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The Neuroemergent Exam

A Case Based Review of the High Yield Neuro Exam Findings in the Neurological Emergency

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Objectives

- Review pathophysiology associated with common neurological emergencies.
- Identify pertinent exam findings in the neurological emergency
- Understand the diagnosis and treatment options for common neurological emergencies



Case 1: 23 yo male

HPI

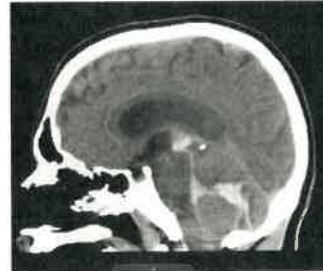
- No significant medical history
- Headaches over the preceding week
- Told roommate he had severe headache
- Found shortly after unconscious and unresponsive
- GCS: 3
- EMS responded and transported to nearest ED.
- Intubated with minimal movement of right upper extremity and groaning
- Flown to Carondelet St. Joseph's for higher level of care



Exam Findings

- Intubated for hypoxia and respiratory failure
- Decerebrate (extensor) posturing bilaterally
- Hyperventilating on ventilator
- Pupils equal and sluggish
- Corneal reflexes intact
- Doll's eyes present

Initial Head CT



Management of ICH

CT Findings

- Right cerebellar hematoma
- Extension into the fourth ventricle and upward into the third and lateral ventricular system
- Significant mass effect
- Concern for mild early upward transtentorial herniation
- Crowding of the basal cisterns noted
- ICH Score 5

Intervention

- Emergent placement of EVD
- Emergent Suboccipital craniectomy for decompression and evacuation of hematoma

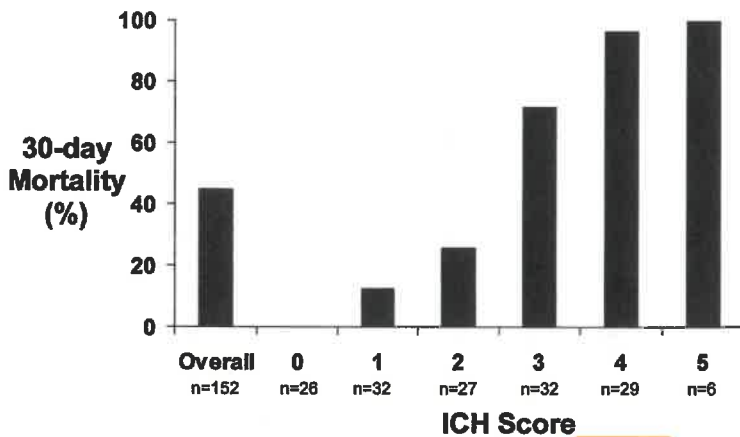
ICH Score	Points
GCS score *	
3-4	2
5-12	1
13-15	0
ICH volume **	
≥ 30 cm ³	1
< 30 cm ³	0
IVH ***	
Yes	1
No	0
Infratentorial origin of ICH	
Yes	1
No	0
Age	
≥ 80	1
< 80	0
ICH Total Score	0-6

The ICH Score is a clinical grading scale that allows for risk stratification of patients presenting with ICH. The 5 categories are independent predictors of 30-day mortality. Mortality rises as the ICH Score increases. The use of the ICH Score could improve standardization of treatment protocols and clinical research studies in ICH.

* GCS on initial presentation (or after resuscitation)

** ICH volume, volume on initial CT calculated using ABC/2 method

*** IVH, presence of any IVH on initial CT



Hemorrhagic Stroke

- Blood spills or leaks into or around the brain
- Creates swelling and pressure which damages cells and tissue
- Hemorrhagic strokes account for approximately 15% of all strokes
- Responsible for over 40% of stroke deaths
- Approximately 50% of people who suffer a hemorrhagic stroke will die in a matter of days



Hemorrhagic Stroke

Intracerebral Hemorrhage

- Most common hemorrhagic stroke
- Blood vessel inside the brain bursts and leaks blood into the surrounding brain tissue
- High blood pressure and aging blood vessels most common
- Symptoms often include:
 - Headache
 - Nausea/Vomiting
 - Hypertension



Subarachnoid Hemorrhage

- Less common hemorrhagic stroke
- Involves bleeding in the area between the brain and the tissue covering the brain
- Most often caused by a burst aneurysm
- Other causes include:
 - AVM
 - Bleeding disorders
 - Head injury
 - Blood thinners

