HEAD TRAUMA

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What is a Head Injury?

Air Methods
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Head Injury Statistics

- Approximately 1.5 million head injuries per year medically attended
- 10% to 20% are rated severe
- Around 275K hospitalized
- 50K Deaths estimated from head injury
- Declining Rates of Head Injury ?

Types of Head Injury

- Concussion (Mild CHI/ Grade I): Brief loss of consciousness with normalization. Radiology negative
- Medium (Grade II): Prolonged loss of consciousness or fixed neurological deficits. Usually with + radiology
- Severe (Grade III): Deep Coma, unresponsive

Head Injury Grading

- Glasgow Coma Scale 3-15
- “Universal Language”

Glasgow Coma Scale

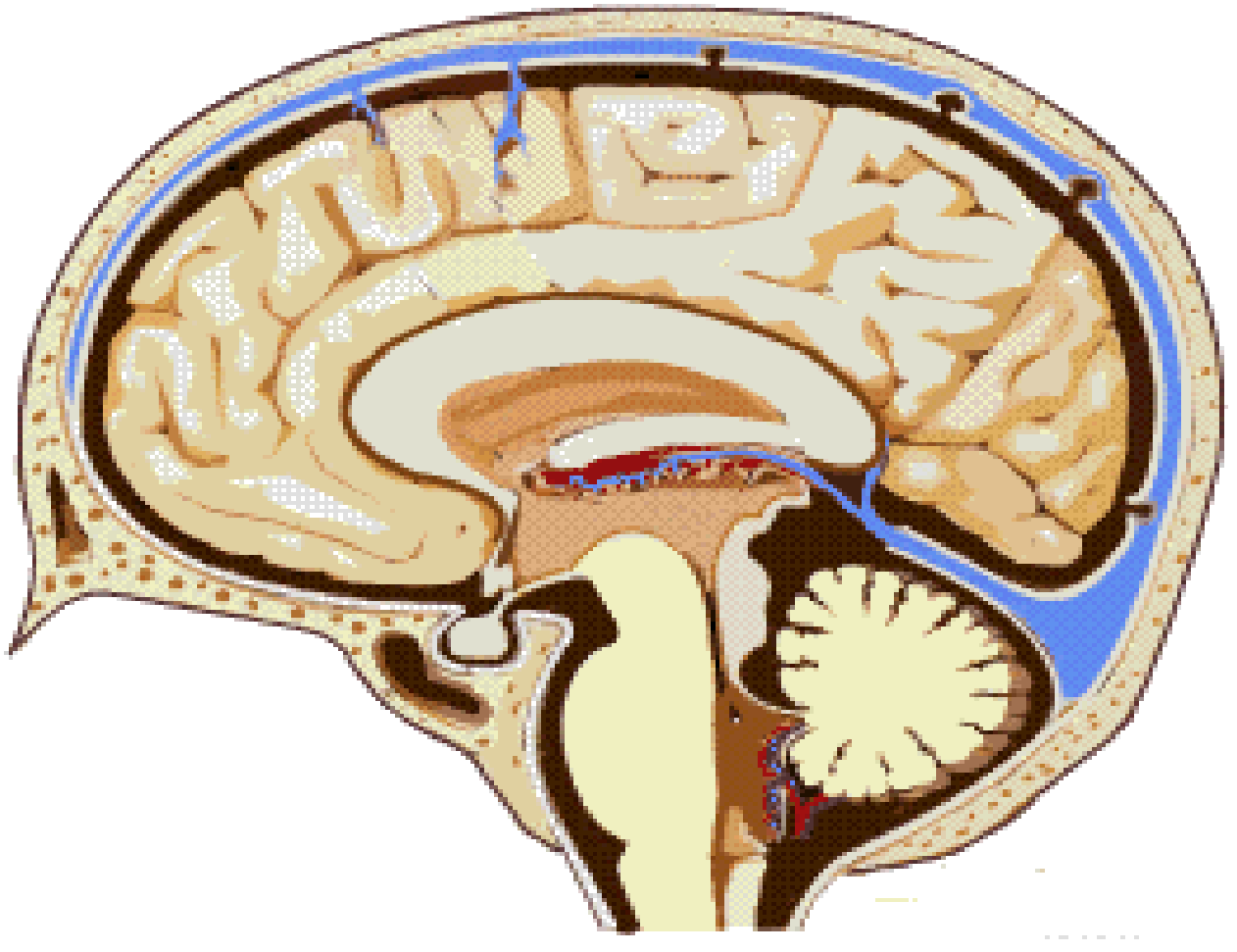
Points	Best Eye	Best Verbal	Best Motor
6	-	-	Obeys
5	-	Oriented	Localize
4	Opens	Confused	Withdraws
3	To Speech	Inappropriate	Flexor
2	To Pain	Garbled	Extends
1	None	None	None

Head Injury Grading Pitfalls

- Intoxication
- Hypotension
- Intubation
- Sedation Medications
- Underlying Medical Problems

Idaho TSE Guidelines

- Statewide Triage Guidelines for Time Sensitive Emergencies
- Priority 1 – GCS <8
- Priority 2 – GCS 9-13
- Priority 3 – LOC, GCS 14,15



