APPROACH AND MANAGEMENT OF STROKE IN PEDIATRICS

GR.Zamani , Ped.Neurologist

Children's Medical Center, TUMS

Aug,2025

OBJECTIVES

By the end of this session, participants will be able to:

- *Recognize key clinical features of pediatric stroke.*
- *Outline an organized diagnostic approach.*
- *Understand acute and long-term management strategies.*
- *Be familiar with common causes by age.*

DEFINITION

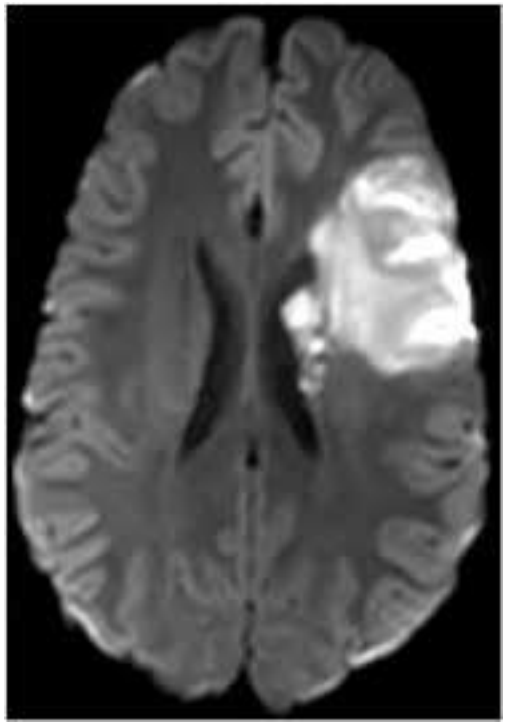
- ***Pediatric stroke*** *is a sudden-onset neurological deficit due to disruption of cerebral blood flow, caused by ischemia or hemorrhage, occurring from birth to 18 years.*

