

Emergent Care of Cerebrovascular Disaster

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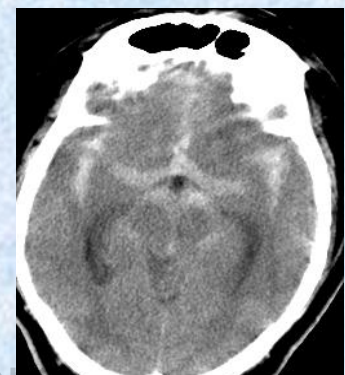
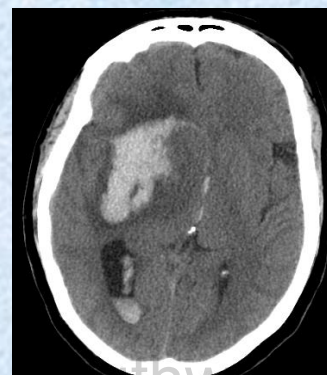
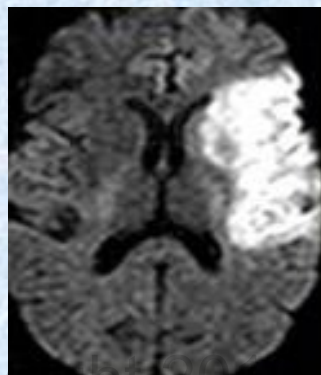
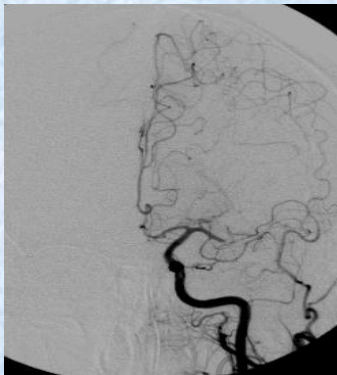
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From nothing else but the **brain** came joys, delights, laughter and jests, and sorrows, griefs, despondency and lamentations. And by this, in an especial manner, we acquire wisdom and knowledge, and see and hear and know what are foul, and what are fair, what sweet and what unsavory...

-Hippocratic

Introduction

- A stroke occurs when the blood supply to the brain is interrupted or there is bleeding in the brain.
- Like heart attack, stroke is a medical emergency.
- Stroke is also called cerebrovascular accident (CVA)
- Stroke is the leading cause of adult disability and the third leading cause of death in the U.S.



Emergent Care of Acute Stroke

1. Call 911 for any of the following symptoms

- Sudden, severe headache
- Numbness, weakness, or paralysis of the face, arm, or leg
- Trouble speaking or understanding
- Dizziness, nausea, vomiting, loss of balance, or fall
- Blurred or decreased vision
- Difficulty swallow
- Sudden confusion

Emergent Care of Acute Stroke

2. Airway protection

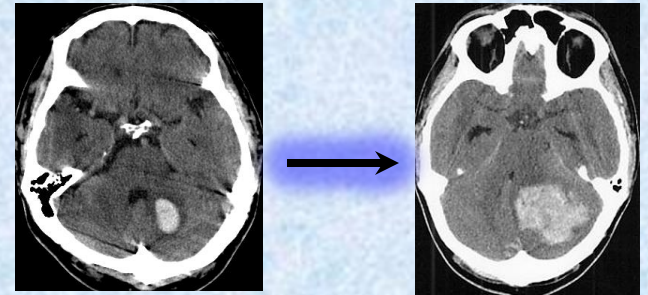
- Intubate patient if any of the followings:
 - Coma: GCS < 8
 - Apnea
 - Airway obstruction/unable to clear secretions
 - Labored breathing

