

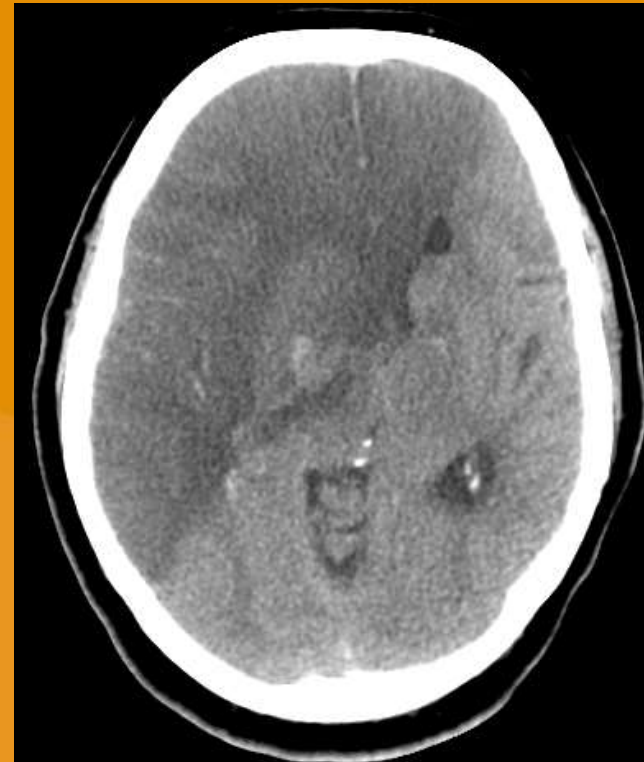
# Stroke Care in the ICU

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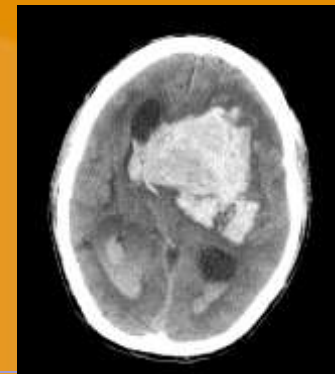
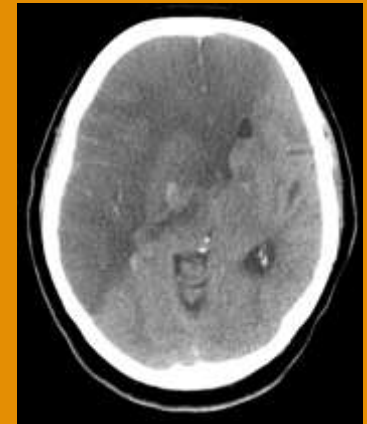
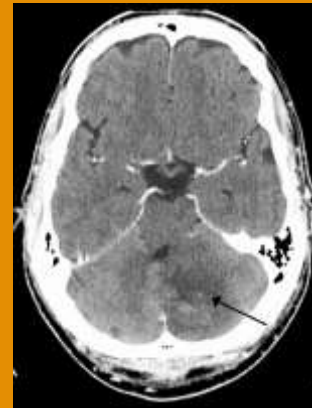
# Bedside Swallow Study

- A formal screening procedure for dysphagia should be performed in all patients before the initiation of oral intake to reduce the risk of pneumonia.
- **AND DOCUMENT IT 😊**



# Who needs intensive/critical care

- Post intervention: alteplase (tPA), thrombectomy
  - Can do outside of NCCU if support and training is right
- Large stroke territory
- Critical stroke territory
- Critical stenosis
- Comorbidities – NSTEMI, Aspiration, AKI, etc
- Head bleeds
  - Intracerebral hemorrhage
  - Subarachnoid hemorrhage



# Post intervention

## IV alteplase

- JCAHO specific for alteplase

### Activase postcare checklist

- Perform neurologic assessments** to monitor for neurologic deterioration. It is recommended that a full NIHSS assessment be performed on a patient upon admission.
  - « Every 15 minutes during infusion
  - « Every 30 minutes for 6 hours after infusion
  - « Hourly until 24 hours after infusion

- Vitals signs too
- Treat BP to keep < 180/105
- Monitor for major and/or minor bleeding
  - Major: intracranial, retroperitoneal, GI, or GU hemorrhages
  - Minimize arterial and venous punctures

# Post intervention

- If decreased LOC, neuro change, severe HA, N/V, acute hypertension, pupillary changes
  - Obtain Stat CT head, non contrast
- Obtain follow up CT scan or MRI at 24 hours BEFORE starting anticoagulants or antiplatelet agents.



# Post Intervention

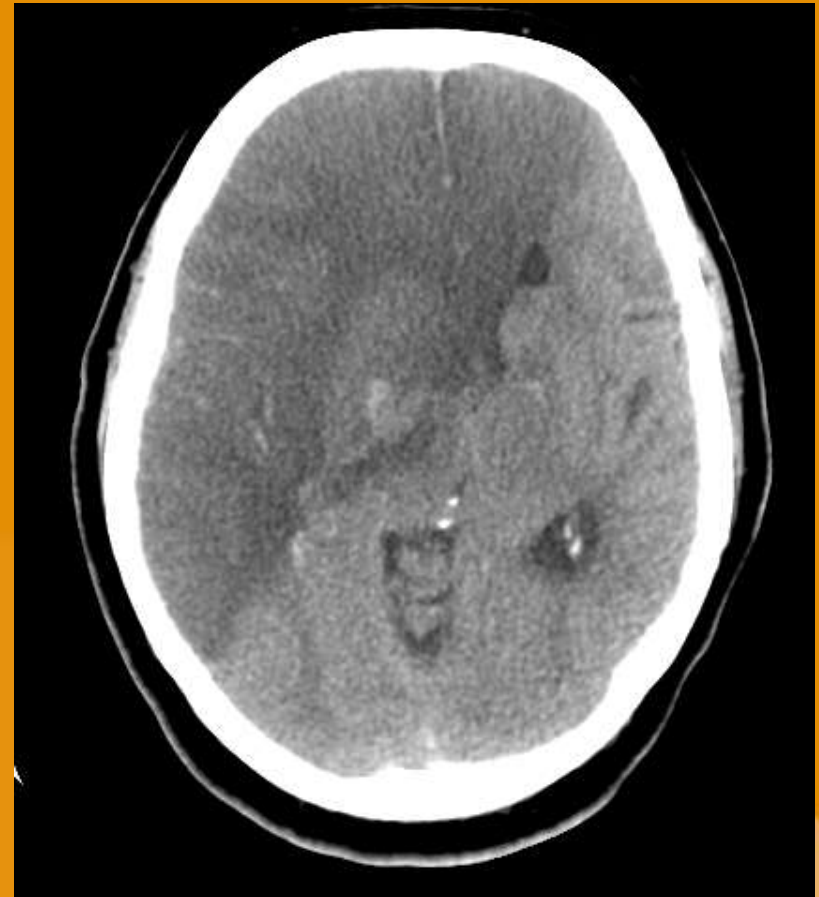
Don't forget thrombectomy!