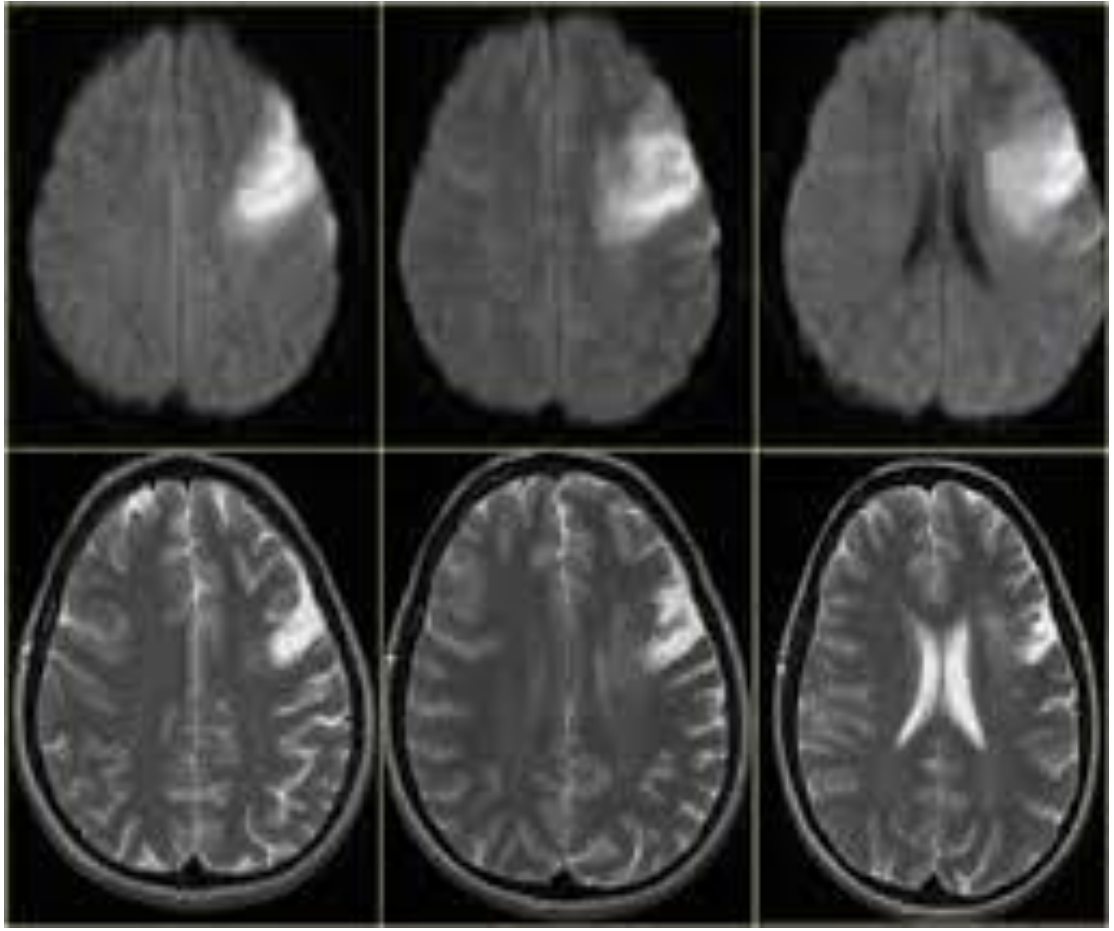
EPIDEMIOLOGY

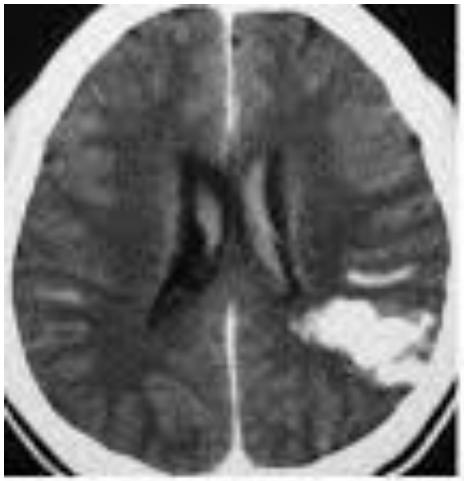
- Incidence: 2–13 per 100,000 children/year
- Higher in neonates less amount in infants & Children between 1 mo to 18 yrs
- **AIS** more common than hemorrhagic stroke in children
- Significant cause of long-term disability

CLASSIFICATION

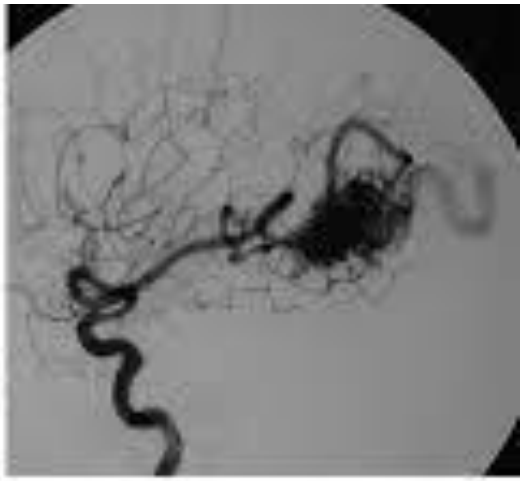
- **Ischemic Stroke**
  - Arterial Ischemic Stroke (AIS) :50%
  - Cerebral Sinovenous Thrombosis (CSVT) :50%
  - TIA:transient ischemic attack that resolves within 24h
- **Hemorrhagic Stroke**
  - Intracerebral
  - Subarachnoid
  - Intraventricular



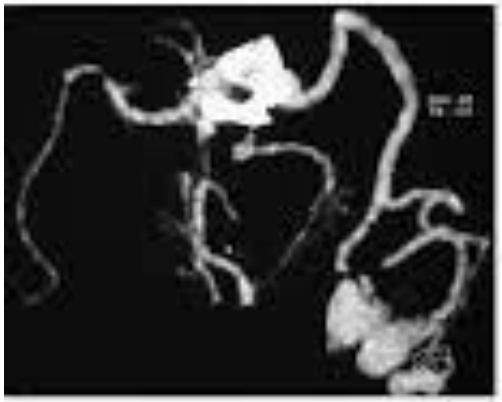




a.



c.



b.

Key Differences: Pediatric vs. Adult Stroke

- Often delayed diagnosis
- More diverse etiology
- Seizures more frequent at onset
- Better neuroplasticity, but also more risk of long-term sequelae

AGE-RELATED ETIOLOGY &RISK FACTORS

Age Group	Common Causes
Neonates	Birth asphyxia, CHD, sepsis, perinatal arterial stroke
Infant& Children	Cardiac disorders, arteriopathy, sickle cell disease, infection, cardiac disease, trauma
Adolescents	Arteriopathy(endocarditis, Moyamoya, Inf), Thrombophilia ,drugs, trauma

CLINICAL PRESENTATION

- Hemiparesis:60-80
- Seizures (especially in neonates)
- Altered mental status
- Headache
- Ataxia
- Visual field deficits
- Vomiting (in hemorrhagic stroke)

MNEMONIC "BE FAST" IN CHILDREN

- Balance loss
- Eyes (vision problems)
- Face drooping
- Arm drift
- Slurred Speech
- ***Time = act quickly***

DIAGNOSTIC APPROACH

- Clinical suspicion and history
- Urgent neuroimaging
  - MRI with DWI preferred
  - CT if MRI not available (esp. for hemorrhage)
- Stroke protocol labs
  - CBC, CRP, glucose, coagulation profile, blood cultures,
  - Metabolic screen (selected cases)
  - Thrombophilia screen (in selected cases)
- Cardiac workup: Echo, ECG
- CSF if infectious
- Vasculitis(If suspected)