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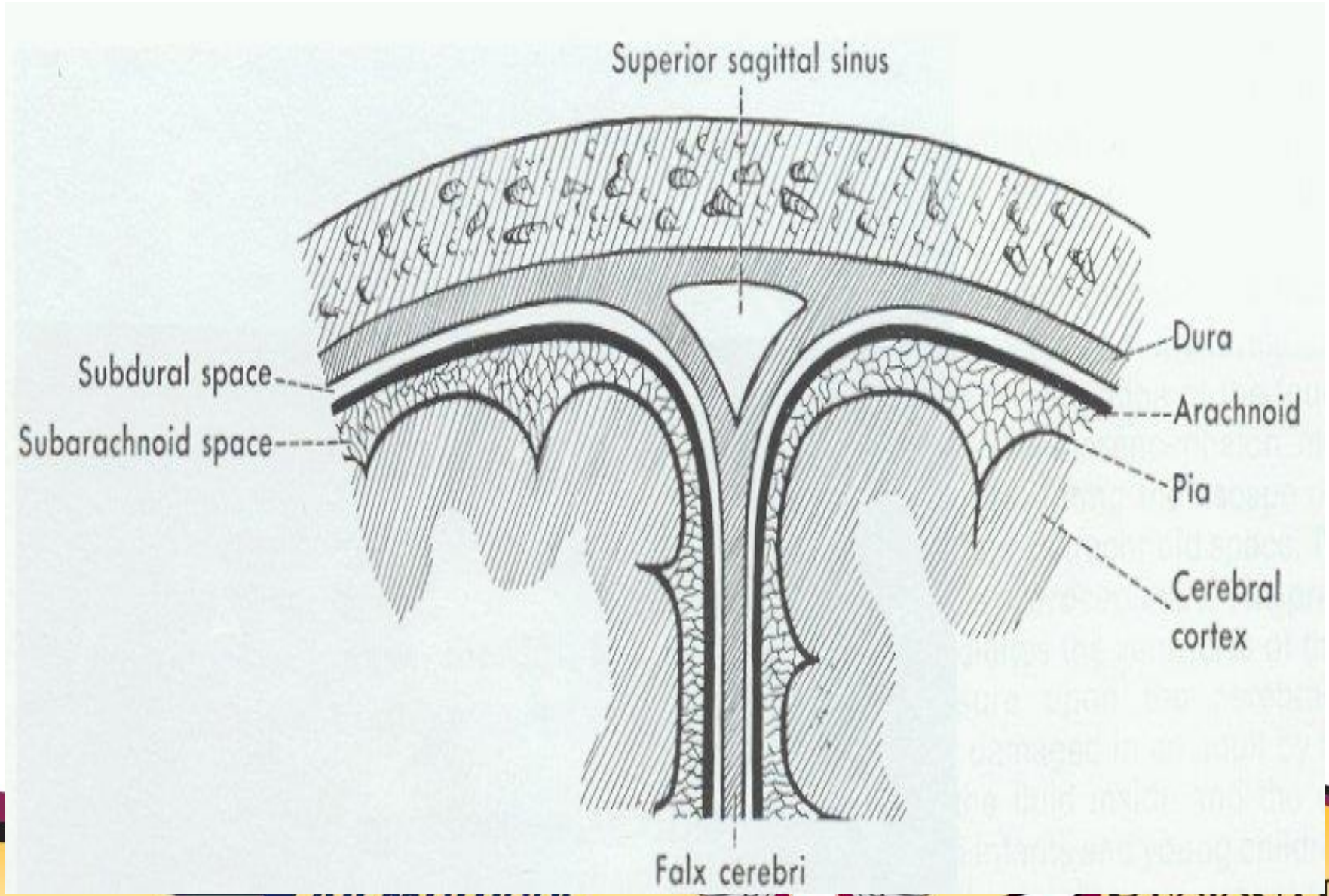
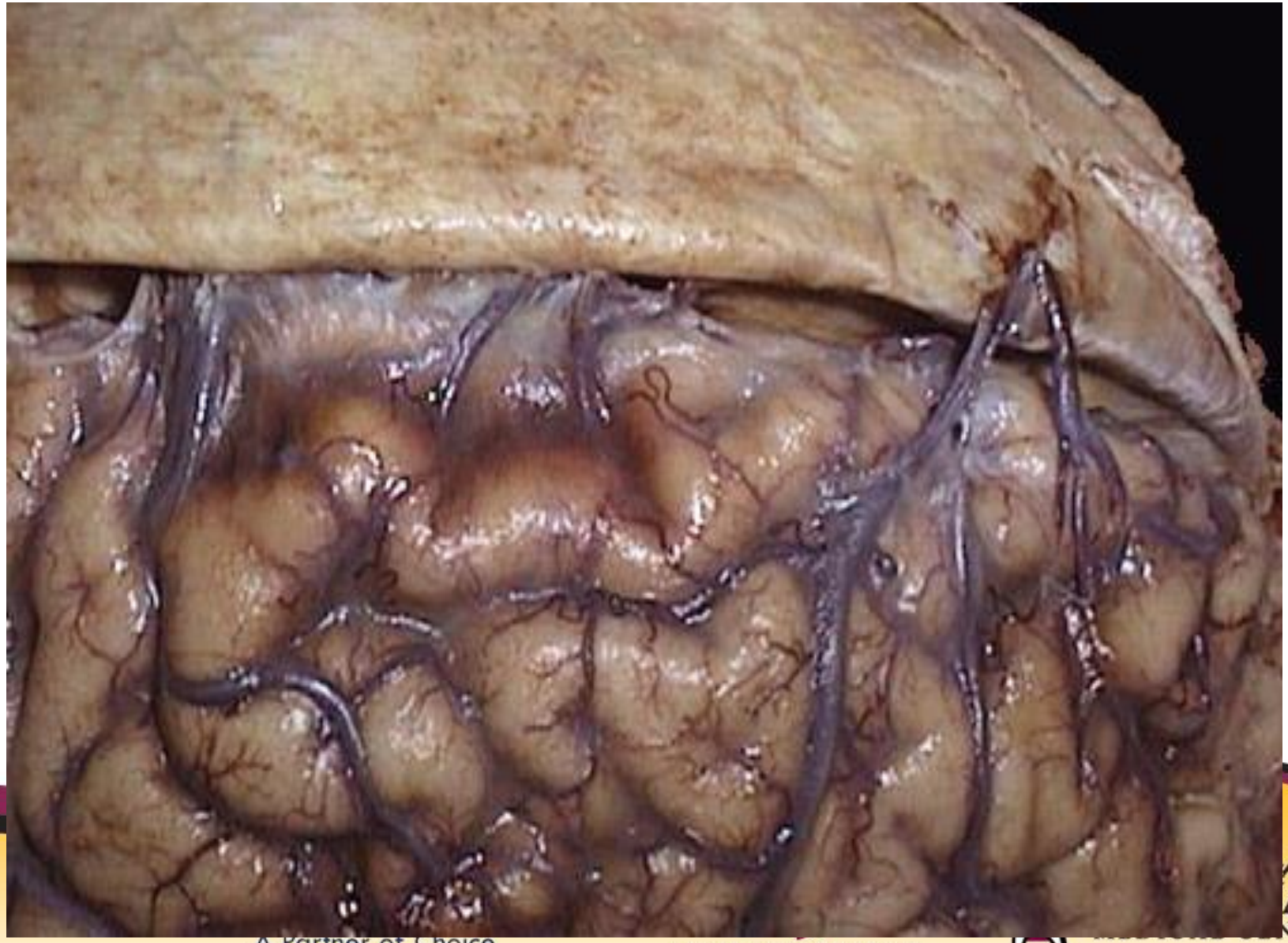
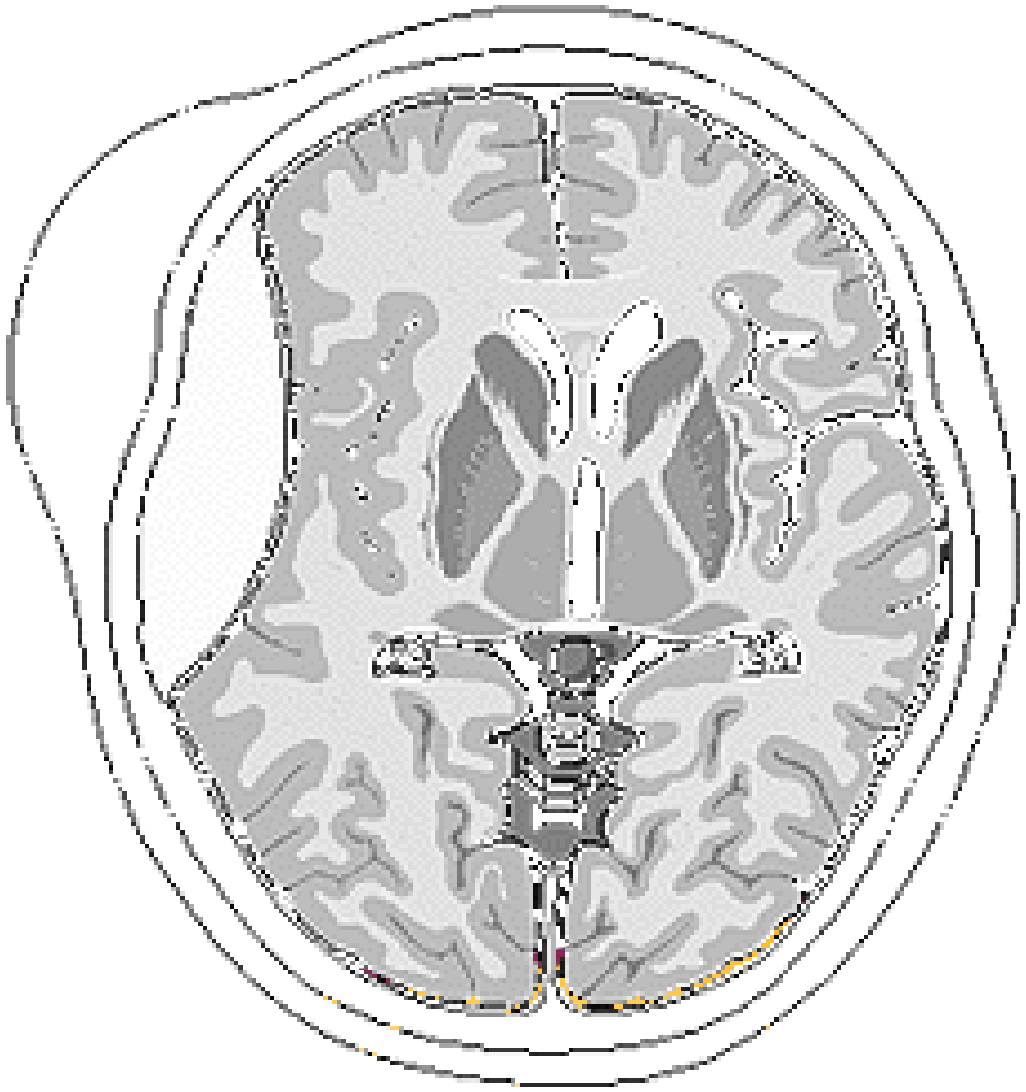