- Standard of care for ischemic stroke with large vessel occlusion
- Close monitoring
  - risk for intracranial bleeding
  - Groin and/or retroperitoneal bleeds



# Large stroke territory

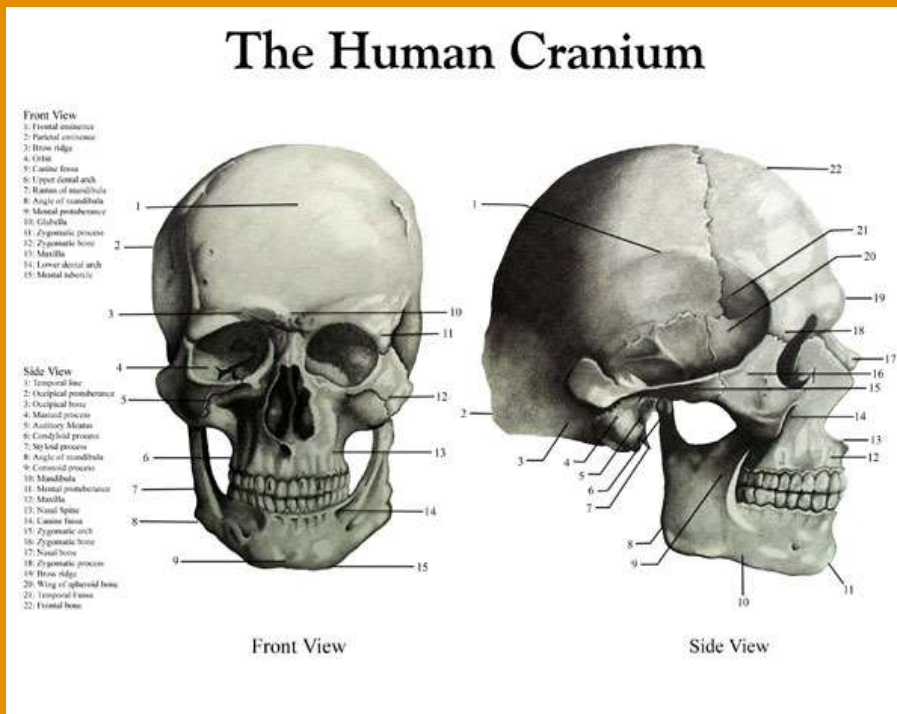
Middle Cerebral area =  $\frac{2}{3}$  of hemisphere





# Malignant Cerebral Edema

- Remember Monro-Kellie Doctrine



- 80% brain parenchyma
  - 10% blood – arterial and venous
  - 10% CSF
- = no room for anything else



# Cerebral Edema - cytotoxic

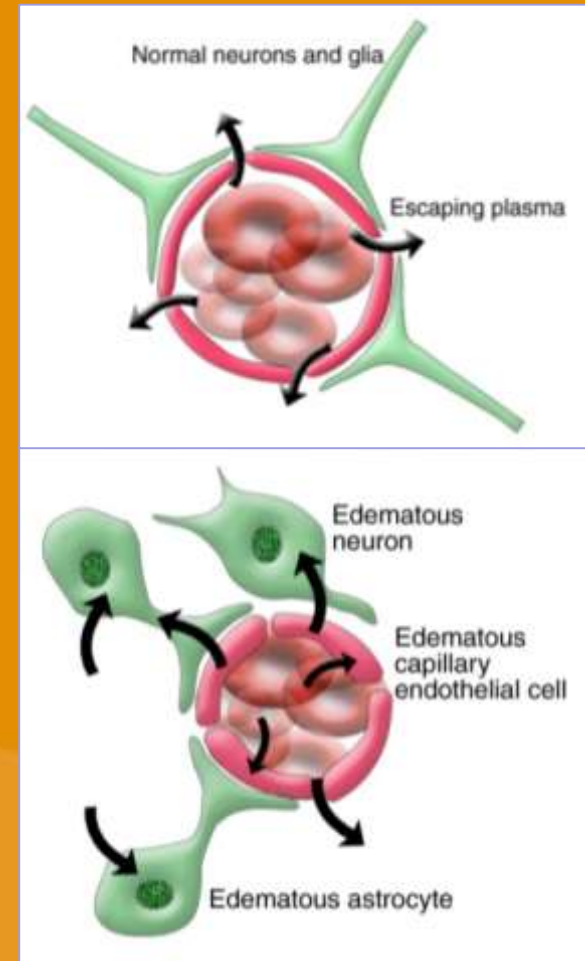
- When you see large stroke and/or early swelling ...
- Assess patient – may see worsening symptoms, progressive coma. Leads to other areas of ischemia, tissue displacement
- Treat it!
  - HOB up, Neck in neutral position, decrease stimulation



# Cerebral Edema Treatment

## Hyperosmolar therapy

- Brain is 77% water
- Mannitol IV 0.25mg- 1.5gm/kg every +/- 6 hours (filter)
  - Draw Osm and BMP before each dose
  - Give the dose
  - Calculate osmolar gap to decide about NEXT dose.
  - GAP >20 needs to have dose missed until GAP is <20
- Decrease doses to taper off to avoid rebound cerebral edema



# Cerebral Edema Treatment

## Hyperosmolar therapy

- 23.4% Saline 30 – 90 mL IV every +/- 6 hours
  - SLOW IV push 10 – 15 minutes (bradycardia, decreased CO)
  - Check BMP BEFORE each dose
  - Consider holding dose if Na >160
  - Central line unless emergency (herniating in front of you)
- Gradual decreasing doses to prevent rebound cerebral edema.



