

EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE



Care Warriors

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Possible Stroke in a Child

A 5-year-old female with no past medical history presents to the ED via EMS after an acute onset of right sided facial droop and right-sided hemiparesis. The symptoms started one hour ago, all of a sudden. The patient has never experienced these symptoms prior to this episode. Mom denies any history of seizures, trauma, fever or recent travel. Patient is afebrile and vitals are within normal limits. On physical exam, patient has right sided facial weakness, except for her forehead muscles. She is unable to speak coherently and upon asking her to smile, the right side of her face stays flat. Gait is limited by hemiparesis, as she is unable to lift her right arm and leg. Which of the following is the most appropriate initial next step for this patient's condition?

- A. CT scan
- B. TPA
- C. Valacyclovir and Prednisone
- D. Surgical decompression
- E. MRI

Clinical Presentation of Ischemic Stroke

- Acute onset of focal neurologic deficit

Speech difficulty
10-35%

Visual field defects
5-20%

Hemiparesis
60-80%



(via www.openpediatrics.org)

The hallmark of a stroke is a focal neurological deficit, including **hemiparesis, speech difficulty, and visual field defects**. The focal defects can sometimes be localized to the territory of the brain affected.

Strokes affecting the **ACA** can lead to weakness of the contralateral leg and behavioral changes.

In the **MCA** there would be weakness of the contralateral arm and aphasia and dysarthria, hemianopia, hemineglect, and sensory deficits.

In the **PCA** there would be visual and sensory deficits.

Vertebrobasilar strokes include LOC dizziness, ataxia, dysarthria, and sensory loss.

Venous occlusion presents with LOC, headache, and papilledema.

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

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The correct answer is C. CT Scan

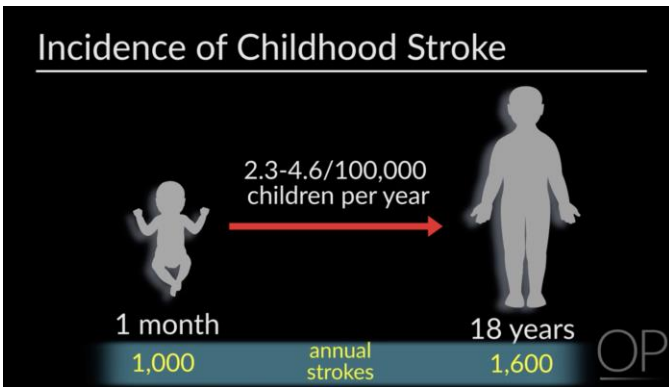
Stroke is a potentially life-threatening condition. When a child is presenting with sudden hemiparesis, speech difficulty and visual field defects, it should be high on the differential. Additionally, these symptoms meet the PCARN Criteria for initiating an initial scan. With these symptoms, even if the initial CT is negative, it will likely be necessary to follow up with an MRI which will require intubation and sedation of the child so it is important to be sure to call anesthesia and make sure they are aware. The incidence of childhood stroke is roughly 2-4/100,000 children per year, with 1,000 in neonates and 1,600 in children up to 18 years old.¹

| Risk Factors Associated with Arterial Ischemic Stroke in Children | | |
|---|--|-----|
| Arteriopathy | Focal cerebral arteriopathy, moyamoya, dissection, vasculitis, sickle cell arteriopathy, post-varicella | 53% |
| Cardiac | Congenital heart disease, acquired heart disease, PFO, post procedure, ECMO/VAD | 31% |
| Acute head and neck | Trauma, pharyngitis, meningitis, intracranial surgery, otitis media | 23% |
| Acute systemic | Sepsis, shock | 22% |
| Chronic systemic | Sickle cell disease, catheters, other genetic disorders, malignancy, oral contraceptives, connective disorders | 19% |
| Prothrombotic state | Genetic or acquired thrombophilias | 13% |
| Chronic head and neck | Migraine, intracranial tumor, vascular malformation, MELAS | 10% |
| Atherosclerosis | Hypertension, hyperlipidemia, diabetes | 2% |
| | Any infection | 24% |
| | Other | 22% |
| | None | 10% |

Mackay MT, Wenzler M, Benedict SL, et al. Arterial ischemic stroke risk factors: the International Pediatric Stroke Study. Ann Neurol. 2011;69(1):130-140.

