

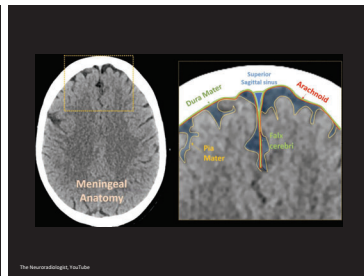
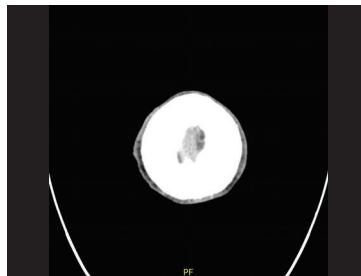
# BRAIN BLEEDS

(Part I: Of the Traumatic Type)

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Associate Professor of Clinical Emergency Medicine and  
Neurology, University of California San Francisco

### Disclosures

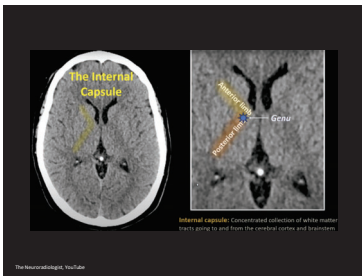
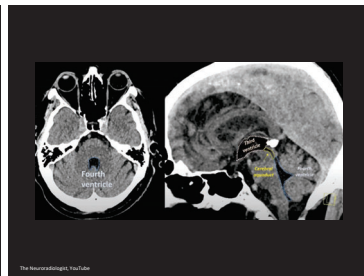
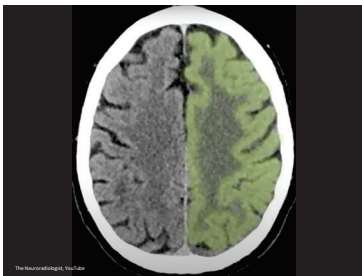
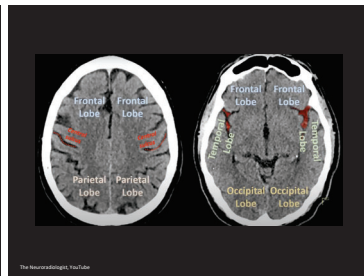
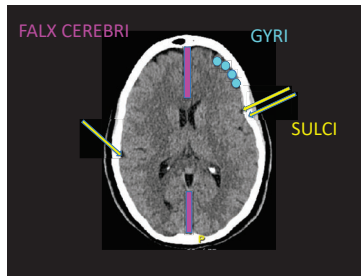
- Funded by Abbott Laboratories to advance development of Abbott's TBI test for diagnosis and determination of severity of brain injury in adults and children