# Cerebral Edema Treatment

## Hyperosmolar Therapy

- 3% saline IV drip titrated to keep Na 145-155
  - Causes local vascular irritation
    - (bad if infiltrates)
    - Use central line if going to continue > 48 hours at higher rates
- Monitor Lab Values Carefully (watch where you draw labs from)
  - Na –K - daily
  - Mg - daily
  - Cl expect it to be elevated
  - Renal function

**Table 2. Infusion Nursing Society Recommendations for Minimization or Prevention of Vascular Damage from Extremes in Infusate pH or Osmolarity.**

Vessel	Blood Flow (mL/min) <sup>B</sup>	Osmolarity (mOsm/L)	Solution pH
Superior vena cava	2000	> 900	< 5 or > 9
Subclavian vein and/or proximal axillary vein	800	500 - 900	< 5 or > 9
Cephalic and basilic veins in the upper arms	40 - 95	< 500	5 - 9

# Cerebral Edema Monitoring

- Strict I/O
- Daily Weights
- Lung and skin assessments
- Monitor labs
- Excellent oral care
- Neuro assessment (obviously)



# Raised Intracranial Pressure

## Treatment

### Always:

- **HOB up > 30**
- **Neck in neutral position**
- **Breaks between cares**

CSF drainage

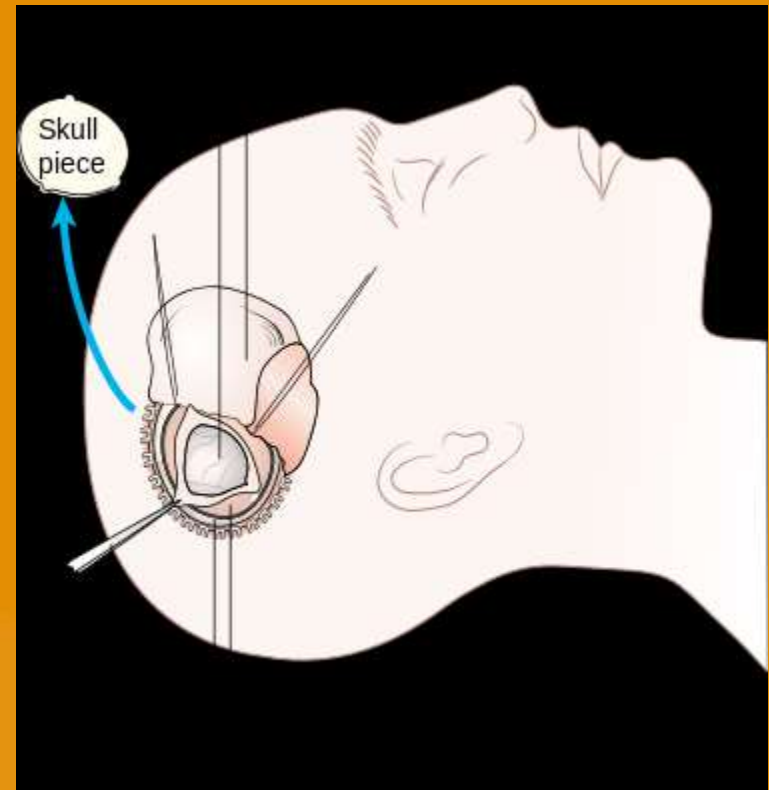
Osmotherapy

Barbiturates

Hyperventilation – briefly

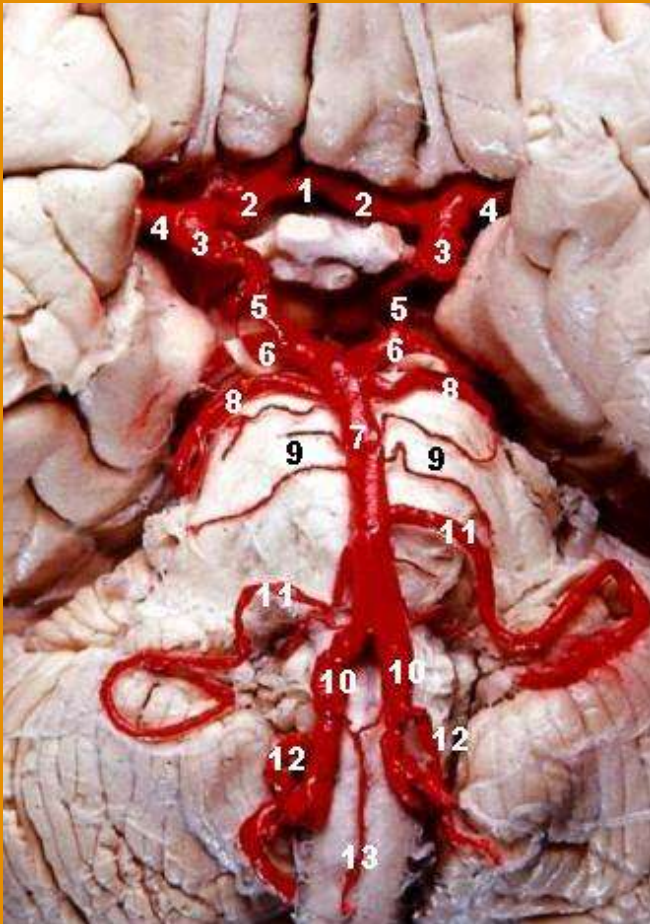
Craniotomy with evacuation

Craniectomy

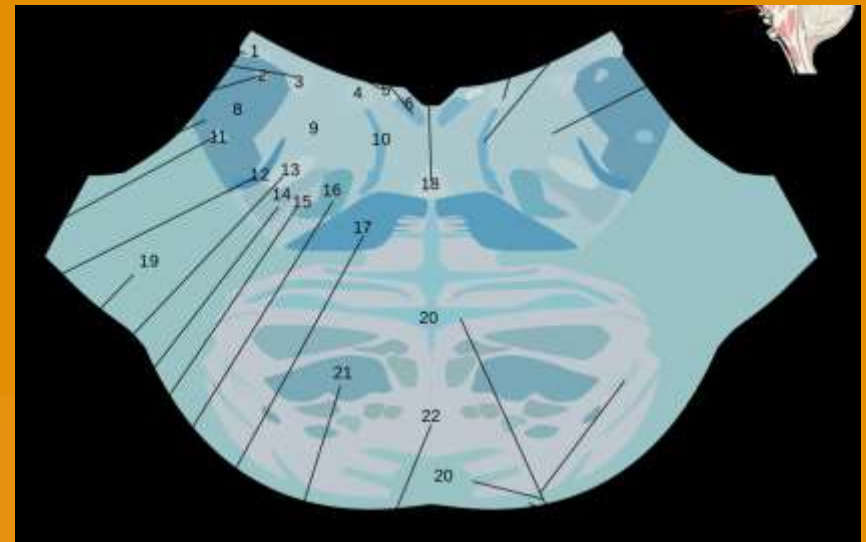




# Critical Stroke Territory



## Brain stem and cerebellum

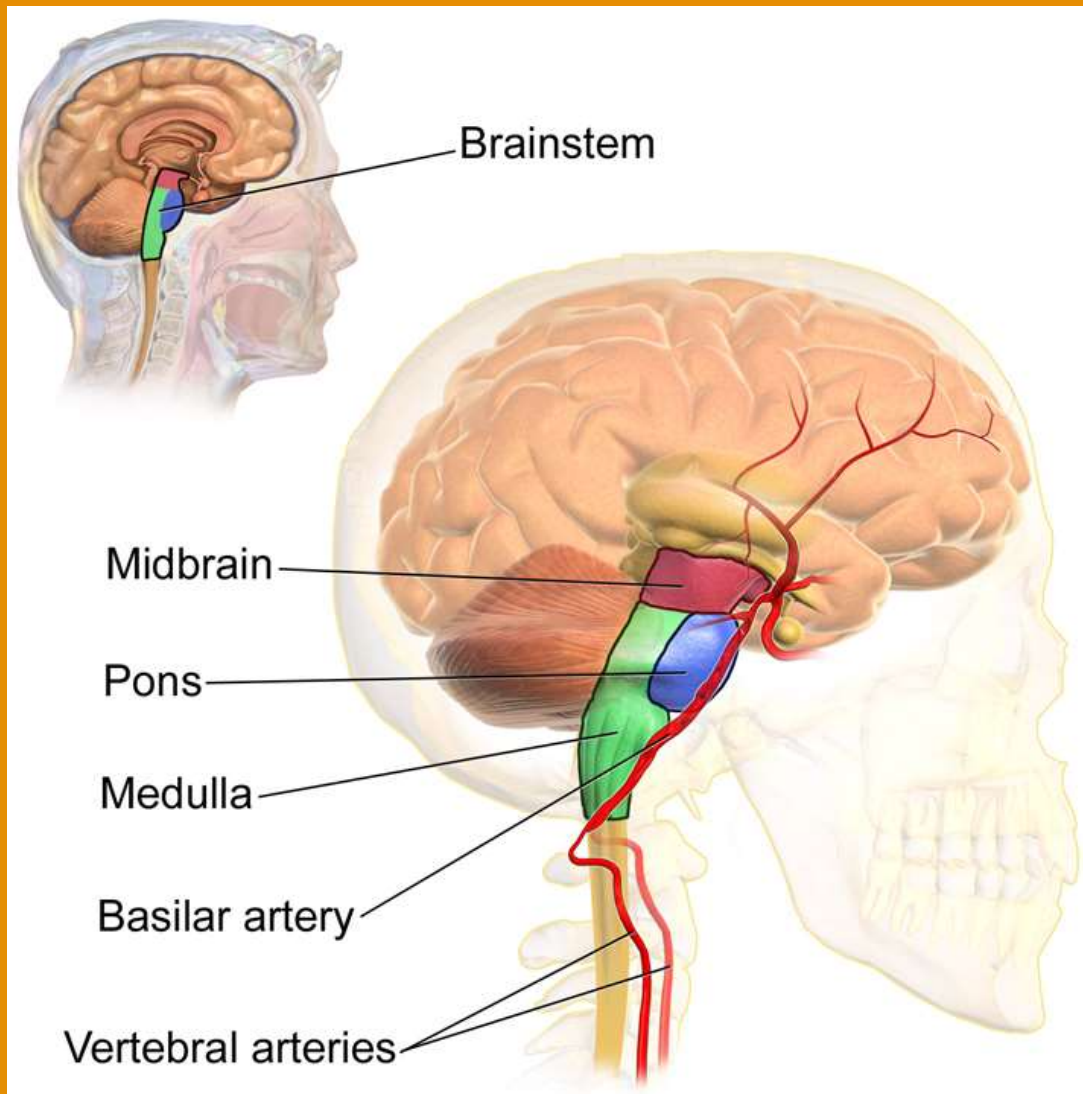


[https://en.wikipedia.org/wiki/Pyramidal\\_tract#/media/File:Lower\\_pons\\_horizontal\\_KB.svg](https://en.wikipedia.org/wiki/Pyramidal_tract#/media/File:Lower_pons_horizontal_KB.svg)

[https://en.wikipedia.org/wiki/Medial\\_pontine\\_syndrome#/media/File:Human\\_brainstem\\_blood\\_supply\\_description.JPG](https://en.wikipedia.org/wiki/Medial_pontine_syndrome#/media/File:Human_brainstem_blood_supply_description.JPG)