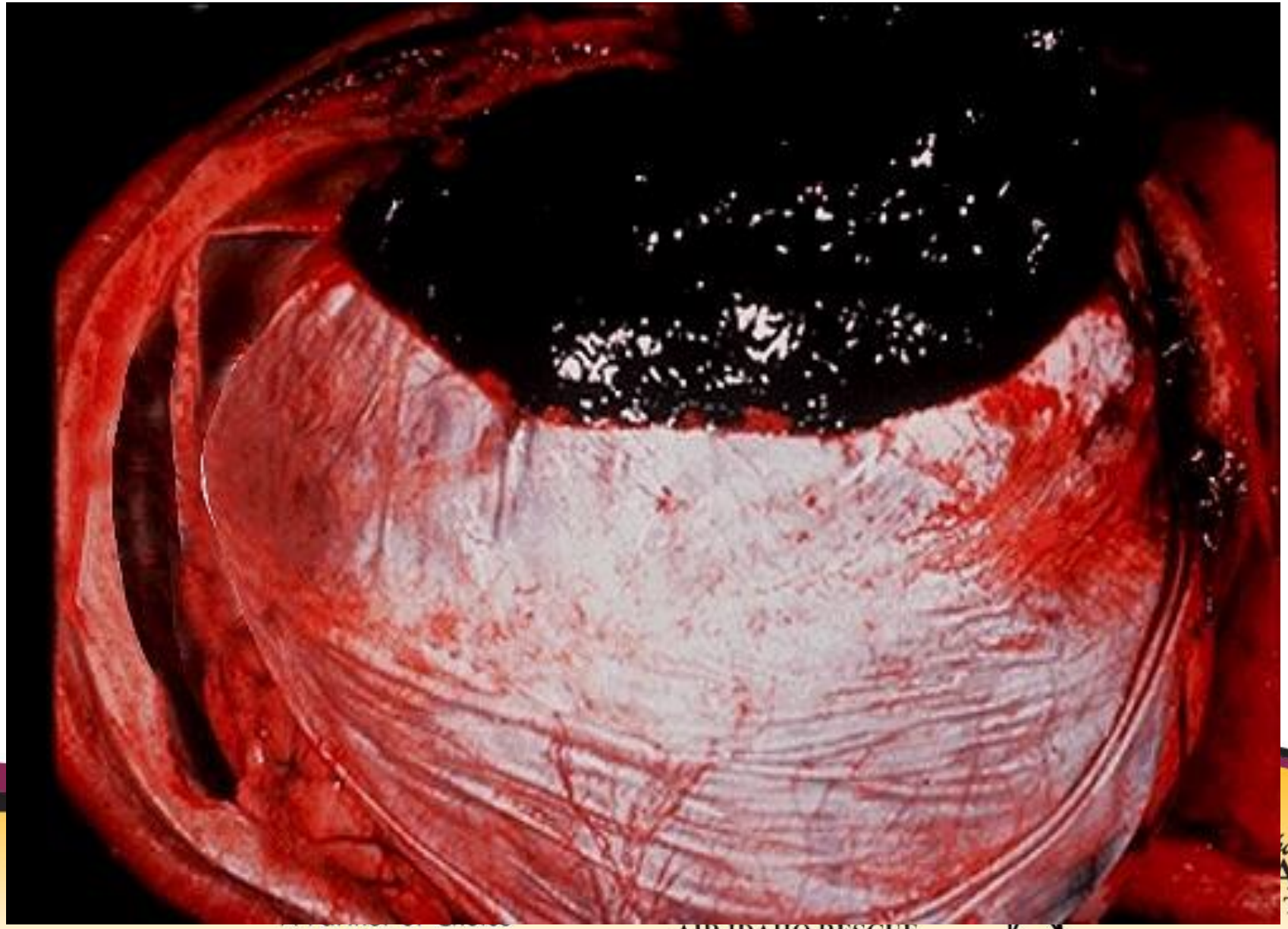
Multiple coverings of brain produce several potential spaces

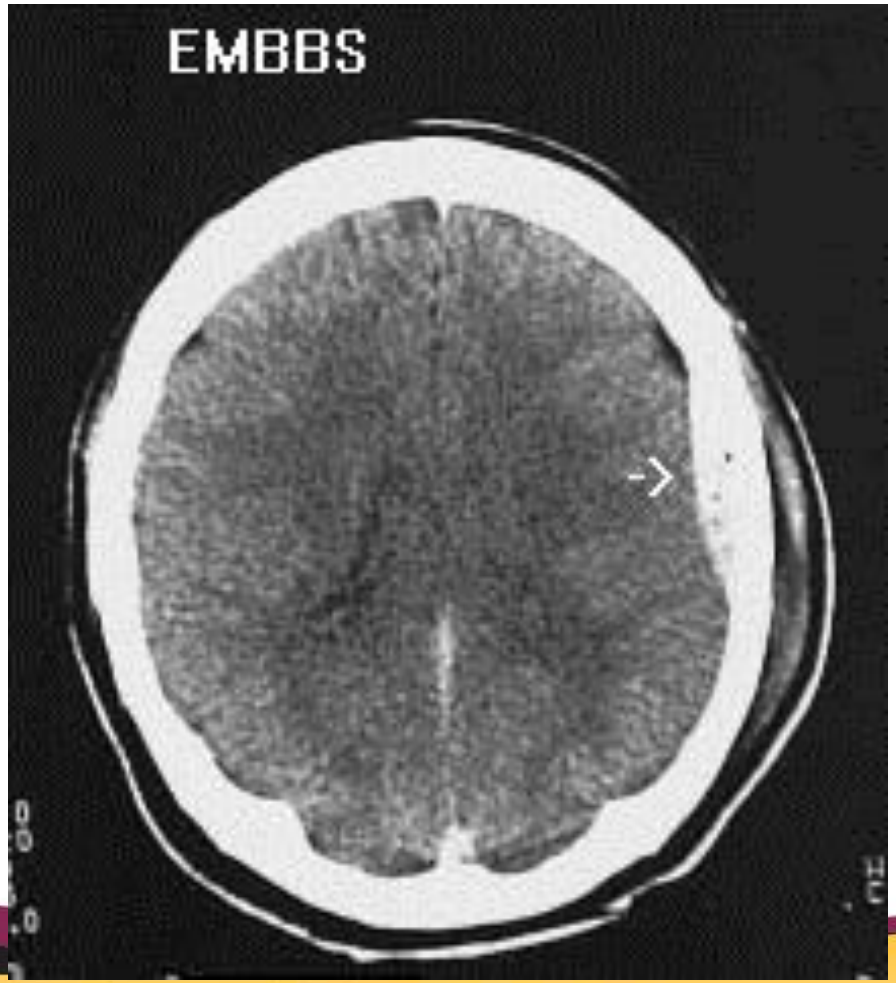


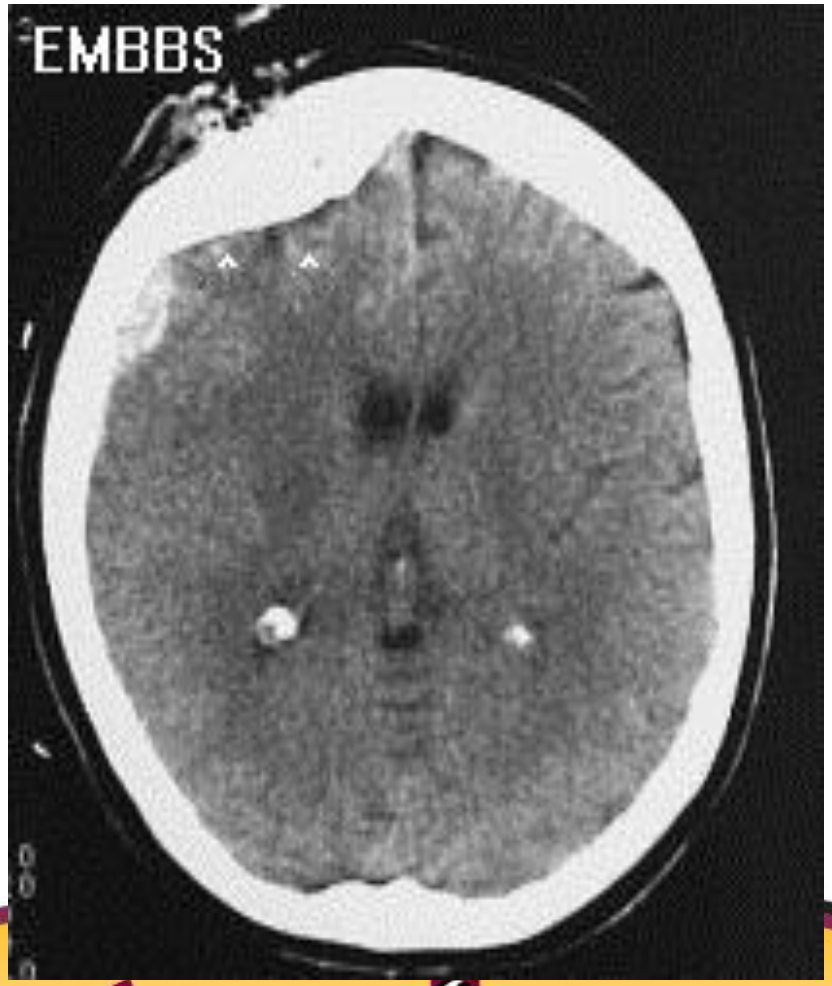
Epidural Hematoma

- 2% of all head injuries
- Lucid interval
- Tear of Middle Meningeal artery, skull fracture.
- Bi-convex clot, may stop at sutures
- Mortality: 20-55% overall. Falls to 5-10% with early treatment.









