Spontaneous Intracerebral Hemorrhage

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Objectives

- Etiology
- Initial management, prehospital and ED including imaging
- Treatment including management of hypertension, reversal of AC, avoidance of secondary injury, and importance of nursing cares
- Management of intracranial hypertension
- Rehab
- Case Study

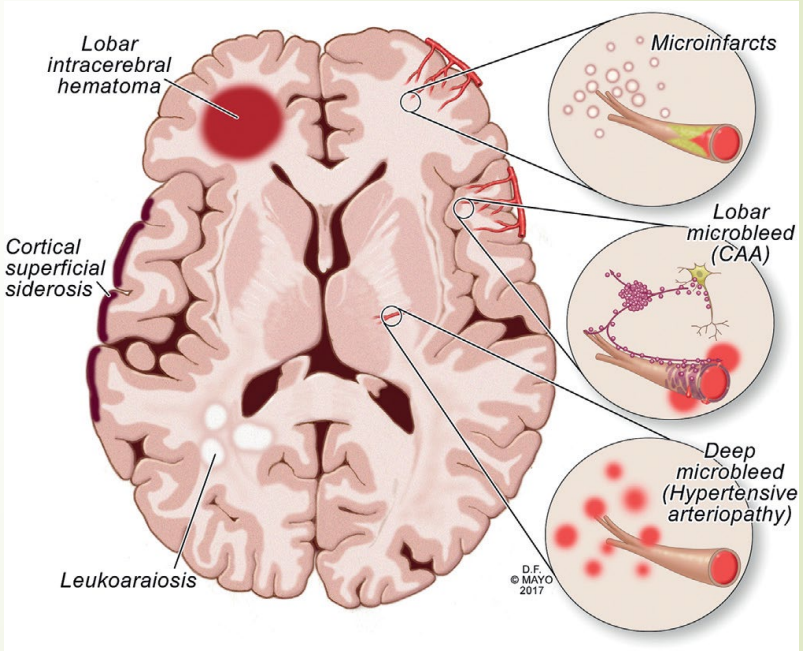
What is nontraumatic spontaneous intracranial hemorrhage

- Blood accumulation within the brain parenchyma
- Second leading type of stroke
- Global burden is higher than ischemic (death and disability)
- Several etiologies, including hypertension, cerebral amyloid angiopathy, and vascular causes

Etiologies

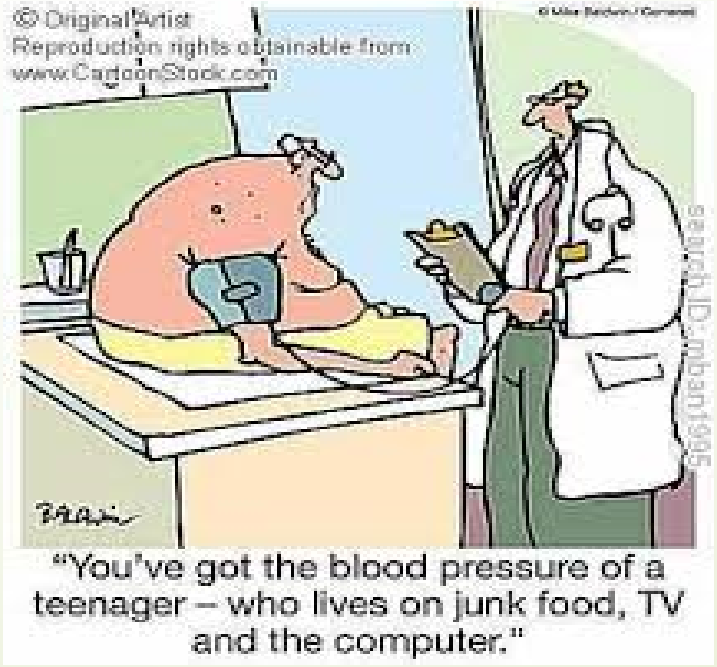
- Hypertension (arteriolosclerosis)
- Cerebral amyloid angiopathy
- Vascular- AVM, DAV, Aneurysm
- Others- hemorrhagic infarct, tumor, sepsis, moyamoya, etc..