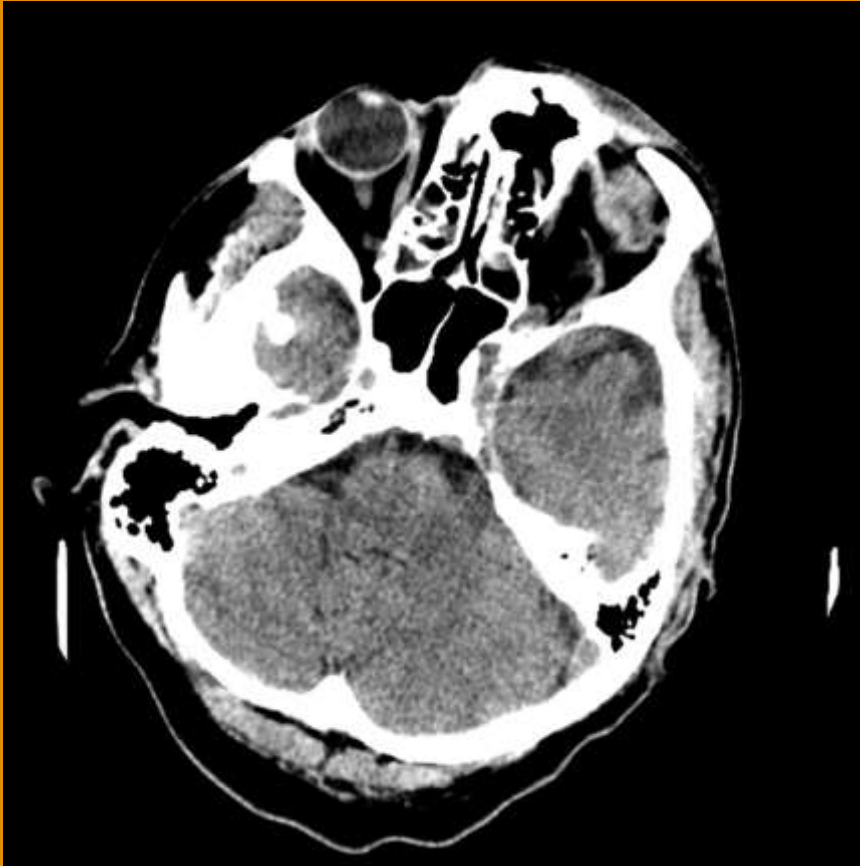


# Critical Stroke Territory

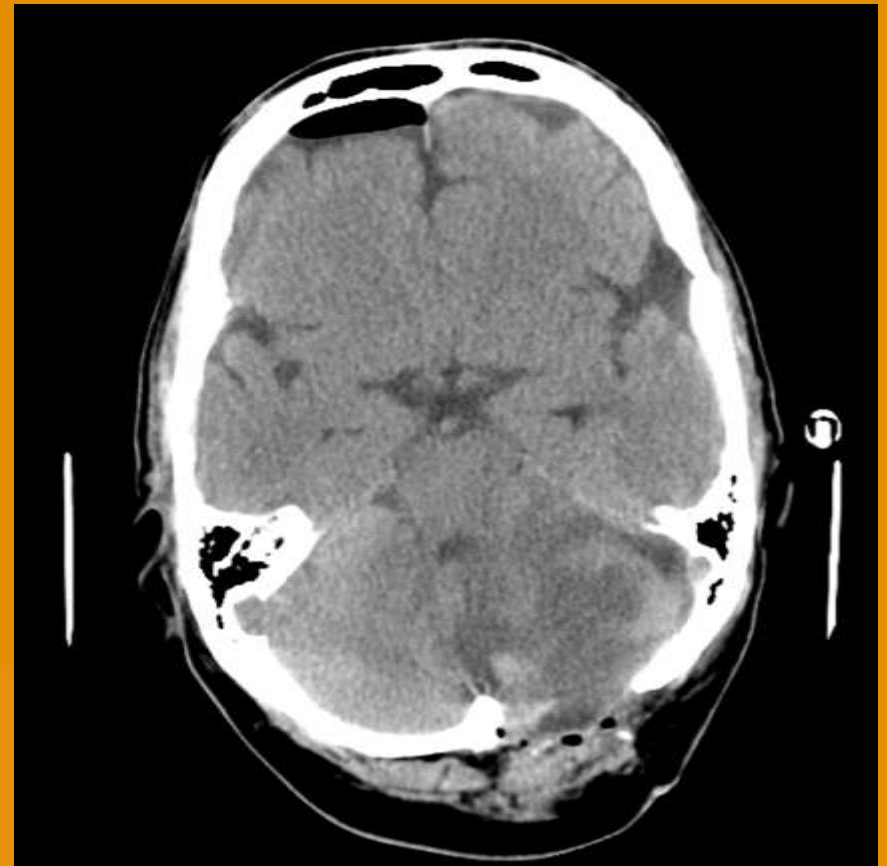


[https://commons.wikimedia.org/wiki/File:Blausen\\_0114\\_BrainstemAnatomy.png](https://commons.wikimedia.org/wiki/File:Blausen_0114_BrainstemAnatomy.png)