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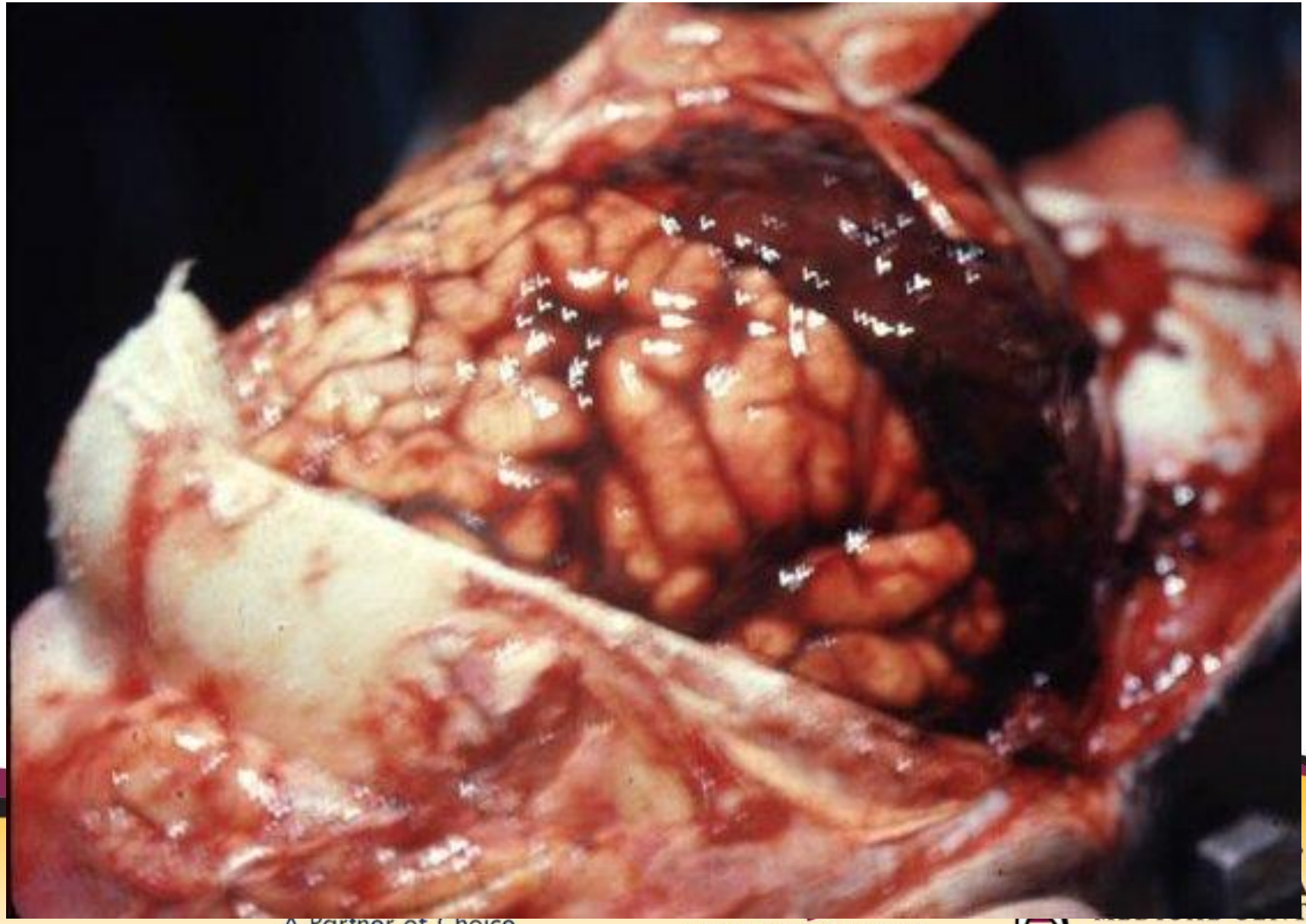
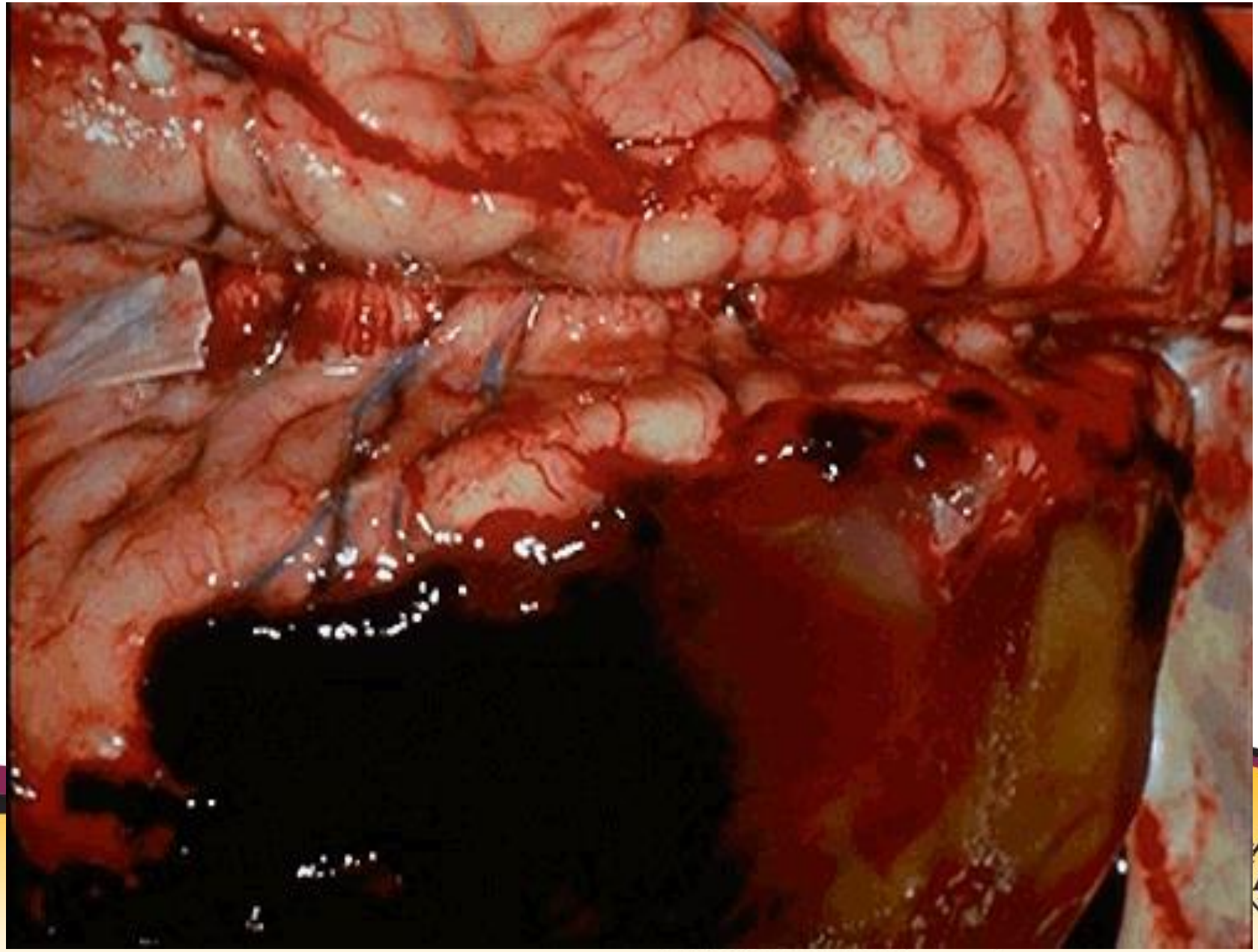
Acute Subdural Hematoma