(Greenberg et al., 2022) (Hemphill et al., 2015)



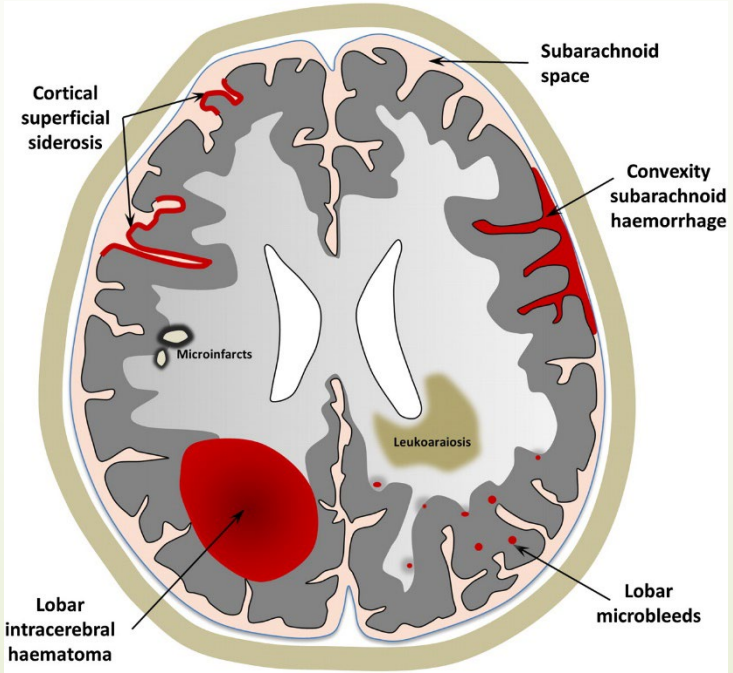
Hypertension

- Most common cause
- Hypertensive- typically associated with the blood vessels which feed off the major cerebral arteries (90 angle)- feeding pons, midbrain, and thalamus



Cerebral Amyloid Angiopathy

- older patients with **lobar** hemorrhage
- CAA- amyloid tissue deposits on vessel wall and weakens the vessel
- Can distinguish CAA vs hypertensive in older person by location



Signs and Symptoms of ICH

- Impossible to determine hemorrhagic vs ischemic (without imaging)
- Based on size and location
- Symptoms typically associated with ICH (rapidly progressing)
  - Vomiting
  - SBP >220
  - Severe headache
  - Coma, decreased LOC

Prehospital management

- Very important- 20% decline in the time between EMS and ED evaluation
- Early treatment → improve long term outcomes
- Primary goal- Airway management, CV support, and transport
- Secondary goal- focused history including timeline, medical history, and medication history
- Notify hospital in advance

(Greenberg et al., 2022) (Hemphill et al., 2015)

Evaluation

- History
  - Time and characteristics of symptoms
  - Risk factors?
  - Meds
  - Recent surgery/trauma
  - Illicit drugs
  - Liver disease
  - Kidney disease
  - Diabetes

Evaluation

- P/E
  - VS
  - Neurological exam- NIHSS, NIHf, GCS
  - Baseline severity score (ICH score)

1a—Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b—Level of consciousness questions: What is your age? What is the month?	0 = Answers two questions correctly 1 = Answers one question correctly 2 = Answers neither questions correctly
1c—Level of consciousness commands: Open and close your eyes Grip and release your hand	0 = Performs both tasks correctly 1 = Performs one task correctly 2 = Performs neither task correctly
2—Best gaze	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation
3—Visual	0 = No visual lost 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4—Facial palsy	0 = Normal symmetric movements 1 = Minor paralysis 2 = Partial paralysis 3 = Complete paralysis of one or both sides
5—Motor arm Left arm Right arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
6—Motor leg Left leg Right leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7—Limb ataxia	0 = Absent 1 = Present in one limb 2 = Present in two limbs
8—Sensory	0 = Normal; no sensory loss 1 = Mild-to-moderate sensory loss 2 = Severe-to-total sensory loss
9—Best language	0 = No aphasia; normal 1 = Mild-to-moderate aphasia 2 = Severe aphasia 3 = Mute; global aphasia
10—Dysarthria	0 = Normal 1 = Mild-to-moderate dysarthria 2 = Severe dysarthria
11—Extinction and inattention	0 = No abnormality 1 = Visual, tactile, auditory, spatial, or personal inattention 2 = Profound hemi-inattention or extinction
Score = 0–42	

Severity Score- ICH score

Communication tool and grading scale to evaluate for 30 day mortality

- GCS
- ICH Volume
- IVH
- Location
- Age

Intracerebral Haemorrhage

ICH Score (Hemphill et al.)