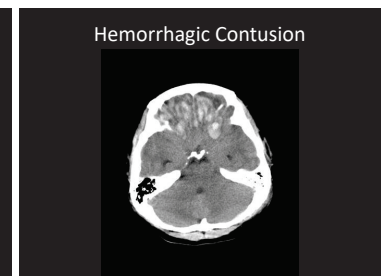
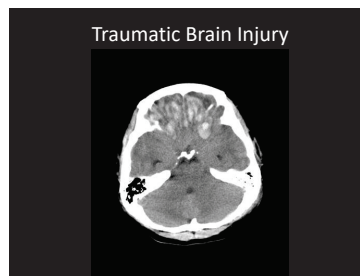
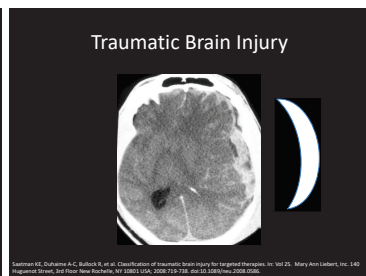
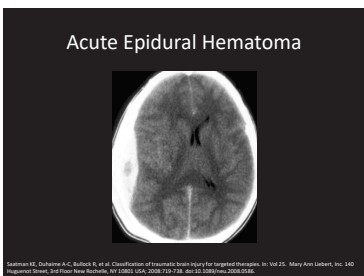
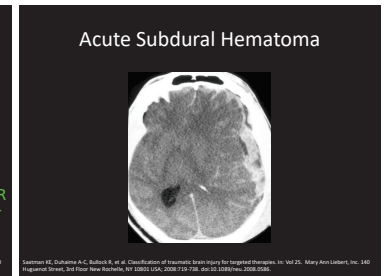
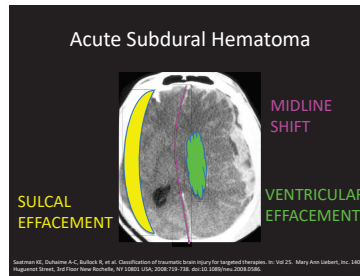
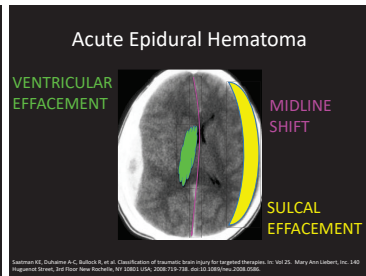
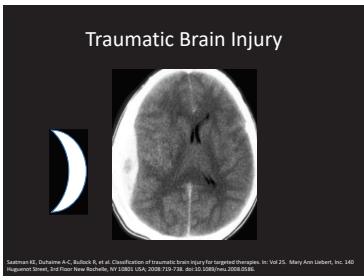
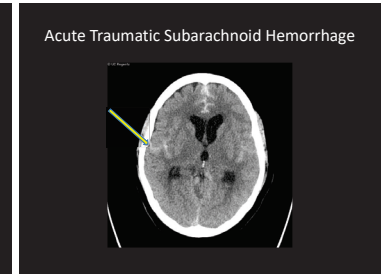
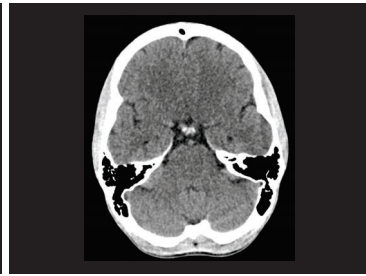
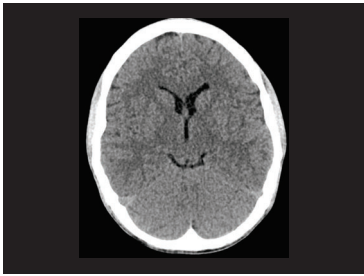
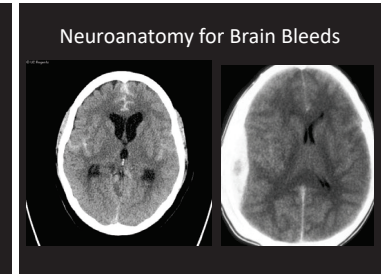
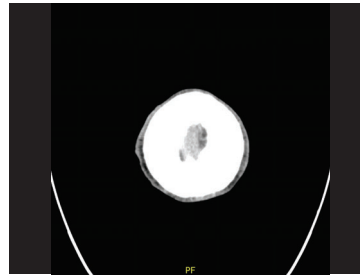
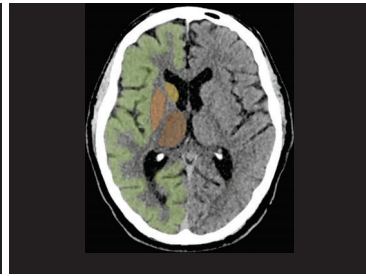
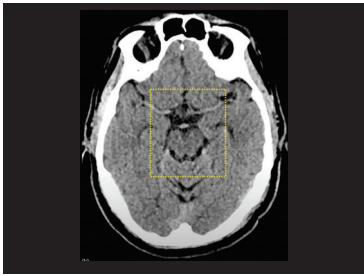
### Agenda