IMAGING IN PEDIATRIC STROKE

- MRI/MRA: preferred for ischemic stroke
- MRV: for suspected CSVT
- CT/CTA: for acute hemorrhage or emergency settings
- Delays in imaging missed early intervention opportunity

ACUTE PHASE MANAGEMENT

- *Stabilize ABCs*
- *Control seizures, brain edema, BP, Sugar*
- *Avoid hypoxia, hypoglycemia, hypotension,fever*
- *Urgent neuro consult and imaging*

AIS: ACUTE TREATMENT

- IV tPA: very limited use (age >2 years, within 4.5 hours, selected centers only)
- Mechanical thrombectomy: experimental in children, but used in large-vessel occlusion in selected cases
- **Antithrombotic therapy**:
  - Aspirin 3–5 mg/kg/day in most cases
  - Enaxaprin first &then switching to warfarin in cardioembolic/CSVT or prothrombotic states

ENOXAPARIN & WARFARIN IN PEDIATRIC STROKE

- Enoxaparin (LMWH): 1–1.8 mg/kg SC every 12 h, adjusted by anti-Xa levels (~0.5–1.0 IU/mL), typically for 3 months, with potential extension up to 6 months based on imaging response .
- Transition to Warfarin: INR target 2.0–3.0; duration aligned with enoxaparin—usually 3–6 months, or 6–12 months if underlying thrombophilia is present .
- Monitor platelet count and watch for hemorrhagic conversion, especially within the first 4 weeks .

MANAGING BRAIN EDEMA IN HEMORRHAGIC STROKE

- First-line osmotic therapy:
  - Hypertonic saline (3 %, 2–5 mL/kg over 10–20 min): preferred over mannitol; maintain ICP <20 mmHg .
  - Mannitol (0.5–1 g/kg bolus q4–6 h): alternative; monitor serum osmolality (<320 mOsm/kg).
- Supportive measures:

ANTICOAGULATION IN CEREBRAL SINOVENOUS THROMBOSIS (CSVT)

- Enoxaparin (1–1.8 mg/kg BID) or UFH, even with hemorrhagic lesions, is safe and improves outcomes .
- Follow-up therapy: Warfarin for 3 months if provoked; 6–12 months if unprovoked or thrombophilia detected; lifelong if severe thrombophilia .
- Monitor anti-Xa levels for dosing adjustment.

ASPIRIN USE & DURATION

- Aspirin: 3–5 mg/kg daily in arterial ischemic stroke, neonates, or low-risk AIS cases .
- Duration ranges from 3 months to lifelong, depending on recurrence risk (e.g., cardiac disease or arteriopathy).
- LMWH and aspirin have similar efficacy in preventing recurrence .

CSVT: MANAGEMENT

- Anticoagulation is standard (even with hemorrhagic component)
  - LMWH preferred initially
  - Duration: 3–6 months depending on cause
- Treat underlying cause: infection, dehydration, malignancy

HEMORRHAGIC STROKE: MANAGEMENT

- *ICU care*
- *Manage ICP, seizures, BP*
- *Neurosurgery if indicated (hematoma evacuation, shunt)*
- *Search for AVM, aneurysms, or coagulopathy*

SECONDARY PREVENTION

- *Identify and treat underlying causes:*
  - *Cardiac repair*
  - *Sickle cell: chronic transfusion*
  - *Moyamoya: revascularization surgery*
  - *Autoimmune: immunosuppressive therapy*
- *Long-term antithrombotics in selected patients*

REHABILITATION

- *Start early!*
- *Multidisciplinary team:*
  - *Physio, occupational, speech therapy*
  - *Neuropsychology*
- *Tailored to child's age, deficit, and family resources*

PROGNOSIS

- ~60% of survivors have residual deficits
- Predictors of poor outcome:
    - Delayed diagnosis
    - Seizures
    - Large infarcts or bilateral strokes
- Better outcomes in neonates than older children

MIMICS OF STROKE IN CHILDREN

- Seizures/postictal paralysis (Todd's paresis)
- complicated Migraine
- Bell's palsy
- ADEM
- Hypoglycemia
- Conversion disorder (rare)

RED FLAGS FOR STROKE REFERRAL

- Acute focal deficits
- Prolonged seizures with persistent deficits
- Sudden-onset visual, speech, or balance issues
- Any child with cardiac disease and new neuro symptoms

TAKE-HOME MESSAGES

- Stroke does occur in children and often presents subtly
- Early recognition and imaging are critical
- Management depends on stroke type and cause
- Long-term care must include rehabilitation and prevention

THANK YOU!