Emergent Care of Acute Stroke

3. Circulation

i) Treatment of Hypertensive Emergency

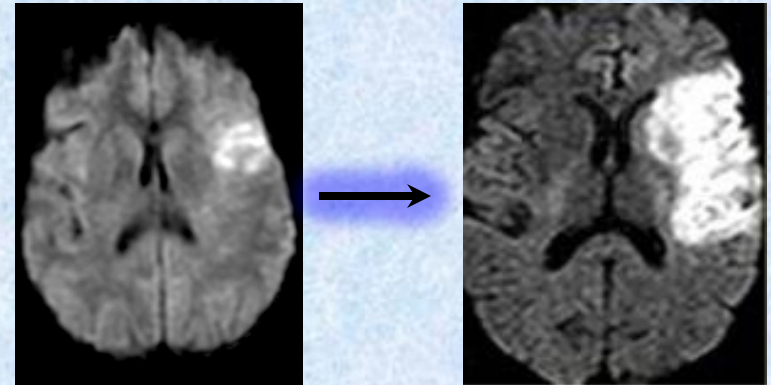
- Hypertensive emergency
 - Increases risk of rebleed or hematoma expansion
 - Limits the use of t-PA
- SBP goal
 - Keep SBP < 185 for all acute stroke patients
 - Keep SBP < 160 for hemorrhagic stroke patients
- Treatment of choice
 - Labetalol 5-20 mg iv q30 min prn
 - Hydralazine 10-20 mg iv q23 min prn
 - Nicardipine 5-15 mg/hr infusion



Emergent Care of Acute Stroke

ii). Treatment of Hypotension

- Hypotension (SBP <90)
 - Very common after intubation
 - Reduces brain perfusion
 - May increase the size of stroke
- Urgent treatment
 - Normal saline 500 cc to 1000 cc iv bolus
 - Reduce sedation (propofol, versed...)
 - Start pressors (Neosynephrine or dapamine infusion...)
 - Slight hyperventilation to reduce PaCO₂ retention



Emergent Care of Acute Stroke

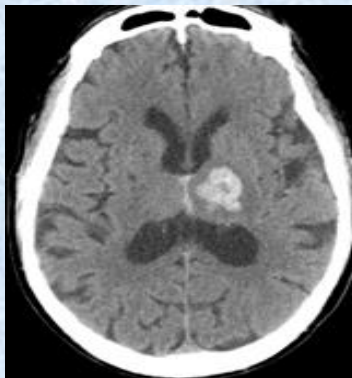
4. Seizure Management

- Lorazepam (Ativan) 2 mg iv push q 2min prn, up to 4-6mg/hr
- Fosphenytoin or Phenytoin loading (15-20 mg/kg iv, @50 mg/min)
- In case of dilantin allergy or hemodynamic instability
 - Valproic acid 20 mg/kg iv loading
 - or Keppra 1000 mg iv q12h
- If still seizing, intubate patient and start one of the followings:
 - Midazolam 2-4 mg iv loading, followed by infusion (2-10 mg/hr)
 - Propofol 1-2 mg/kg loading, then 2-10 mg/kg/hr

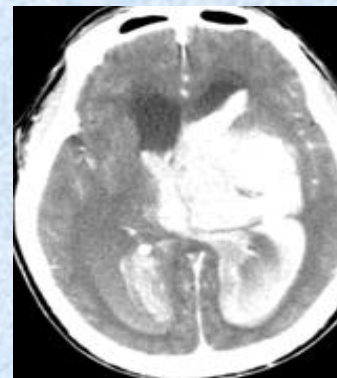
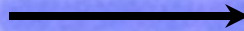
Emergent Care of Acute Stroke

5. Reversal of Coagulopathy from Warfarin use or hepatic failure

- Recombinant Factor VIIa 20-80 $\mu\text{g}/\text{kg}$ iv push x1
 - + Vitamin K 10 mg iv daily x 3 days
- Prothrombin complex concentrates (PCC) 15-50 units/kg iv x 1
 - + Vitamin K 10 mg iv daily x 3 days.
- FFP 2 units q6h x 24h
 - + Vitamin K 10 mg iv daily x 3 days.



INR 4.5



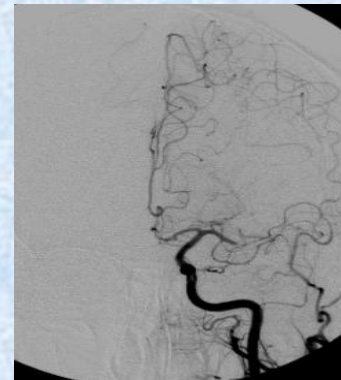
6). General Management

- Keep head of bed up 30-45 degree unless hypotension.
- Hydrate patient with normal saline (1cc/kg)
 - *No* D5 or D5W.
- Treat severe headache with morphine sulfate (1-2 mg) or fentanyl (25-50 µg).
- Treat nausea and vomiting with Zofran or Reglan.
- Adequate sedation if patient is intubated and agitated.