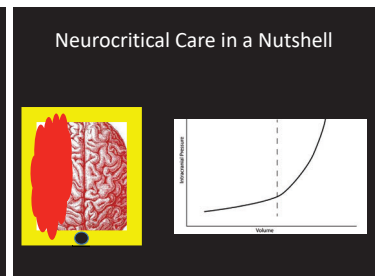
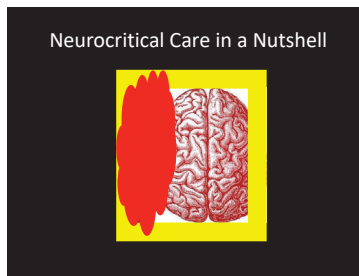
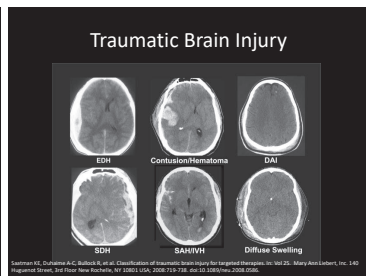
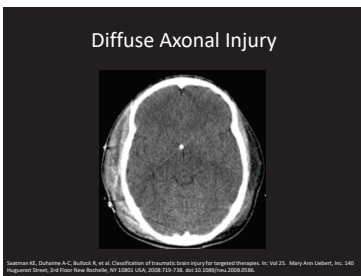
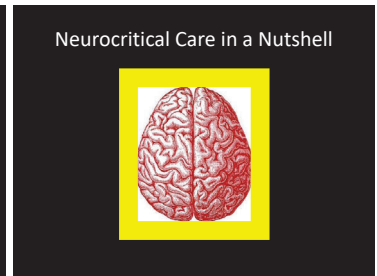
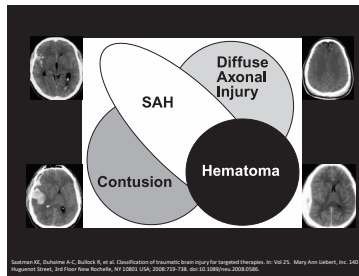
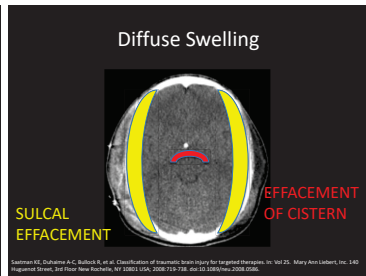
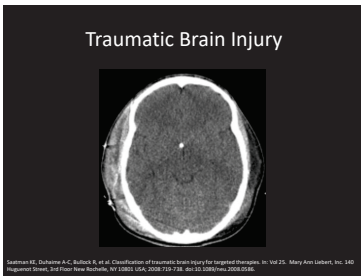
- Neuroanatomy 101
- Neuroanatomy for Brain Bleeds
- Neurocritical Care in a Nutshell
- Cases

### Neuroanatomy 101



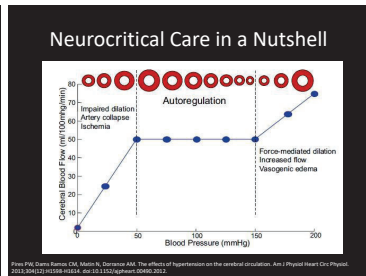
### Quiz





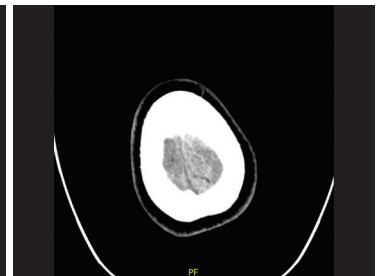
### Neurocritical Care in a Nutshell

**CPP = MAP - ICP**



### Case

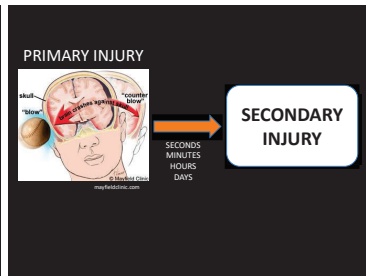
40s F unknown PMHx BIBEMS as PVA  
Patient was hit by car traveling unknown speed  
In the field, GCS 3  
On arrival, GCS 3, HR 110, BP 80/60  
Fixed and dilated pupils, mangled R leg, +FAST



### How Bad Things Happen

**3 H's**

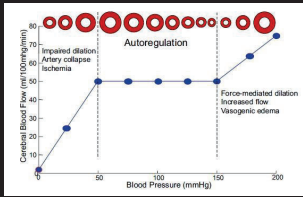
- Hydrocephalus
- High ICP
- Herniation



Brought to OR for R leg amputation and ex-lap, found to open eyes spontaneously and move L arm