# Critical Stroke Territory

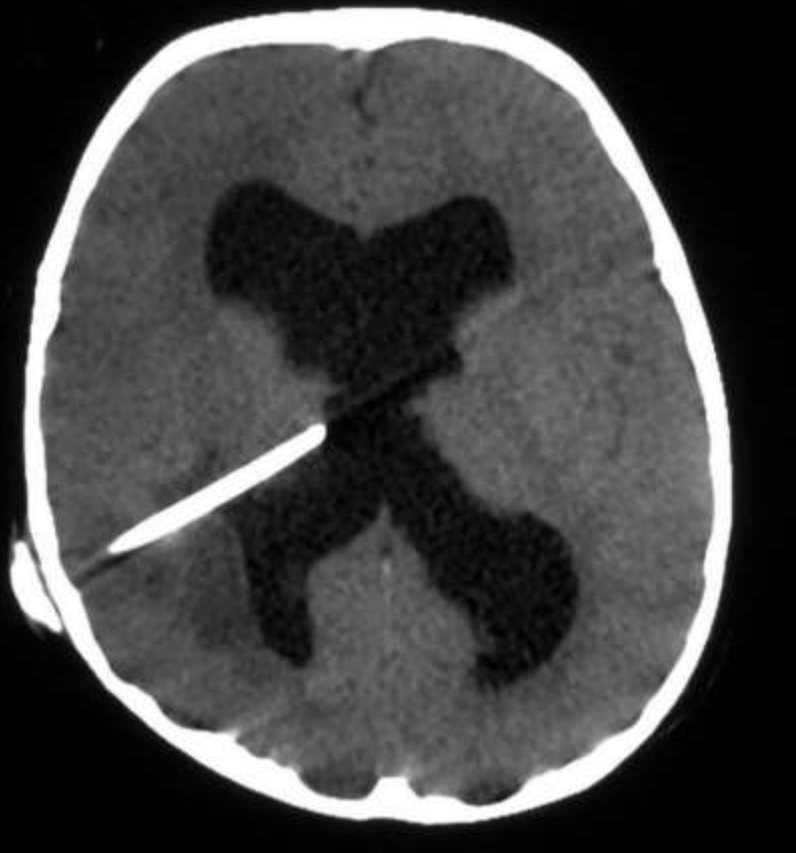


August 8



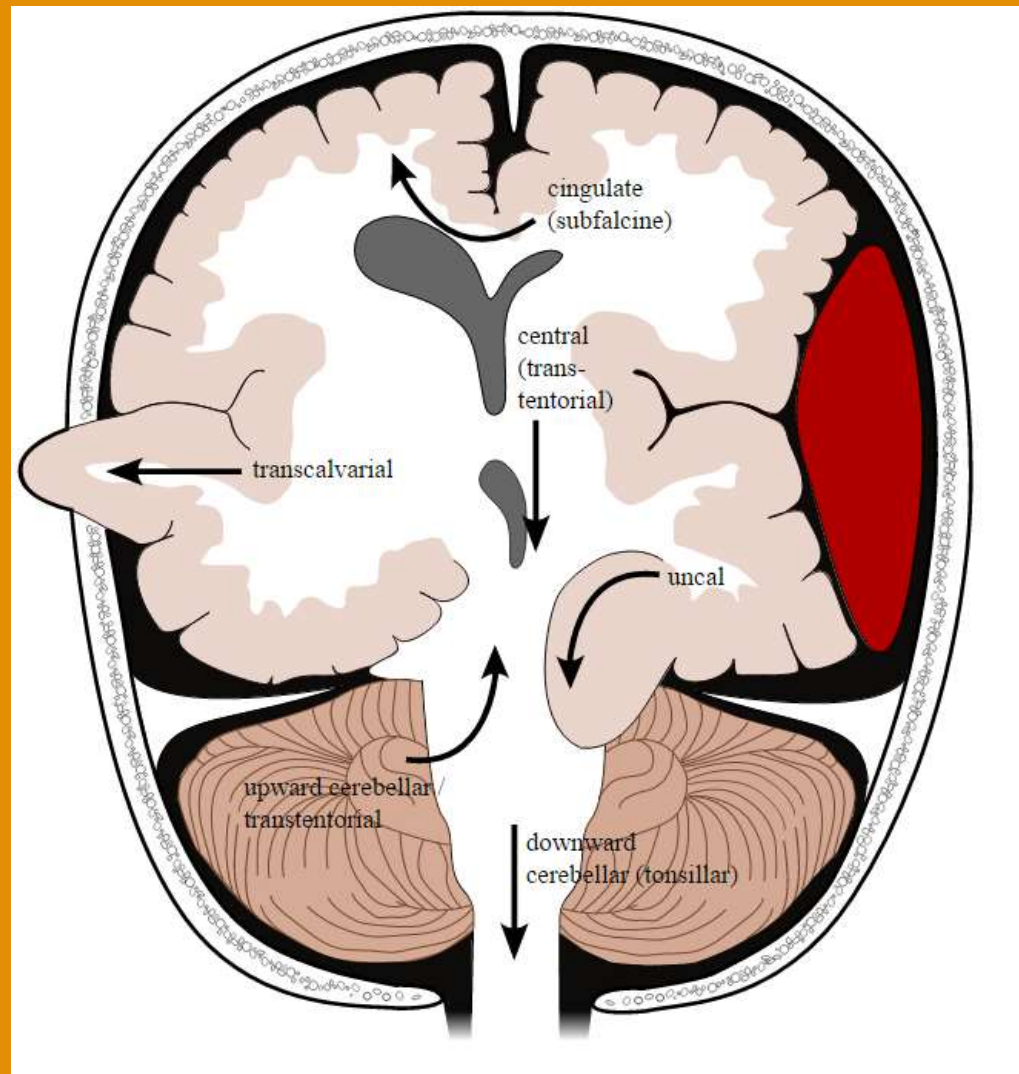
August 10

# Hydrocephalus



- Brain drain AKA ventriculostomy or EVD
- Needs critical care monitoring
  - Prevent over-drainage, monitor waveforms
  - Check ICP
  - Drainage actually treats ICP

# Once it's too late its just too late



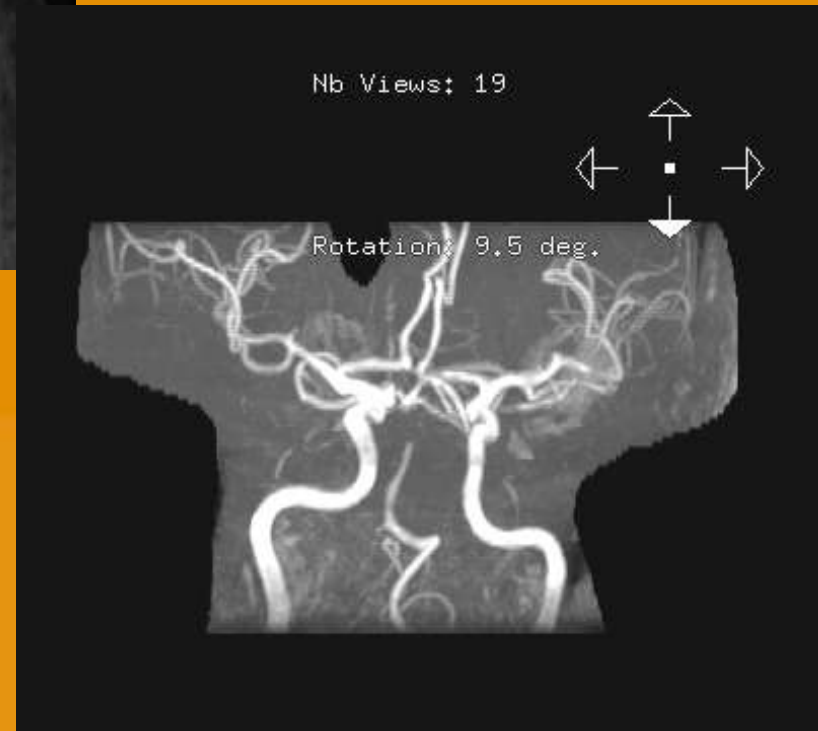
[https://upload.wikimedia.org/wikipedia/commons/7/79/Brain\\_herniation\\_types-2.svg](https://upload.wikimedia.org/wikipedia/commons/7/79/Brain_herniation_types-2.svg)