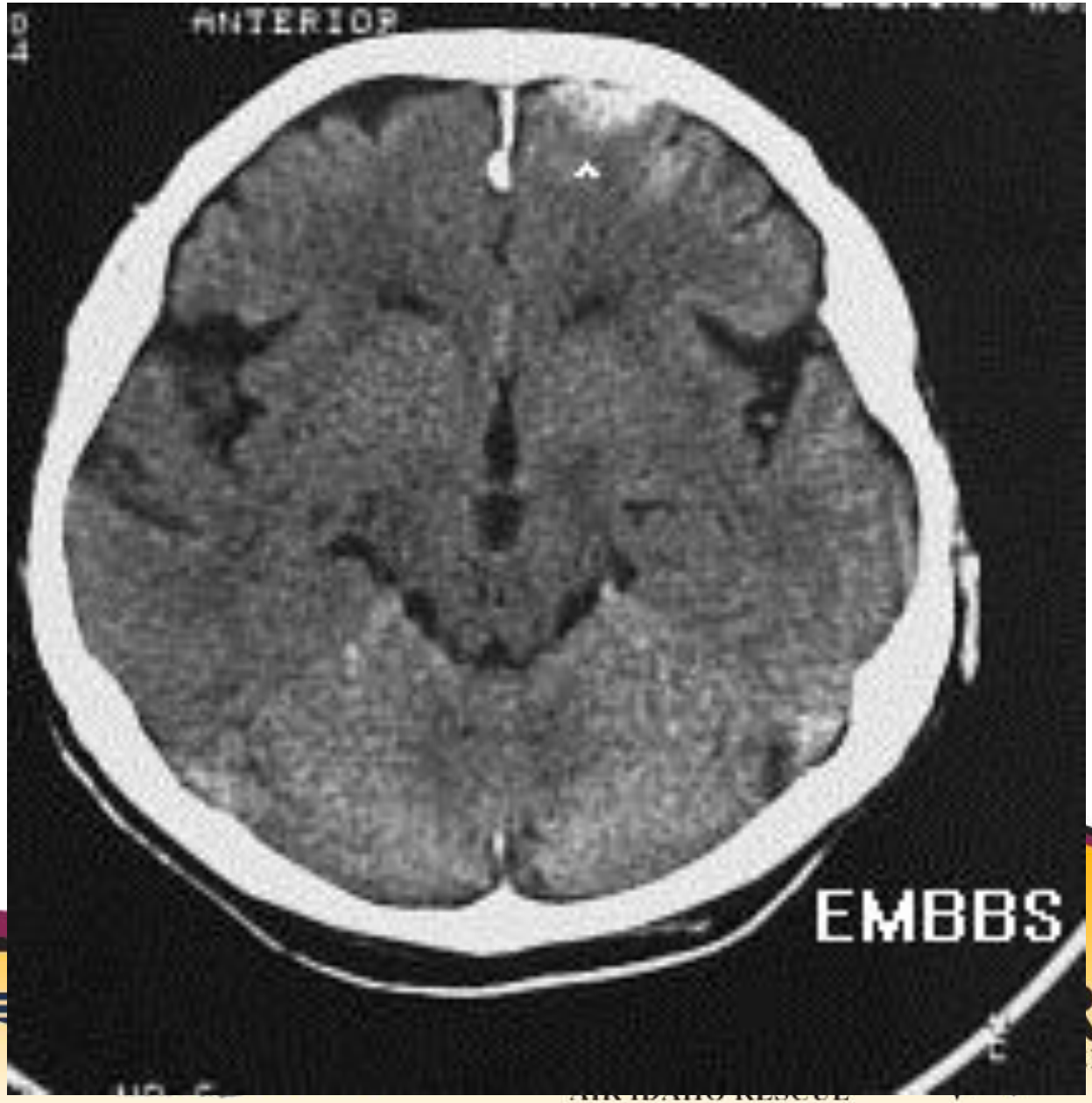
- 5% of all head trauma
- Clot from tear of bridging vein or from underlying brain.
- Surgery for SDH > 1cm
- Mortality 50- 90%
- In acute setting greater chance of underlying brain injury (50%)

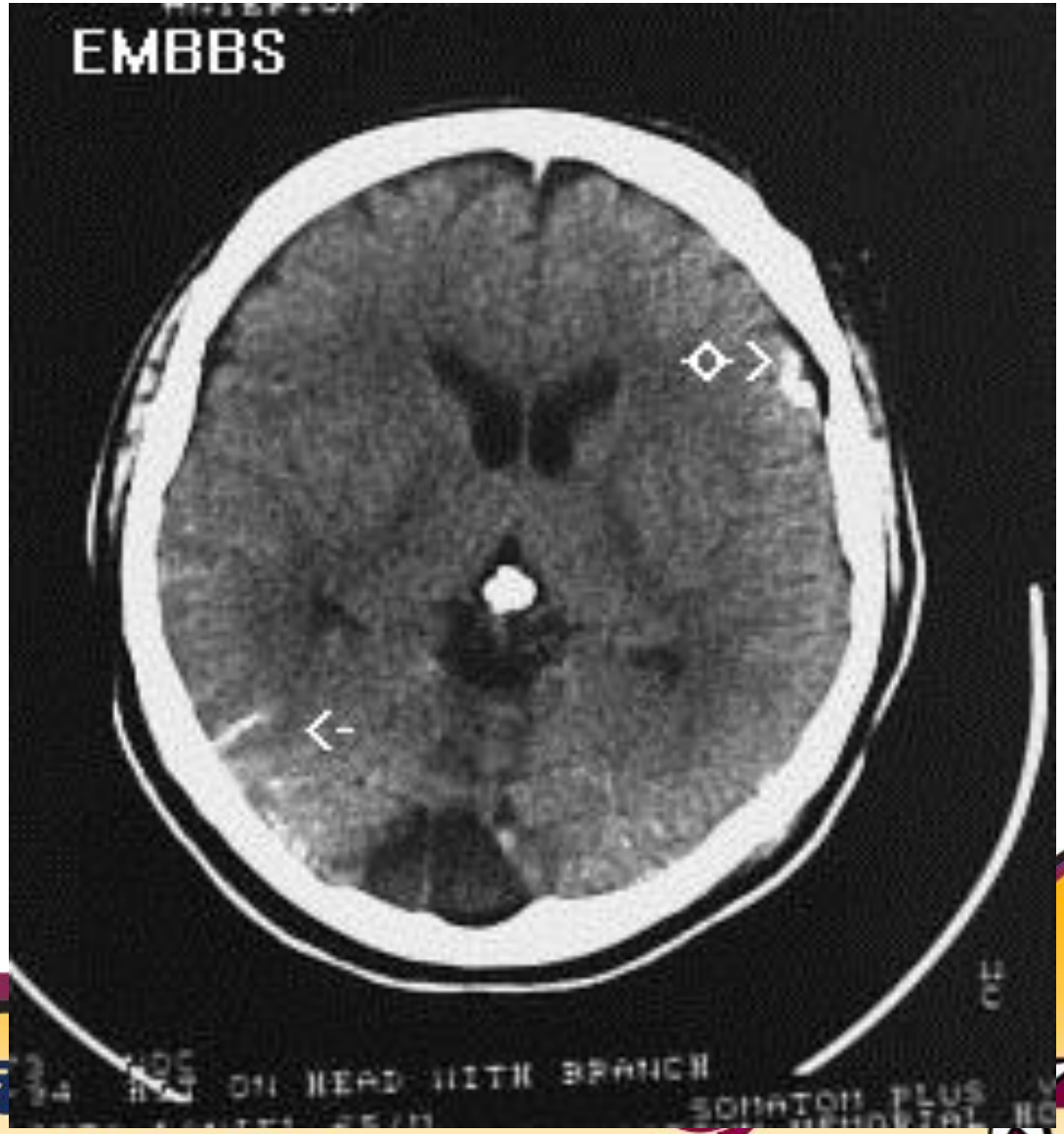




Traumatic Subarachnoid Hemorrhage (SAH)