Feature	Finding	Points
GCS	3-4	2
	5-12	1
	13-15	0
Age	>=80	1
	<80	0
Location	Infratentorial	1
	Supratentorial	0
ICH volume	>=30cc	1
	<30cc	0
Intraventricular Blood	Yes	1
	No	0
ICH SCORE		0-6 points

ICH Score	30 Day Mortality
0	0%
1	13%
2	26%
3	72%
4	97%
5	100%
6	100%

Evaluation

- Labs
  - **COAGS**
  - CBC
  - Kidney function tests
  - Glucose
  - Cardiac markers
  - UA/culture

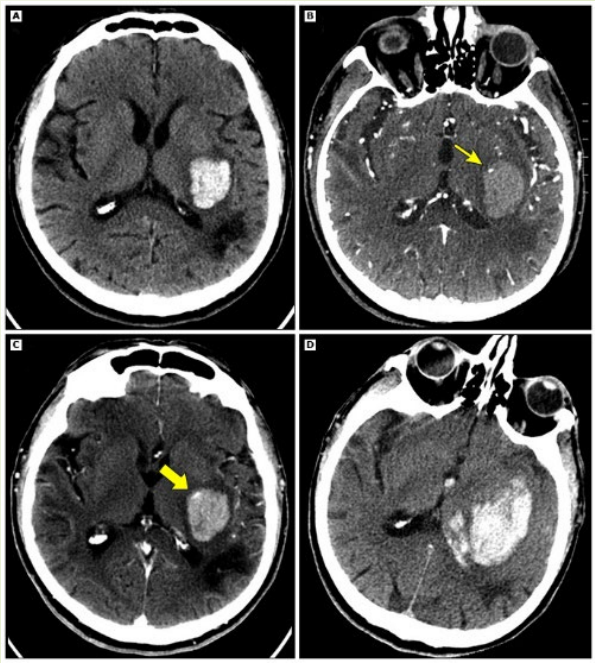
(Greenberg et al., 2022) (Hemphill et al., 2015)

Imaging

- CT head wo- gold standard (quick, high sensitivity)
- MRI
- CTA, MRA- evaluate for vascular cause,
- spot sign with increased risk of HE and worsening outcomes
  - Aneurysm
  - AVM
  - Catheter angiogram if high suspicion for vascular cause

(Greenberg et al., 2022) (Hemphill et al., 2015)

(Rordorf & McDonald, 2022)



Treatment

- **Treat hypertension**
- Reverse coagulopathy
- Prevent hematoma expansion and secondary brain injury or complications

- Corrected INR and SBP < 160 within 4 hours has shown reduced rates of hematoma expansion (Hemphill et al., 2015)

BP management

- VERY IMPORTANT to improve outcomes and reduces hematoma expansion!
- Presenting SBP 150-220, safe to lower to SBP 130-140 (<130 can be harmful) (Greenberg et al., 2022)
- Smooth reduction of BP- Nicardipine infusion
- **It is safe to reduce SBP to 140 in patients who presented with SBP 150-220 (Class IA evidence) (Interact2 study)- improved outcomes and QOL**

(Hemphill et al., 2015)

Reversal of AC

- **Warfarin-** vitamin K, 4 factor PCC (kcentra), FFP

  For warfarin induced: Kcentra and Vit K d/t transient nature of PCC
- **Pradaxa**- Praxbind, PCC, HD (if praxbind not available)
- **Xarelto, Eliquis –** Andexxa, Kcentra (4 factor activated PCC)- ongoing studies
- **Heparin**- Protamine
- **Plavix**- DDAVP (Don't give platelets unless going to surgery- 1 unit, PATCH trial)

(Greenberg et al., 2022) (Rordorf & McDonald, 2022)