Proceeded to hemicraniectomy

**CPP = MAP - ICP**



Wess PM, Davis-Ramus CM, Marsh K, Coorssen AJM. The effects of hypertension on the cerebral circulation. *Am J Physiol Heart Circ Physiol*. 2013;304(12):H2081-2088. doi:10.1152/ajpheart.00499.2012

SBP  $\geq 100$  for patients 50-69

SBP  $\geq 110$  for patients 15-49 and  $> 70$

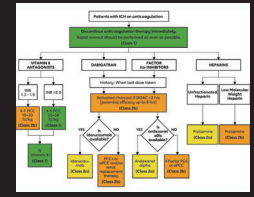
Brain Trauma Foundation, "Guidelines for the Management of Severe Traumatic Brain Injury", 2016.

### Seizure Prophylaxis

- Depressed skull fracture
- Acute SDH or EDH
- Hemorrhagic contusion
- Penetrating head trauma
- Seizure within first 24 hours
- GCS  $\leq 10$  (use phenytoin)

Brain Trauma Foundation, "Guidelines for the Management of Severe Traumatic Brain Injury", 2016.

### Reverse Anticoagulation



### Hypertonic Saline vs. Mannitol

- Patients with severe TBI and elevated ICP
- Only 1 type of hyperosmotic agent, mannitol or HTS
- 35 patients got HTS, 477 got mannitol
- 25 1:1 patients were included

Mengge W, S, Chou Y, Gerner J, M, Alim M, Ochoa J, & HERS B. (2015). Hypertonic saline reduces cerebral and daily intracranial pressure burdens after severe traumatic brain injury. *Journal of Neurotrauma*, 32(22), 2202-2210. doi:10.1089/neuro.2014.32.2202

### Hypertonic Saline vs. Mannitol

- Mean ICP burden lower in HTS group (15.52% [HTS] vs 36.5% [mannitol];  $p = 0.003$ )
- Mean ICU days lower in HTS group ( $8.5 \pm 2.1$  vs  $9.8 \pm 0.6$ , respectively;  $p = 0.004$ )
- 2-week mortality rate was lower in the HTS group, but the difference was not statistically significant ( $p = 0.56$ ).

Mengge W, S, Chou Y, Gerner J, M, Alim M, Ochoa J, & HERS B. (2015). Hypertonic saline reduces cerebral and daily intracranial pressure burdens after severe traumatic brain injury. *Journal of Neurotrauma*, 32(22), 2202-2210. doi:10.1089/neuro.2014.32.2202

### GCS 3, Fixed & Dilated Pupils

Retrospective Review of 93 cases with GCS 3 to a Level I TC:

- Time to hospital, mechanism of injury and pre-hospital hemodynamics  $\rightarrow$  no significant effect on survival
- "Trauma patients with GCS 3 persisting from the scene with bilaterally fixed dilated pupils have no appreciable chance of survival."

Madhok-Debbie, Gregory M, Madhok, Jeffrey V, Rosenfeld. Survival of trauma patients with comatose bilateral fixed dilated pupils. *Prehospital Emergency Care*, 16(1), 2012, Pages 24-31, DOI:10.1080/10903129.2011.603663

### GCS 3, Fixed & Dilated Pupils

Retrospective Review of 62 cases of TBI with GCS 3:

- Overall mortality 80.6%
- 14.5% had a good outcome at 6 months
- 6.9% with fixed & dilated pupils had a good outcome
- Avoid the **Self-fulfilling Prophecy**

Madhok-Debbie, Jeffrey V, Madhok, Jeffrey V, Rosenfeld. Survival of trauma patients with comatose bilateral fixed dilated pupils. *Prehospital Emergency Care*, 16(1), 2012, Pages 24-31, DOI:10.1080/10903129.2011.603663

### Key Points

- Traumatic Brain Injury (TBI):
- SBP  $\geq 110$
  - Seizure Prophylaxis for
    - Depressed skull fracture
    - Acute SDH or EDH
    - Hemorrhagic contusion
    - Penetrating head trauma
    - Seizure within first 24 hours
    - GCS  $\leq 10$  (use phenytoin)
  - Reverse Anticoagulation
  - Avoid the Self-fulfilling Prophecy

Thank you!

Questions?

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