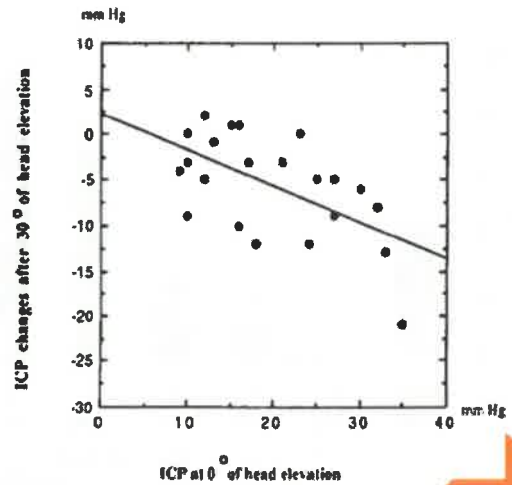


Emergency Management of Hemorrhagic Stroke



- Monitor and stabilize ABC's
- Immediate non-contrast head CT
- Neurological Assessment: GCS, ICH, H/H, NIHSS
- Neurosurgical Consult/ Interventional Radiology Consult / Neurology Consult
- Management of Hypertension
- Management of coagulopathy, patients with anticoagulant induced hemorrhage, reversal should be based on the type of anticoagulant
- Manage ICP
 - Elevate head of bed to 30 degrees
 - Monitor for signs of intracranial hypertension (impaired consciousness, vomiting, papilledema, anisocoria)

How to Lower ICP in 2 seconds



Hospital Course and Outcome

- Admitted 4/2/2019
- Intubated x 7 days
- EVD x 8 days
- Neuro ICU x 11 days
- Neuro Acute care x 3 days
- Transfer to Inpatient Rehab on 4/17/2019



Case 2: 72 yo male

HPI

- History of HTN
- Sudden onset of difficulty swallowing, feeling dizzy and right arm numbness
- EMS called and identified stroke-like symptoms
- Pre-hospital stroke alert
- Hypertensive during transport 258/82
- Assessed in the Emergency Department
- Improved but then exam worsened and was administered tPA
- Admitted to Neuro ICU
- Deteriorated and required intubation for respiratory failure

Initial Head CT and CTA



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Exam Findings

- Intubated for hypoxia and respiratory failure
- Left gaze deviation
- Nystagmus
- Difficulty swallowing
- Vomiting
- Dysarthria
- Left tongue deviation

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Management of Acute Ischemic Stroke and Large Vessel Occlusion

CTA Findings

- Left intracranial vertebral artery is not visualized consistent with occlusion

Intervention

- Emergency thrombectomy of distal left vertebral/ proximal basilar artery

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Ischemic Stroke

- A blood vessel carrying blood to the brain is blocked by a blood clot
- Causes immediate focal neurological symptoms
- Ischemic strokes account for approximately 85% of all strokes
 - 25-40% are Large Vessel Occlusion
 - 20 % are Posterior Circulation
 - 30% of strokes are cryptogenic "unknown cause"



Large Vessel Occlusion (LVO)

- Acute blockage of a proximal great vessel or one of its branches (MCA for example)
- Account for 25-40% of all ischemic strokes
- Symptoms can include:
 - Facial drooping
 - Unilateral arm/leg weakness
 - * Right hemiparesis
 - Slurred speech
 - * Aphasia
 - Visual field disturbances
 - * Gaze Deviation

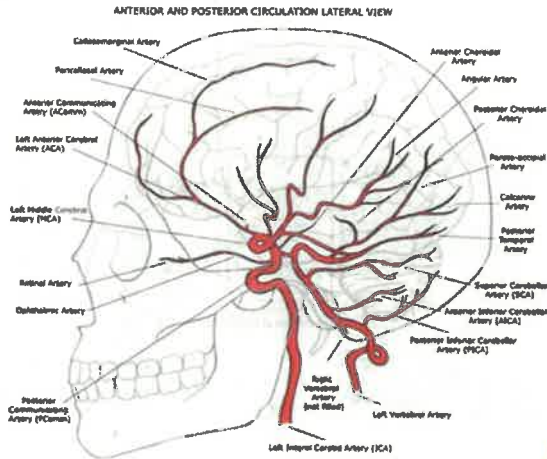


Acute Ischemic Stroke Treatment

- Recognition of stroke symptoms
- Transport immediately to medical facility prepared to care for the acute stroke
- IV tPA within 3 hours of onset, sometimes up to 4.5 hours
- Mechanical Thrombectomy / Clot extraction
- Close Monitoring in the ICU
- Rehabilitation



Anterior vs Posterior Circulation Strokes



Posterior Circulation Stroke

- An occlusion in the posterior circulation of the brain
- Often patients are younger, 50% are less than 50 years old
- Account for 20-25% of Ischemic Strokes
- Many are misdiagnosed because of their often vague presentation
- Focal neurological deficits may be absent or subtle
- Dizziness, Diplopia, Dysarthria, Dysphagia, Dystaxia
- Often associated with nausea/ vomiting and gait unsteadiness