Preventing secondary injury & hematoma expansion

- Hematoma expansion occurs in up 1/3 of ICH- poor function outcome
- HE independent predictor of poor outcomes (Rordorf & McDonald, 2022)
- Increased glucose→ Increased mortality and poor outcomes
  - Avoid hyper and hypo-glycemia

- Treat fever (prolonged fever leads to worse outcomes, could relate to hematoma growth)
  - r/o infectious causes

- Seizure
  - Treat if patient has a seizure
  - Altered mental status + EEG findings- AED
  - Decreased MS out of proportion- continuous EEG
  - No prophylactic AED

  (Hemphill et al., 2015)

DVT prophylaxis

- SCD (compression stockings are not adequate)
- Early mobility

- After documented stable CT, may start SQ heparin or Lovenox on PBD 1-4
- Known symptomatic DVT/PE- heparin gtt vs IVC filter

(Hemphill et al., 2015)

Medical complications

- Pneumonia
- Aspiration
- Respiratory failure
- PE
- Sepsis
- Heart failure- MI, stress induced cardiomyopathy, etc

  Formal dysphagia screen

  ECG and cardiac markers after ICH

- 50 % of deaths after stroke attributed to these medical complications, with increase mortality (Hemphill et al., 2015)

Nursing Care

- ICU
- Frequent monitoring and exams
- Protocols for treatment of ICP, BP, fever, and glucose
- Positioning, early mobilization, and oral care
- Nurses care for ICH should be trained in GCS, NIHSS

DNR

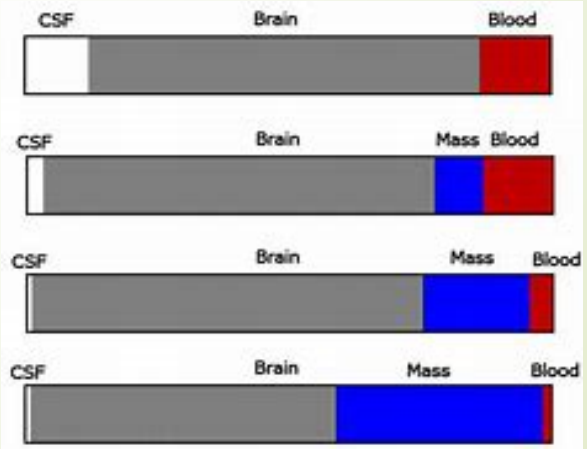
- Discuss after 2nd full hospital day
- Self fulfilling prophecy
- Unless patient already has DNR status, and this should not decrease medical cares
- Reiterated in the recent 2022 guidelines

(Hemphill et al., 2015)

"My name is Daniel Nathan Reed. I don't initial anything."

ICP

- Monroe Kelly Doctrine
- Brain parenchyma (80%), CSF (10%), Blood (10%)in a rigid compartment. Increase in 1 component must have a decease in the another.
- Body will compensate for a period of time, then ICP will rise (Blood, CSF, or brain will discplace)
- Normal ICP 5-15, >20 elevated
- CPP= MAP - ICP



S/S elevated ICP

- Mental status change
- N/V/Headache
- Noted on bedside monitor ☺
- Pupillary changes
- Posturing
- Cushings triad