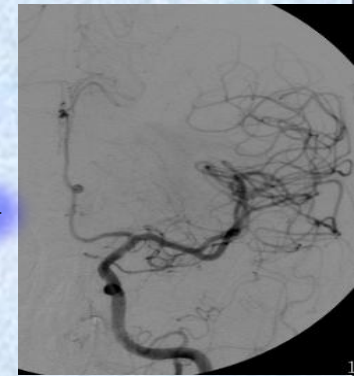
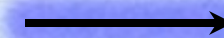
Emergent Treatment of Ischemic Stroke

1). Thrombolysis

- IV-tPA (0.9 mg/kg)
 - Within **4.5** hrs of symptom onset
 - NIHSS > 4
 - No bleed or major infarction on CT
 - INR <1.7
- IA-tPA (10-20 mg)
 - Within **3-6** hrs of symptom onset
 - NIH stroke scale >10
 - MCA or basilar artery occlusion
 - No signs of major infarction on CT



tPA



2). Mechanical Embolectomy

i). MERCI Retriever Device:



ii). The Penumbra system:



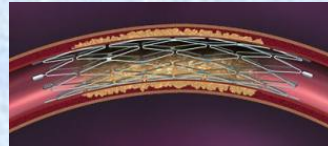
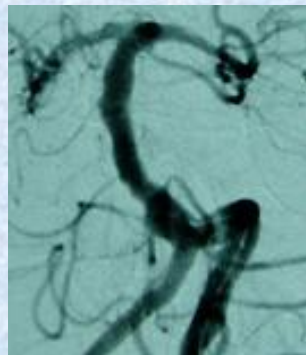
Yu W et al. Neurology. 2003;61:1441

Wade WS et al. Stroke. 2005;36:1432

Bose A et al. AJNR 2008, 29:1409-1413

- Clot removal from large artery
- Indicated within **8 hrs** of symptom onset.
- For patients ineligible for thrombolysis

3). Angioplasty and Stenting

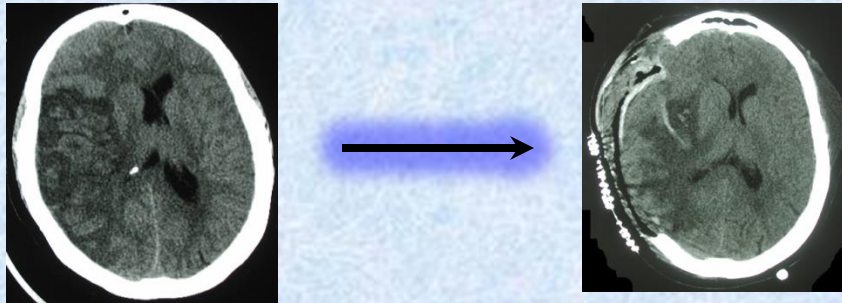


Pre-stenting Post-stenting

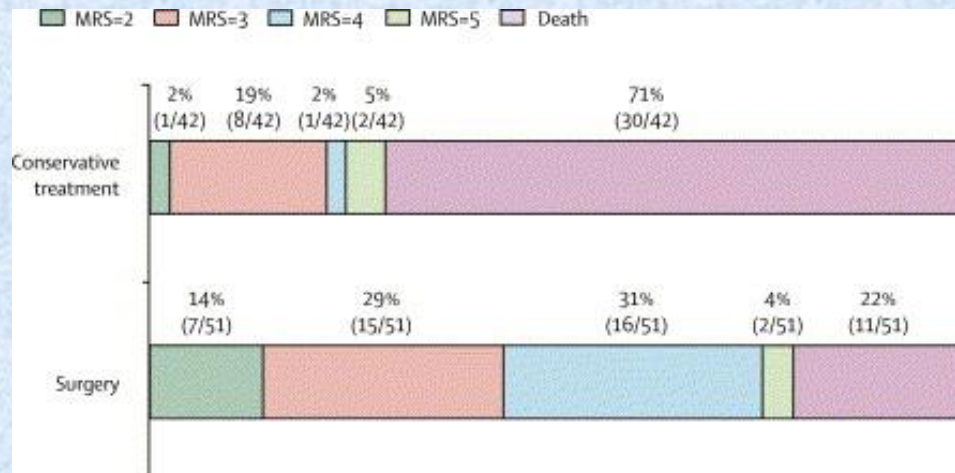
- Angioplasty and stenting for symptomatic intracranial stenosis.
- 16.7% major complications in patients with basilar artery stenosis.