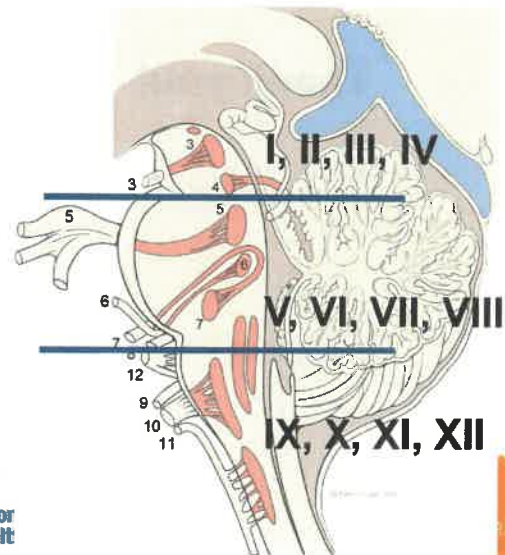


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Hospital Course and Outcome

- Admitted 1/14/2019
- Extubated 1/15/2019
- CT on 1/15 showed stable right temporal hemorrhage
- Neuro ICU x 5 days
- Neuro Acute care x 6 days
- Transfer to Inpatient Rehab on 1/23/2019

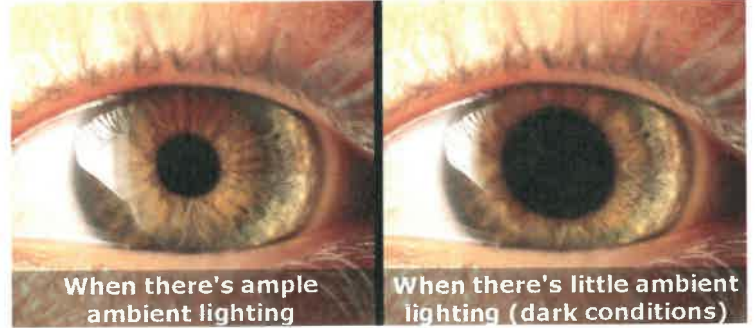


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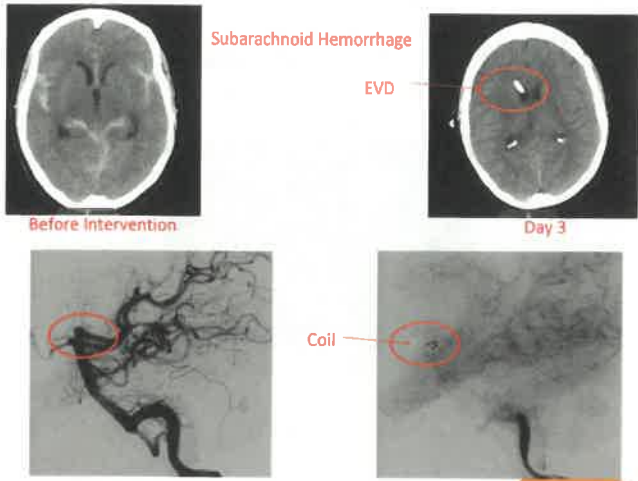
Reflex	Afferent (Sensory)	Efferent (Motor)	Description
Pupillary	II - Optic	III - Oculomotor	Midbrain
Corneal	V ₁ - Trigeminal	VII - Facial	Pons
Cough/Gag	IX - Glossopharyngeal	X - Vagus	Medulla



Thank you!

Questions





Carondelet Neurological Institute at St. Joseph's Hospital carondelet.org

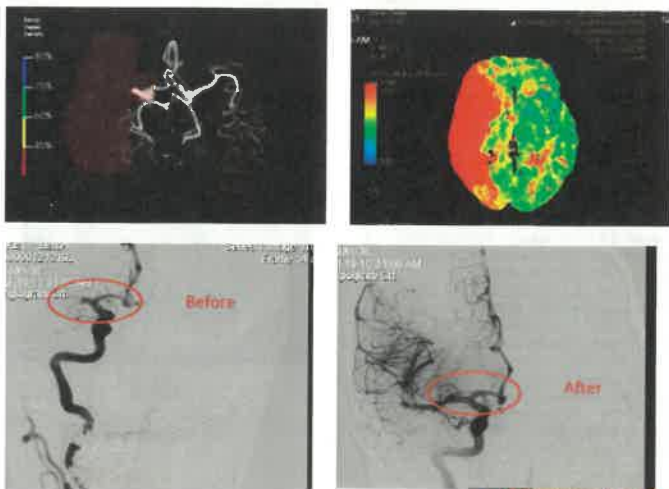
Brain Attack tPA Feedback: Carondelet St. Josephs Emergency Center