# Hanging on by a thread

– critical stenosis

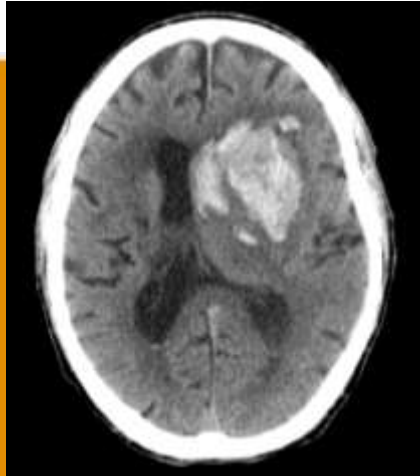


- Frequent monitoring
- Might get intervention if symptomatic again
- Maybe heparin gtt with close monitoring

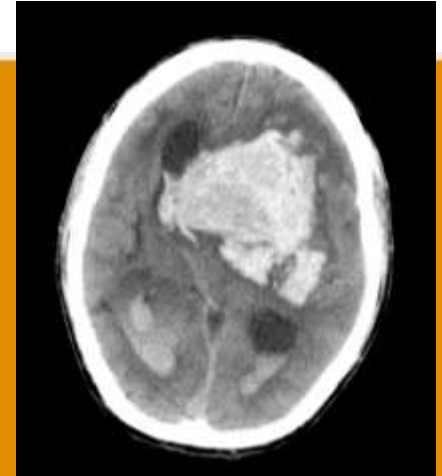




# Don't forget...



## Intracerebral Hemorrhage (ICH) is a stroke

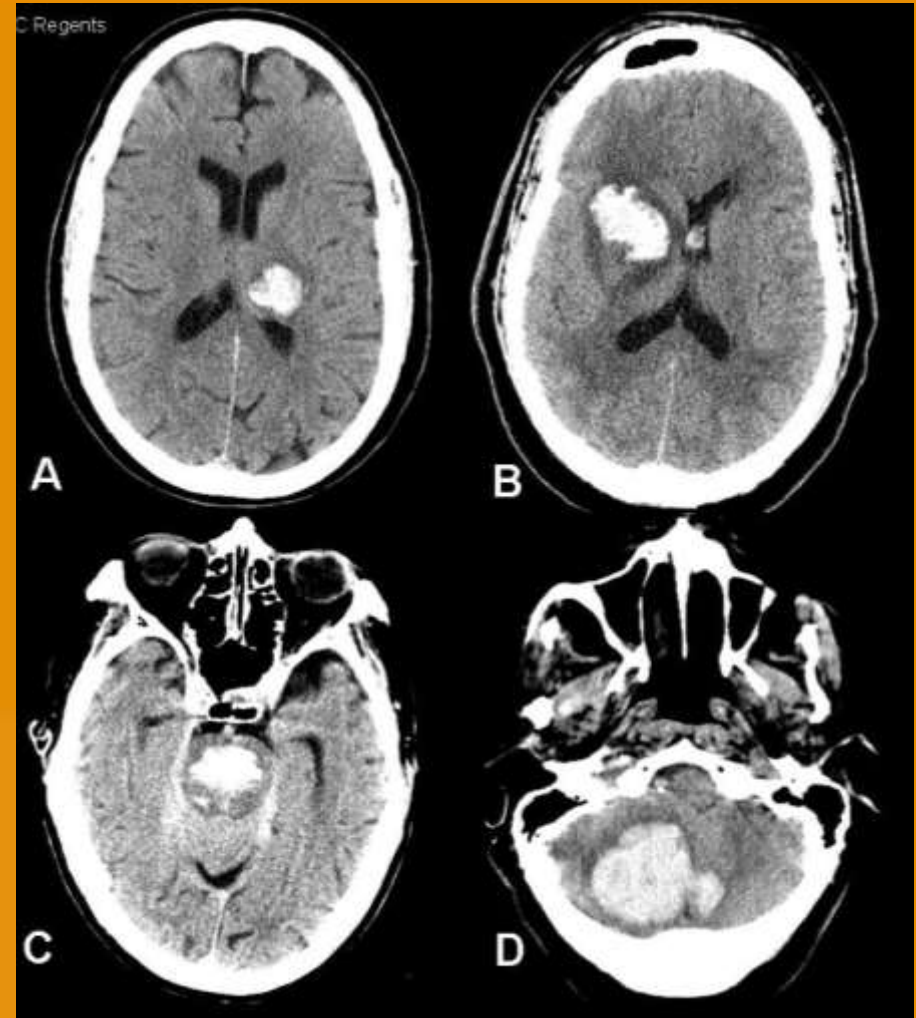


- ICH is a medical emergency
- Rapid diagnosis and attentive management of patients with ICH is crucial, because early deterioration is common in the first few hours after ICH onset.
- More than 20% of patient will experience a decrease in the GCS of 2 points or more between EMS and ED
- Another 15-23% demonstrate continued deterioration within the first hours after hospital arrival.