Yu et al. Neurology 2005; 64:1055.

4). Hemicraniectomy for MCA Stroke



- 3 clinical trials: DECIMAL, HAMLET, and DESTINY.
- 93 patients randomized to surgical or medical therapy.
- Age ≤ 60 years old, timing of surgery < 48 hrs after stroke onset.
- Better outcome at 1 yr.

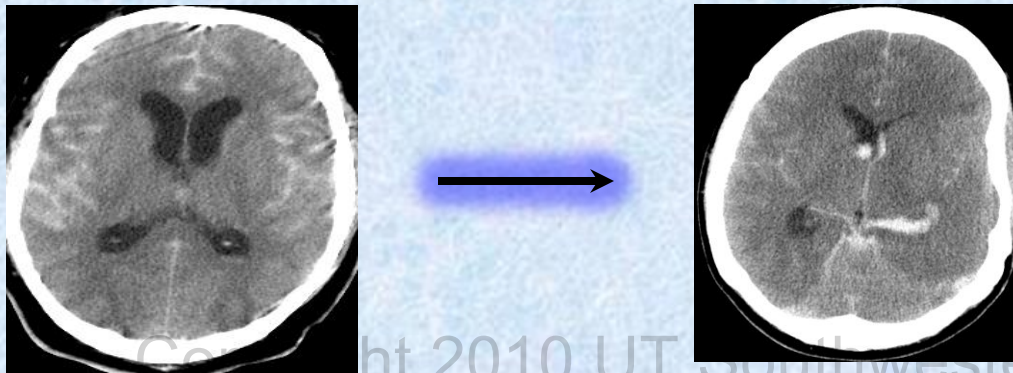
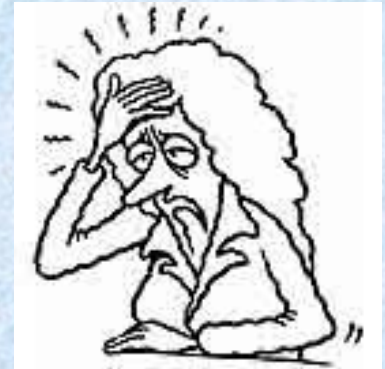


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Vahedi K, Hofmeijer J, Juettler E, et al. *Lancet Neurology* 2007;6(3):215-22

Subarachnoid Hemorrhage (SAH)

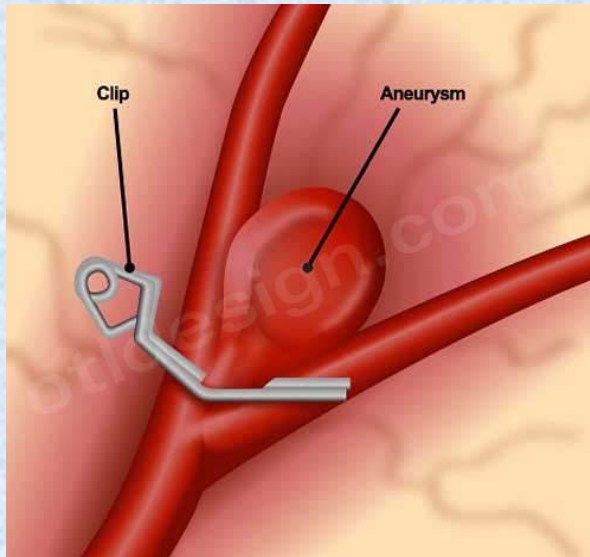
- Sudden severe headache
- **No** Aspirin/ibuprofen or other NSAIDs.
- Patient may have intact neurological examination
- Mortality can be as high as 50%
- Hospital ED evaluation with CT head ASAP