Treatment for ICP

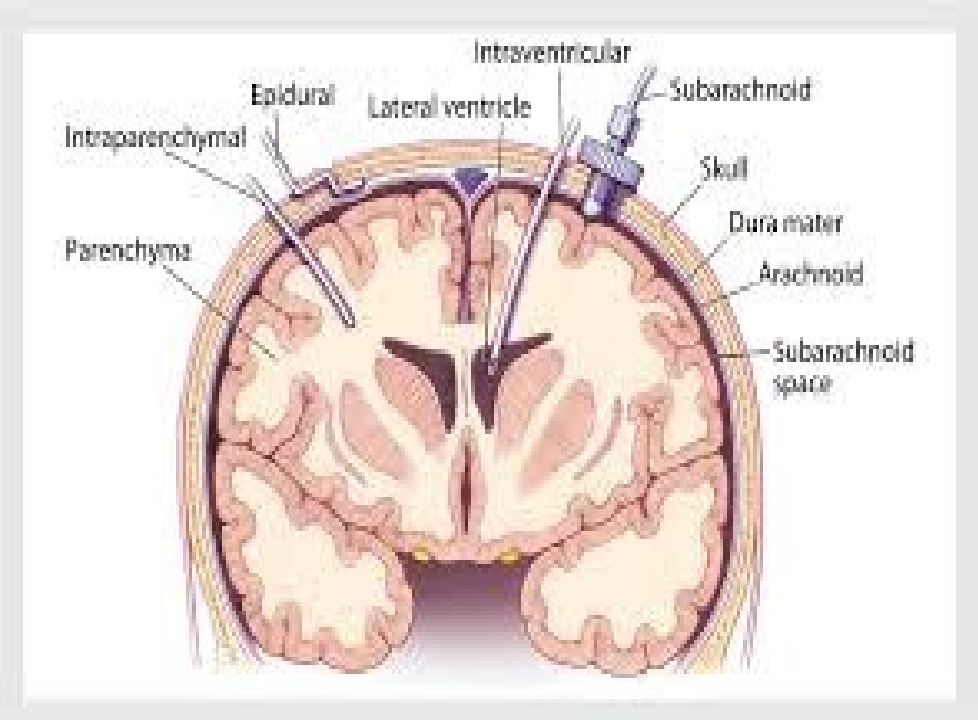
- Nursing cares, VERY IMPORTANT
  - Elevate HOB
  - Neck straight alignment
  - Check cervical collar
  - Reduce pain/anxiety
  - Prevent shivering
  - Treat fever

Neurosurgical intervention

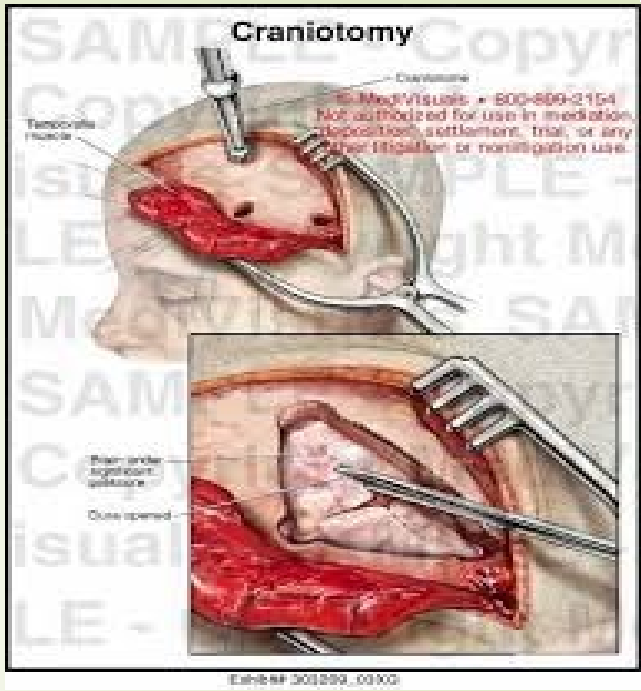
- Mannitol, Hypertonic saline
- ICP monitor: EVD vs Bolt
- Decompressive craniectomy

When to measure ICP

- EVD for treatment of hydrocephalus
  With decreased LOC (IIA evidence)
- GCS < 8
- Herniation
- Patients with intraventricular hemorrhage may benefit from intraventricular TPA. (Greenberg et al., 2022)



Surgery- When to operate



- ***Hemorrhage removal is a life saving procedure.***
- ***Generally not found to improve***

  long-term functional outcomes
- For supratentorial hemorrhage-
  - For nontraumatic- not generally recommended
  - STICH I- Will surgery improve mortality and functional outcomes?
  - STITCH II- What if it's superficial?
  - STITCH I, STITCH II, and MISTIE- no clear data that outcomes improve with surgery, can be considered "life saving"
  - DC – again, not well studied

(Greenberg et al., 2022)

Surgery- When to operate

- Posterior Fossa
  - > 15cc (Greenberg et al., 2022)
  - Worsening neuro exam
  - Hydrocephalus from obstruction
  - Brainstem compression

Prevention of Recurrent ICH

- Review patient specific risk factors
- SBP < 130/80- modify BP immediately after bleed (Selim, 2022)
- Etoh < 2 drinks/day, no illicit drugs, tobacco use
- Treat OSA
- Resume AC uncertain, wait 4-8 weeks in patients w/o mechanical heart valves. Aspirin can be started following days, IF needed. Antiplatelet w/ valve may be started after stable CT head. (Selim, 2022)