(via www.openpediatrics.org)

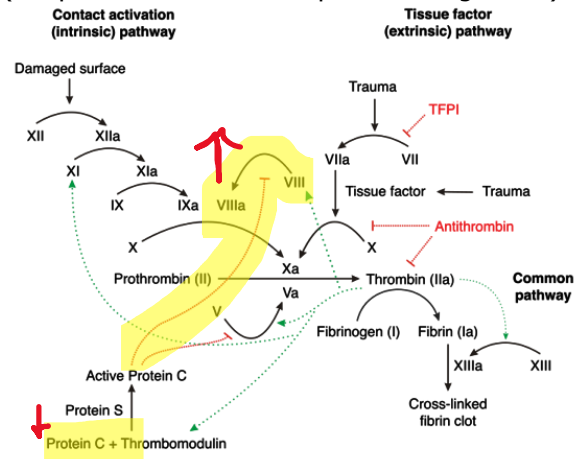
We will focus on arterial ischemic stroke for the remainder of the discussion. While most children who have an arterial ischemic stroke, it can be attributed to an arteriopathy or a cardiac cause, our patient was in the minority of etiologies. The team did coagulation studies on her and found that she had an elevated Factor VIII and low Protein C. If you recall the coagulation cascade, when Factor VIII is activated it creates blood clots. Protein C and S inactivate Factor VIII. In this case, our patient had two things leading to her hypercoagulable state, an increased amount of Factor VIII (the clotting factor) and a decreased amount of Protein S (the protein that would stop the clotting factor).



(via www.openpediatrics.org)

Discussion

Stroke can be divided into ischemic and hemorrhagic, and in children, typically half are ischemic and the other half hemorrhagic. The child in this vignette turned out to have an ischemic stroke, due to the blockage of an artery in the brain. There are three possibilities for why she had an ischemic injury: vessel lumen narrowing, endothelial injury/hypercoagulability, or thromboembolism.³ She could have also had a venous infarction leading to a buildup of fluid in the brain but that did not occur in this case. In this case she would have likely complained of a headache, vomiting, and symptoms of mass effect.



(via: <https://step1.medbullets.com/hematology/111004/coagulation-cascade>)

For a list of educational lectures, grand rounds, workshops, and didactics please visit BrowardER.com and click on the "Conference" link.

All are welcome to attend!

Warriors

Treatment

For an arterial ischemic stroke with vascular occlusion, intravenous TPA and endovascular stent retrieval may both be options. Secondary stroke prevention is essential either with Aspirin 3-5 mg/kg once per day at a maximum dose of 81 mg OR with therapeutic anticoagulation including either a Heparin drip or injection of Low Molecular Weight Heparin. If the AIS was due to sickle cell disease, an exchange transfusion is indicated to reduce the number of sickled hemoglobin. In a venous occlusion, Heparin is also indicated to prevent more clotting. Neuroprotective care is essential, including airway, breathing, and circulation. Lay the head of the bed flat to increase blood flow to the brain, start isotonic fluids to aid in perfusion, target blood pressure above the 50% for age and weight, treat fever and seizures to minimize metabolic demand, normalize electrolytes, and treat cerebral edema if necessary. ¹

Prognosis

Immediate mortality is between 10% and 40%. Around 37% of children with an ischemic stroke make a full recovery. Of those who suffer an arterial ischemic stroke or CSVT, 41% continue with moderate to severe deficits. Stroke recurrence is also a possibility. More than 25% of childhood strokes lead to epilepsy later in life. ¹

Take Home Points

- Stroke in children can be life threatening, being among one of the 10 causes of death in children.² It can also lead to neurologic disability, including permanent long-term cognitive and motor impairment.
- It can be divided into ischemic and hemorrhagic.
- Ischemia can be caused by vessel lumen narrowing, endothelial injury/hypercoagulability, or thromboembolism, and the workup should aim to discern the etiology.
- Risk factors include arteriopathies, cardiac disorders, acute head and neck injuries, chronic systemic causes, prothrombotic states, atherosclerosis, and infection.
- Depending on the etiology, it can present with visual disturbances, hemiparesis, facial droop, aphasia, and headache, and requires immediate attention.
- The initial studies include a CT scan, likely followed by an MRI.
- The mainstay of treatment includes anticoagulation and TPA.
- Neuroprotective measures should also be put into place including administering fluids, laying the bed flat, maintaining an elevated blood pressure, treating any fevers and seizures, normalizing electrolytes, and treating any cerebral edema.



ABOUT THE AUTHOR

This case was written by Roshan Bransden. Roshan is a 4th year medical student from FIU-HWCOM. She did her emergency medicine rotation at BHMC in December 2020. Roshan plans on pursuing a career in Family Medicine after graduation.

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