An 83 yo woman who while visiting with her daughter had sudden onset of difficulty speaking and facial drooping. EMS was called. PM 9 B shift responded. Her assessment was positive for possible stroke-like symptoms including facial droop, hemiparesis, slurred speech and weakness. She was brought immediately to Carondelet St. Joseph's as a stroke-alert. The Brain Attack Team received the patient and assessed her for stroke, her NIHSS was 16, showing a possible moderate stroke. Her head CT was negative and she was administered tPA 24 minutes from arrival. Her CTA/CTP showed a large vessel occlusion and she was taken urgently to Interventional radiology for clot retrieval. She had successful thrombectomy of her right MCA. She had complete resolution of her symptoms

	07/09/19	Goal (mins)	Actual (mins)
Registration Time:	0936		
Last known well time	0900		
Door to Physician Contact	0936	15	1
Door to CT	0948	15	12
CT done to CT Read	0955	15	7
Door to Lab Result	0936	20	1
Door to EKG Read	Done in route	45	n/a
Door to Drug (revised measure)	0936 \pm 1000	45	24



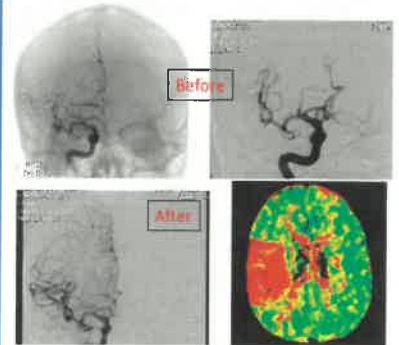
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Carondelet St. Joseph's Brain Attack 07/09/2019 carondelet.org

Brain Attack EMS Feedback Form: Carondelet Neurological Institute

An 86 year old man who went to bed normally. He got up around 2 am and did not feel "right", he was weak and had difficulty walking. His wife noted slurred speech and facial droop when we woke up later in the morning and called 911. EMS arrived and recognized his stroke-like symptoms. He was immediately brought to Carondelet St. Joseph's Emergency Department and was treated as a Brain Attack. He was out of window for tPA, however the CTA/CTP showed a large area that could be treated with mechanical thrombectomy. He was taken to the IR suite and had successful extraction of a clot. He had immediate improvement in his speech during the procedure. He has been monitored in the Neuro ICU at St. Joseph's. I am happy to report he now has no neurological deficits. He was discharged home.



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For every 30-minute delay in reperfusion in an ischemic stroke, the possibility of a favorable patient outcome decreases by 26 percent.



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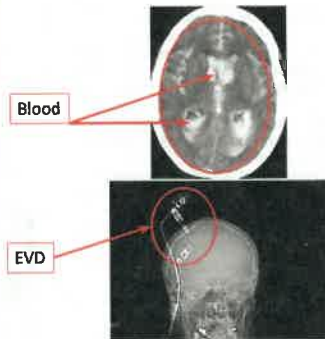
Additional Case Study Review



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Brain Attack EMS Feedback Form: Carondelet Neurological Institute

A 71 year old woman who had been having a severe headache and then suddenly became aphasic. Her husband called EMS. PM 16 assessed her. Although she began speaking again and the headache was subsiding, she was brought to Carondelet St. Joseph's Emergency Department for possible stroke. She began vomiting upon arrival. The Brain attack team evaluated her immediately and she was taken emergently for head CT. Unfortunately, the non-contrast head CT showed a diffuse subarachnoid hemorrhage, compatible with aneurysm rupture. There was bleeding also observed in the ventricles with early hydrocephalus. The patient's neurological status quickly deteriorated requiring intubation. Neurosurgery was consulted and an EVD was placed at the bedside. The plan was for the patient to go to the IR suite for coiling, however the family has since decided to make her comfort care only. The patient is exhibiting decorticate posturing at this time. Unfortunately this bleed has been catastrophic.



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EMS Feedback: Carondelet Neurological Institute

A 50 year old female with history of depression, daily alcohol and occasional cocaine use who was at work when she suddenly felt an intense headache and fell to the floor. Her boss called EMS who assessed her on scene. Her vitals were stable, she had no neuro deficits but complained of headache, nausea and vomiting. She was brought to Carondelet St. Joseph's for further evaluation. Her non-contrast head CT revealed a large volume subarachnoid hemorrhage with possible underlying aneurysm. She was evaluated immediately by Neurointensivist who started a nicardipine drip to lower her now high blood pressure. Neurosurgery arrived and placed emergent external ventricular device. She was evaluated in the IR lab the following day for coiling and had successful embolization of her aneurysm. She is being followed very closely in the Neuro ICU. She was discharged with no neurological deficits.



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