Rehab

- Multidisciplinary rehab
- Reasonable to start within 24-48, NOT first 24 hours
- Continue rehab into a community program
- Monitor closely for depression (Greenberg et al., 2022)

Case Study

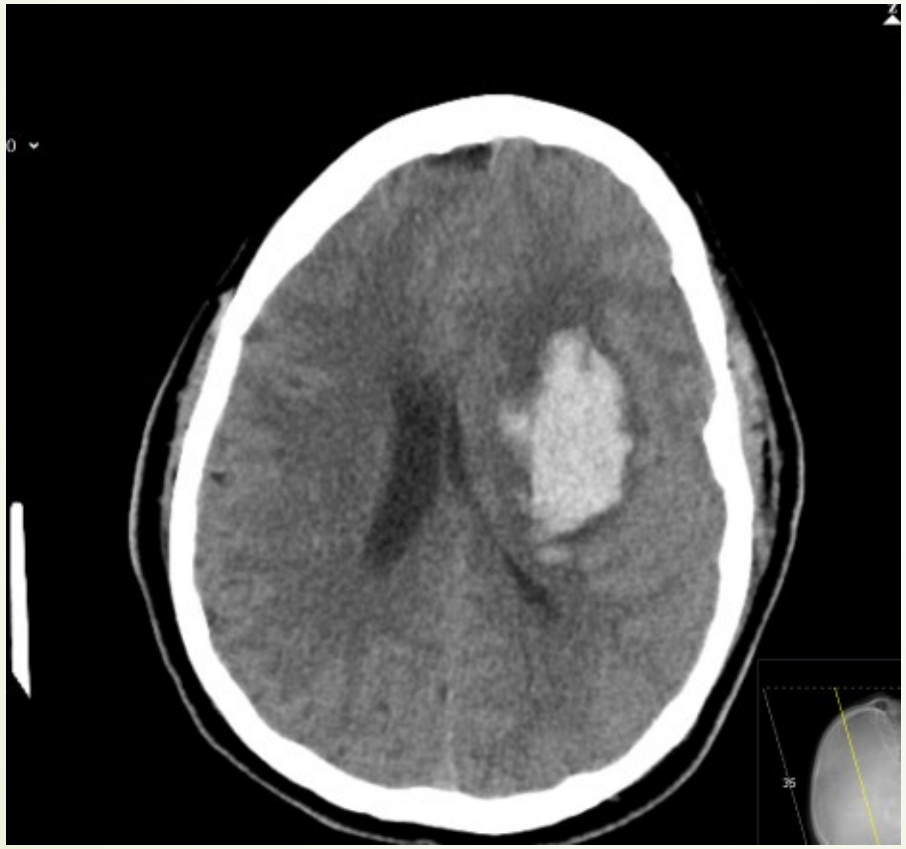
- 49-year-old male presented via EMS after being found down by his wife
- PMH: hypertension- untreated, no PCP
- Meds: No prescription medications, multiple supplements and diet pills

Initial presentation- Obtunded, moving the left arm and leg spontaneously, densely plegic on the right. Sonorous respirations with apnea.

Case Study: Evaluation

- Exam: VS: BP 214/131. Initial NIHSS 25, GCS 8. Densley plegic on left.
- Labs (p): INR 1.1
- CT: large left basal ganglia ICH measuring 6.3 cm x 2.6 cm, significant mass-effect and effacement of the left lateral ventricle, 1 cm left on right.
- ICH score: 2 - estimated 30 day mortality of 26%

Case Study: Evaluation



Case Study: Treatment

- Cardene infusion to keep SBP <140
- Intubated for airway protection
- Taken emergently to the OR for decompressive craniectomy

Case Study: ICU care

- Hourly neuro checks
- Hypertonic saline, sodium goal 145-150
- Cardene infusion for SBP <140
- Oral Norvasc initiated
- POD 2- extubated
- Exam- Aphasic, facial droop, densely plegic on right
- Complication with external hydrocephalus required an LP shunt
- Ultimately dc'd to rehab.
- 6 month follow up- remained densely plegic, but at home and remaining mobile with wheelchair

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