Urgent Treatment of Ruptured Aneurysm

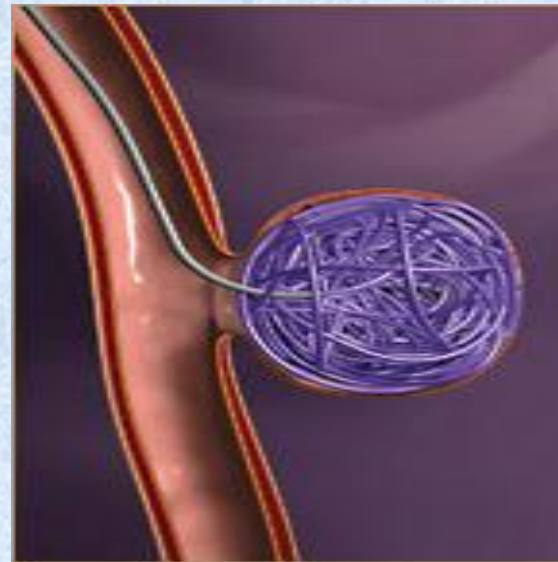
- **Surgical clipping**

- Require craniotomy
- Better for large or broad neck aneurysm
- Lower risk of re-bleed.

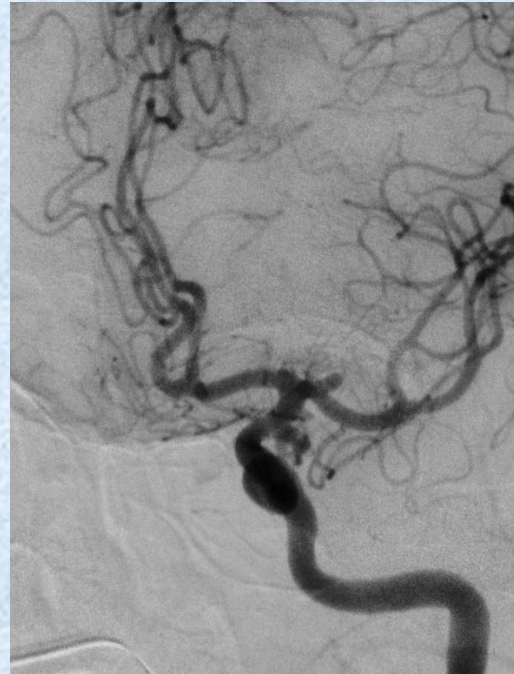
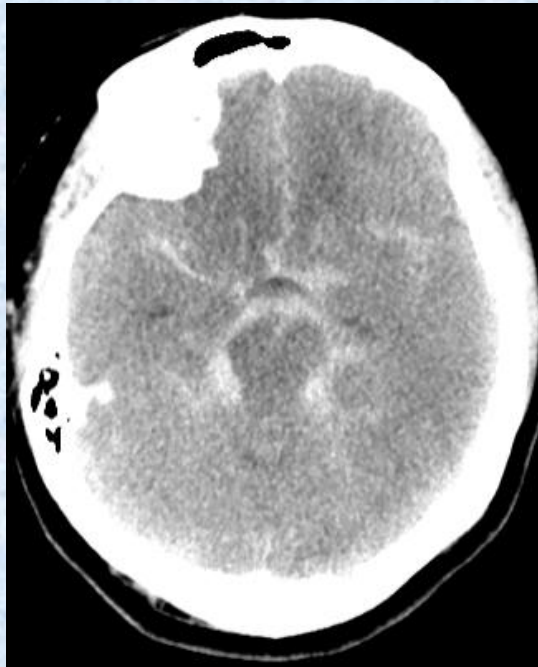


- **Endovascular coiling**

- Less invasive
- Slightly higher recurrence
- Better for basilar apex aneurysm



46 year old woman with family history of SAH presented with severe headache 2 weeks ago. She recovered well following clipping of 4 aneurysms at left ICA/MCA



The Team

Vascular Neurology	Vascular Neurosurgery	Endovascular Neurointervention	Neurocritical Care
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Robin Novakovic, MD		Jonathan White, MD	
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