# ICH: Initial Management

- AB-CT
- SBP goal less than 140 or 160

Monitored and treated as often as every 5 minutes



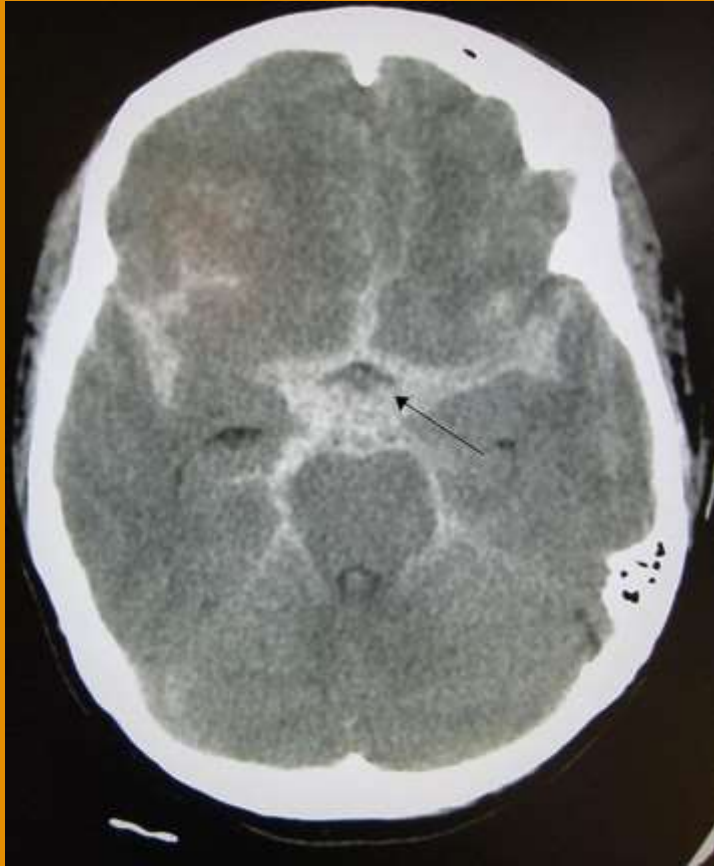


# ICH while on anticoagulation

- Vitamin K, FFP @ 10-15 mL/kg
  - FFP side effects
- aPCC –
  - Replaces clotting factors II, VII, IX, X (FEIBA or Kcentra)
  - Decreases INR faster and with much lower volume
- Factor VII – replace factor VII, used in association with vit K and FFP (rarely used anymore)
- Protamine for Heparin.
- Antiplatelets: can do desmopressin and/or platelet transfusion – but not recommended



# Subarachnoid hemorrhage



<https://commons.wikimedia.org/wiki/File:SAH1.JPG>

Usually severe HA “worst HA of my life”

- AB – CT
- SBP goal less than 140 -160
- Reverse anticoagulation
- CTA look for aneurysm
- Cerebral Angiogram –look for aneurysm
  - Can coil aneurysm or
  - May need crani for clipping
- Long SAH lecture

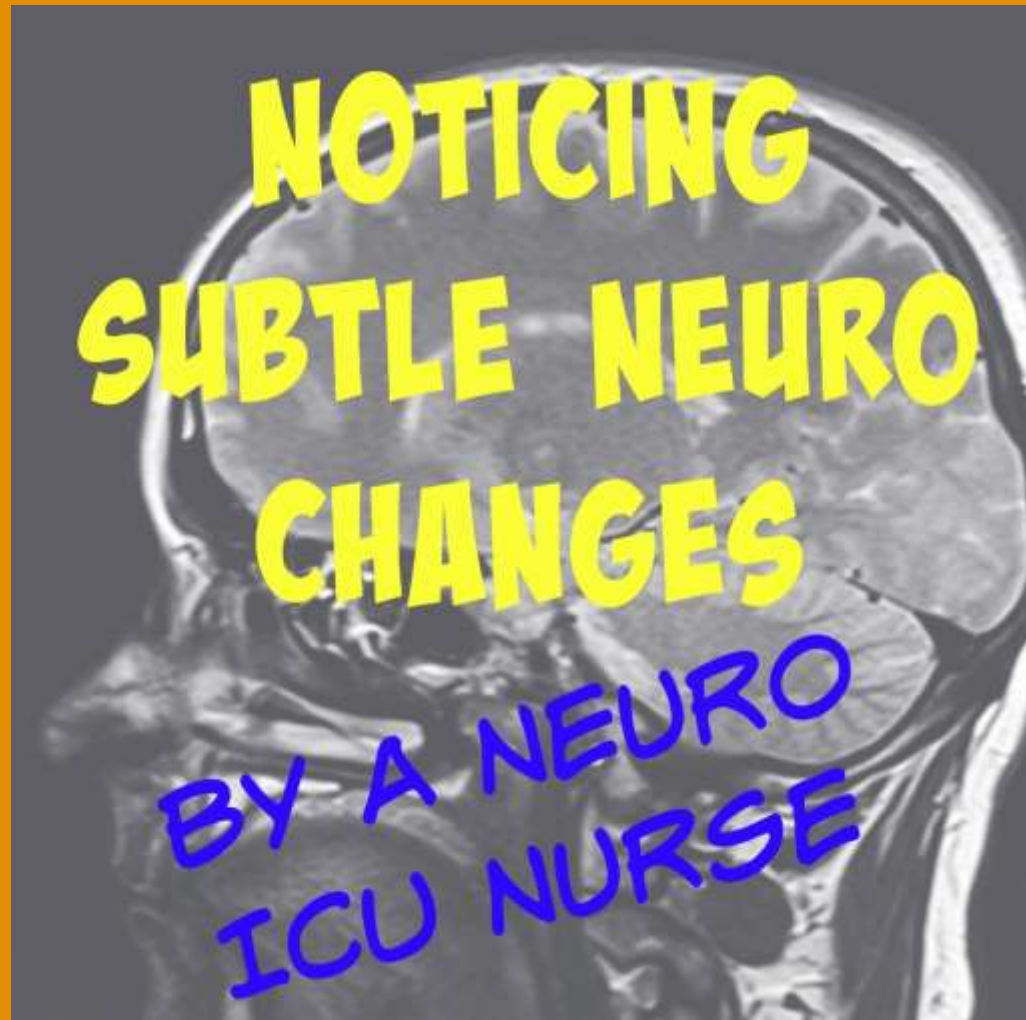
# The Basics for all

<https://www.flickr.com/photos/125892716@N05/14583652276>

- DVT prophylaxis
- Early mobility
- PT/OT/SLP
- Glucose management
- Fever management
- Prevent complications
- Treat seizures
- Recognize problems early



<http://www.nurseeyeroll.com/2015/02/24/noticing-subtle-neuro-changes/>



# References

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- My brain