference or asymmetric gait
F	Presumed perinatal hemorrhagic stroke (PPHS)	Rare, similar in presentation to APPIS, but caused by an initial hemorrhage



A — NAIS (axial diffusion weighted imaging)

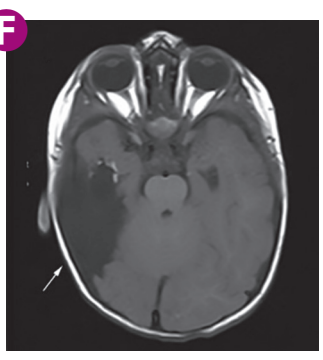


B — NHS (axial T1-weighted sequence)

C — CSVT affecting the left transverse sinus (sagittal sequence)

D — APPIS (axial FLAIR sequence)

E — PVI (coronal T2-weighted sequence)



F — PPHS (axial T1-weighted sequence)

- **Neurological outcome:** 40% of perinatal arterial stroke survivors are neurologically normal.
- **Motor outcome:** Hemiparetic CP. Upper limbs involved in NAIS and AAPIS, while lower limbs more commonly involved in PVI. Fine-motor skills and sensory perception may also be impaired.
- **Non-motor outcomes:** Cognitive/behavioral issues during school age. Functional communication ability typically preserved.
- **Epilepsy:** 25-30% risk. Remote epileptic encephalopathy (continuous spike and wave in sleep) is a major, treatable modulator of adverse outcomes, and a sleep EEG is required in all children with abnormal non-motor neurodevelopment.
- **Recurrence risk:** Extremely low, both in the affected child and subsequent pregnancies (unless underlying genetic risk, bleeding diathesis, vascular malformation or associated complex congenital cardiac lesion).

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MCA: Middle cerebral artery
LP: lumbar puncture
ACT: anti-coagulation
ICP: intracranial pressure
NAIT: neonatal alloimmune thrombocytopenia
CBC: complete blood count
PTT: partial thromboplastin time
INR: international normalized ratio.

MR: Phenylketonuria Magnetic resonance
DWI: Diffusion-weighted imaging
ADC: Apparent diffusion coefficient
GRE/SWI: Gradient echo sequence/susceptibility-weighted images
MRA/MRV: MR arteriogram/venogram
US: Ultrasound
CT: Computed tomography
EEG: Electroencephalogram.

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