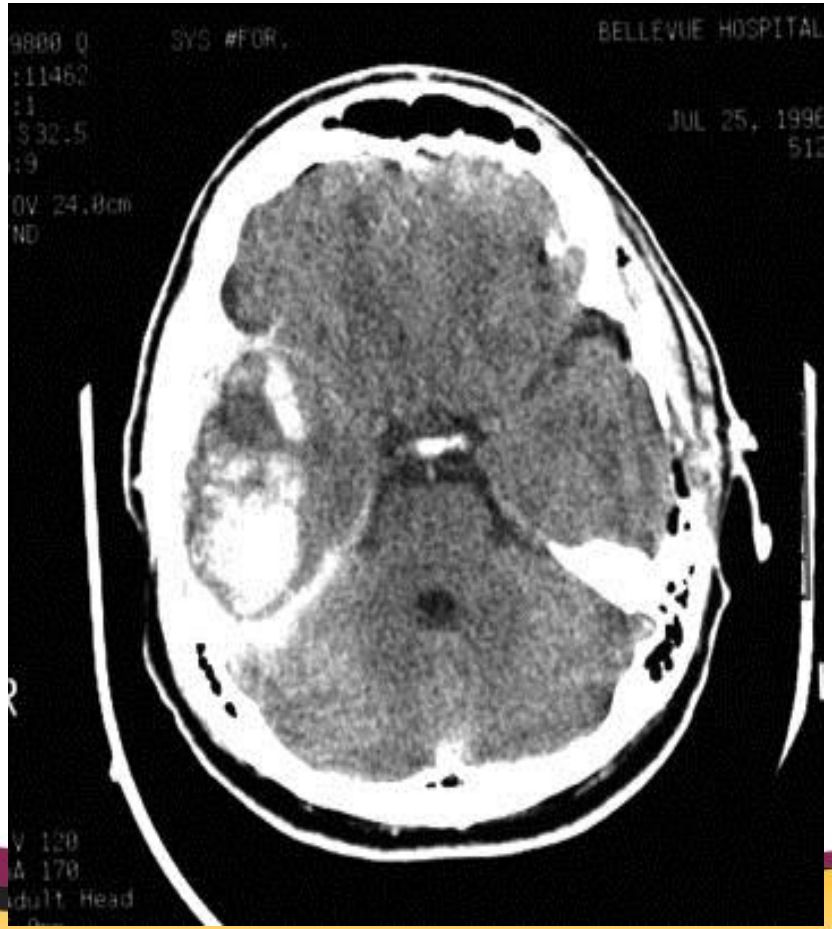
- Most common cause of SAH
- Most commonly seen hemorrhage in brain
- Wispy hemorrhage seen peripherally in brain
- May be indicative of underlying brain injury




EMBBS

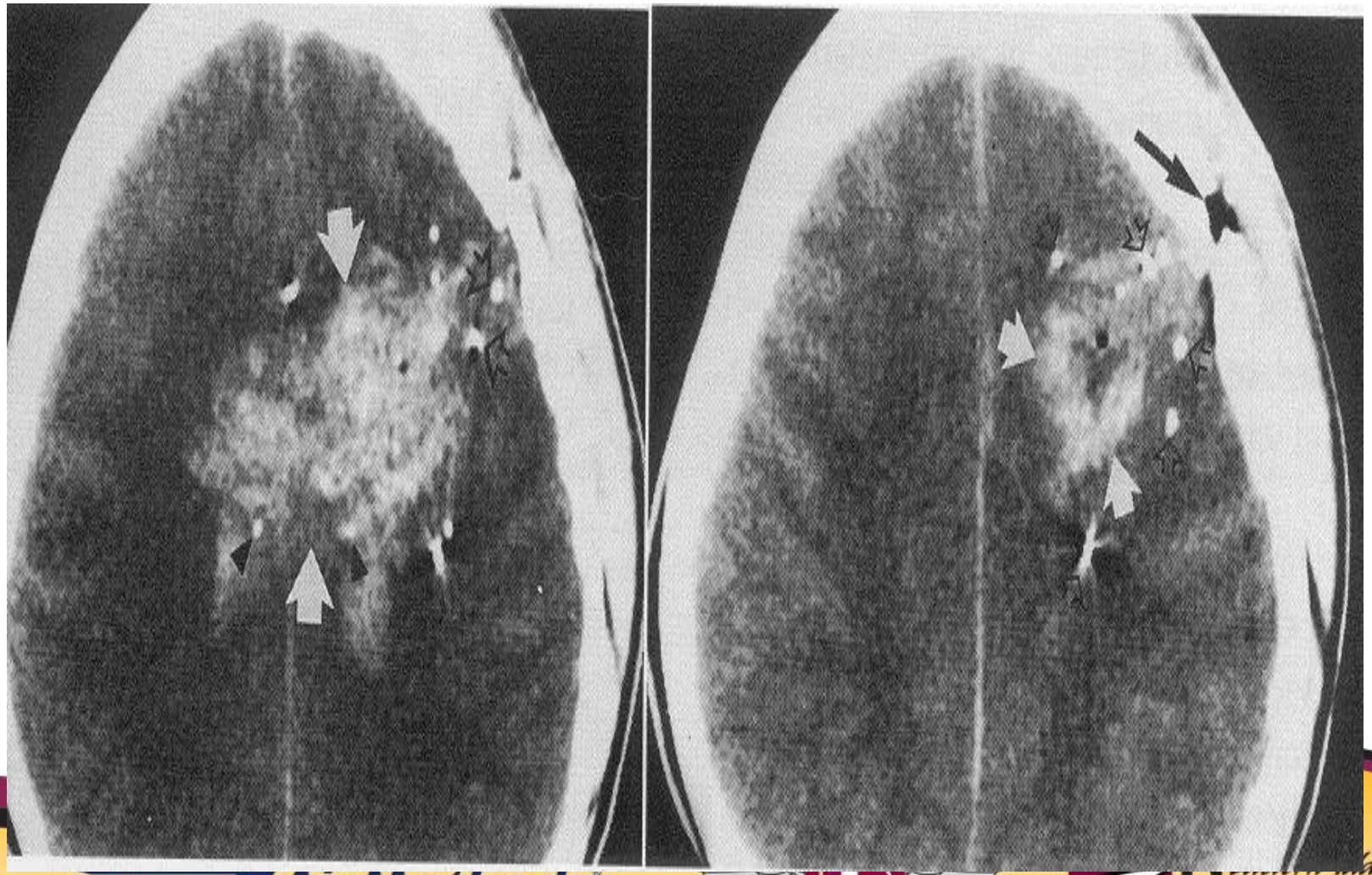
Cerebral Contusion

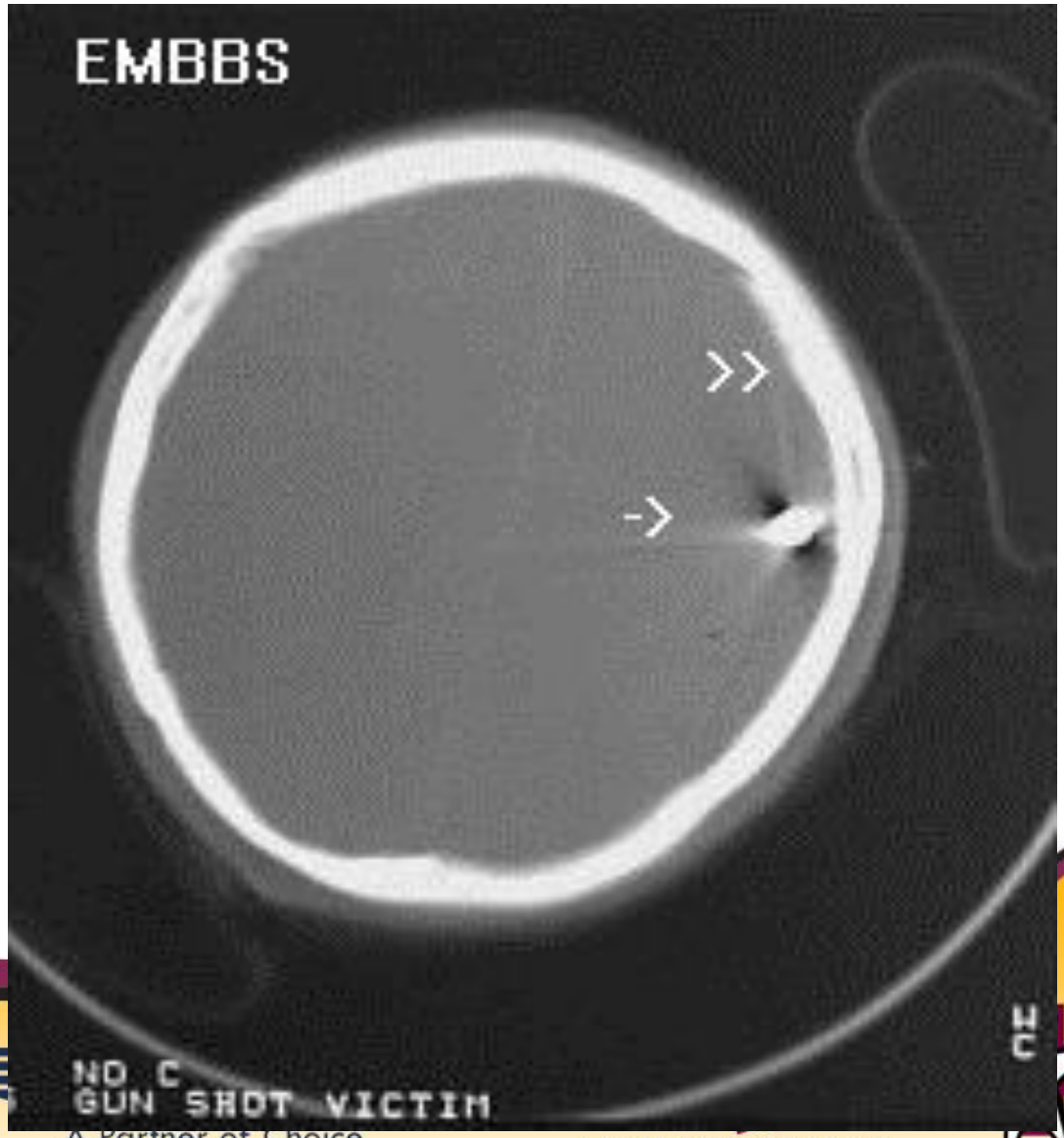
- Frontal, Temporal most common
- Seizure risk
- May be multiple or “sliding”
- Contra-coup injury
- May “blossom” with cerebral coagulopathy
- Generally associated with tissue destruction



Penetrating Head Trauma

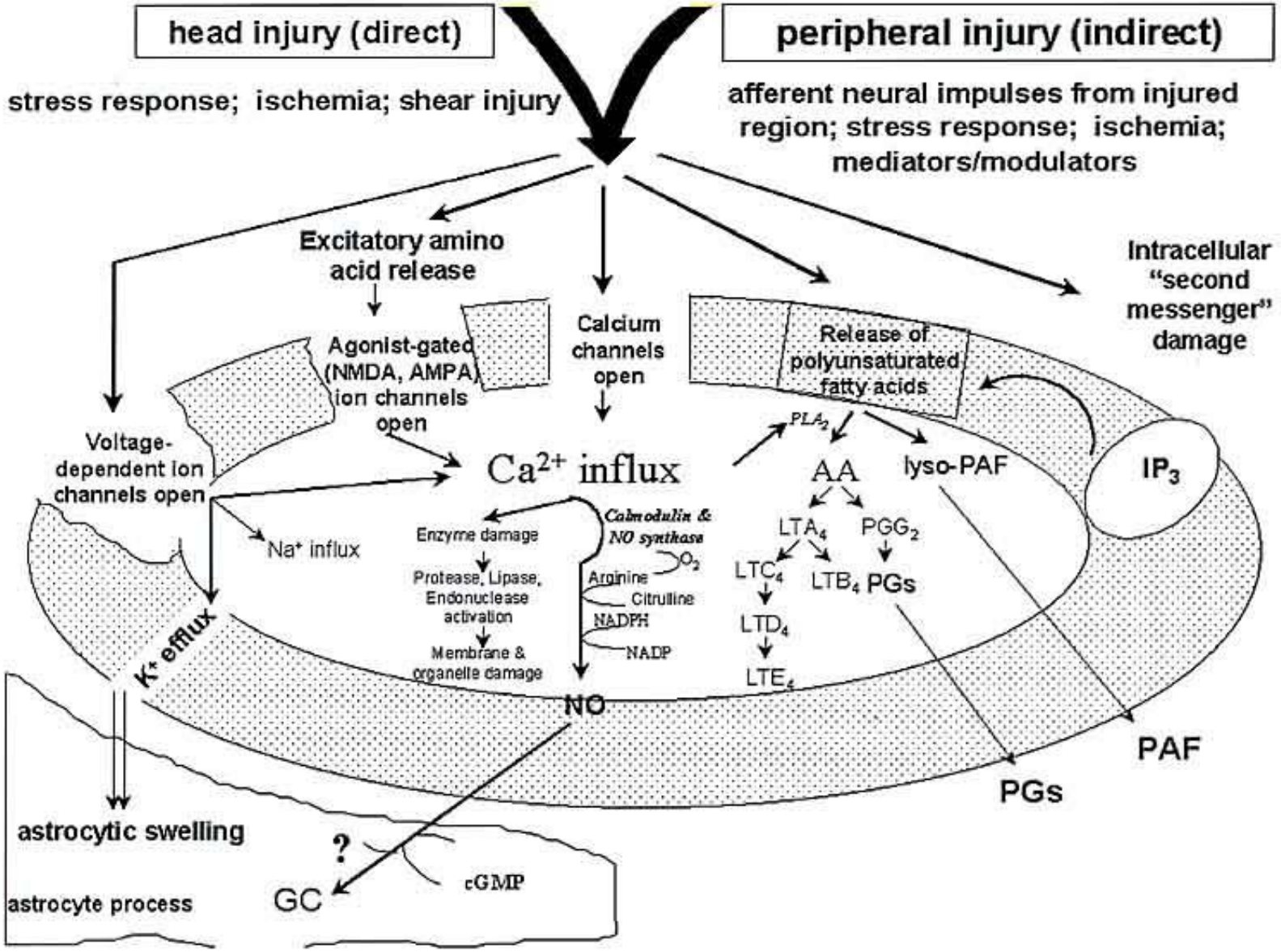
- Cerebral damage is done. Goal is preservation of living tissue.
- May see any of previous hemorrhages with penetrating.
- Infection, retained foreign body




EMBBS
ND C
GUN SHOT VICTIM

Head Injury with No Lesion

- Shearing Injury or Diffuse Axonal Injury
- Results from shearing, tearing, or stretching of cerebral axons and neurons.
- Caused by rapid rotation, acceleration, deceleration



Evaluation of Head Injury

- Time and Mechanism of Injury
- Loss of Consciousness?
- Other Multi-System Trauma?
- C-Spine precautions (10% concordant injury increasing with decreasing GCS)
- Past History
- Intoxication

Symptoms of Head Injury

- Altered Mental State
- Nausea and/or Vomiting
- Seizure Activity
- Pain
- Respiratory Distress
- None of the Above!

Physical Evaluation

- Orientation Questions
- Pupillary Response and Symmetry
- Gaze Symmetry
- Bruising, Open Wounds, CSF, Step-Offs
- Symmetry of Motor and Sensory
- Follows Commands?

Treatment

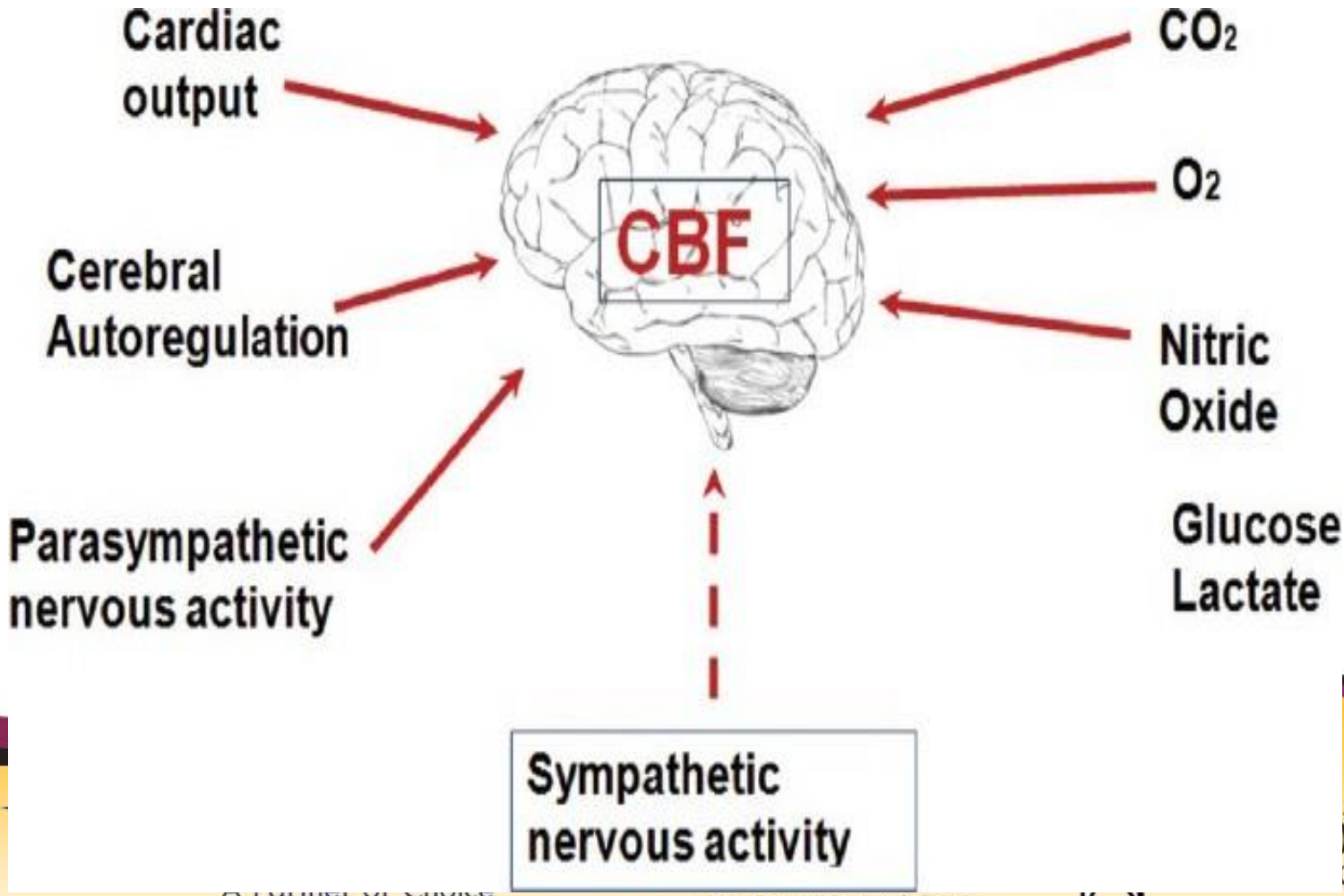
- Oxygenation: GCS<9 ---> Intubation

  Maintain SpO_2 > 90%
- Fluid resuscitation for hypotension and evaluate for multi trauma
- Conservative fluids for stable blood pressure in head injury

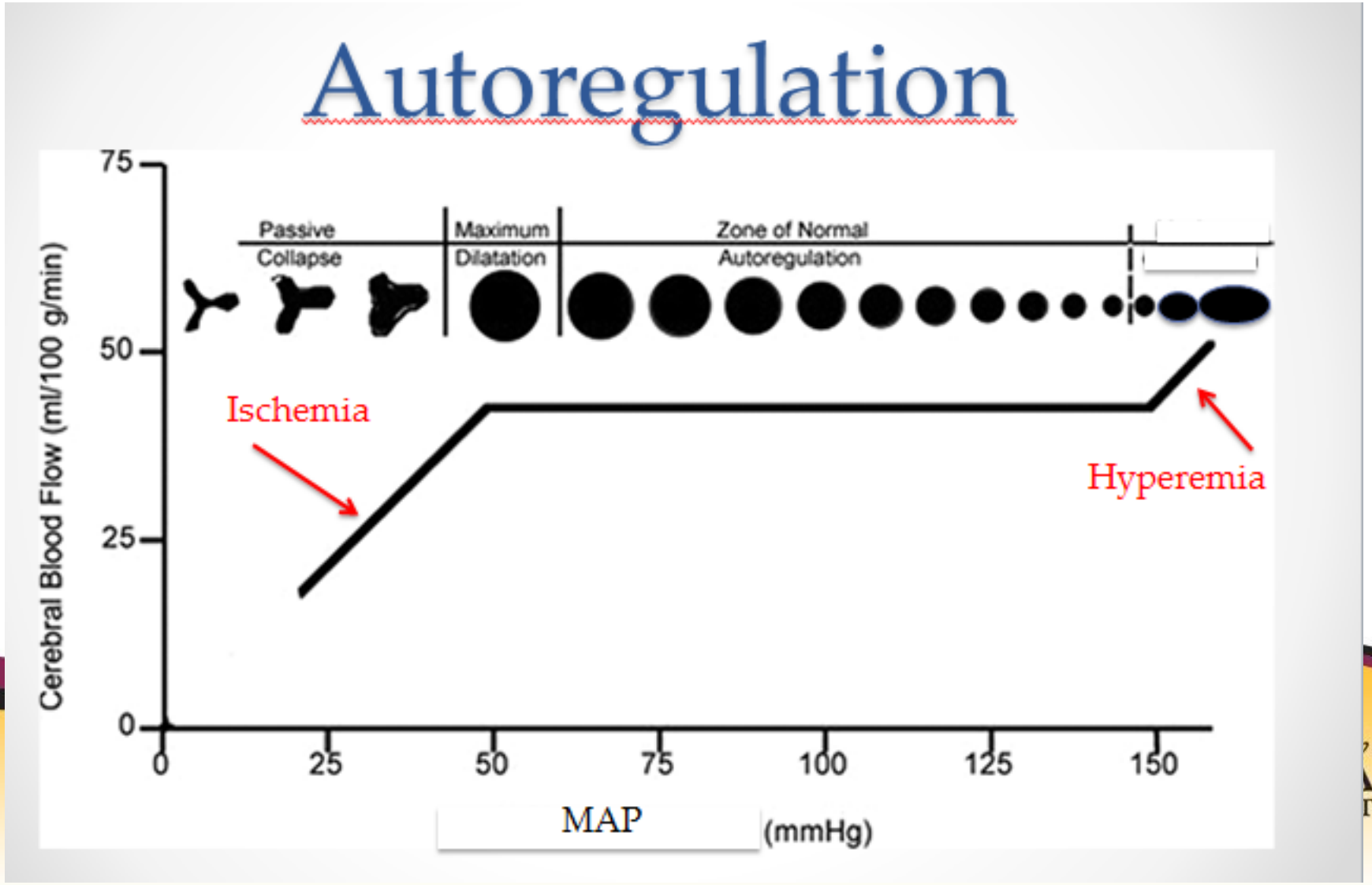
Blood Flow to the Brain

- CPP = MAP – ICP
- CBF = CPP / CVR
- Autoregulation

Cerebral Blood Flow



Autoregulation



Other Treatments

- Antiemetic / Antiepileptic
- What else can you do???
- Steroids, Cooling, Phenobarbital, Lazarides

Hyperventilation

- Decrease blood CO_2 and cerebral vessel caliber will decrease
- Decrease volume in Cranial vault
- Will also diminish CPP and CBF
- Goal of $EtCO_2$ = 25-30 for herniation

Sedation

- Lower brain activity and metabolism
- Will also decrease CPP and CBF
- Paralytics, narcotics, benzodiazapines, propofol

When things are going bad

- Progressive change in pupillary response or enlarging pupil
- Global drop in all three categories of GCS
- Cushing Response (Hypertension, Bradycardia, Respiratory Irregularity)
- Posturing

Rapid Transport?

- GCS < 12
- Changing GCS and Mental Status
- Signs of increasing ICP
- Significant Mechanism
- Unstable BP/Respirations
- Posturing

Pediatric Head Trauma

- Abuse?
- Fluid Resuscitation
- “Rule of Absolutes”

What I want to Know

- Initial GCS and all changes in mental status. Document changes.
- Sedation medications given and times
- Seizure Activity

Clinical example

- Middle Aged Male, Moderate MVA, Not Belted, Airbags +
- Combative, Agitated and Intoxicated
- GCS 13. Complains of headache, neck pain, nausea, chest pain, wrist pain.

Clinical example

- SBP 70 Pulse 125

Clinical example

- SBP to 100 Pulse to 90
- GSC declines to 8

"I don't think it's a concussion ... although the smoke has me a little concerned."