Pediatric Head Trauma

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No Disclosures

Objectives

- Understand the common injuries
- Understand the unique concepts of pediatric patients
- Review current linear skull fracture guidelines

Evaluation

- Initial Eval
- ABC's
  - Airway
  - Breathing
  - Circulation

Secondary Evaluation

- D—disability
- E—environment

Glascow Coma Score

- Motor 6 points
  - 6 = follows commands
  - 5 = localizes to pain/stimulation
  - 4 = withdraws to painful stimuli
  - 3 = flexor posturing (decorticate)
  - 2 = extensor posturing (decerebrate)
  - 1 = no response

GCS cont.

- Verbal 5 points
  - 5 = oriented
  - 4 = disoriented
  - 3 = words
  - 2 = sounds
  - 1 = none, or 1T for ETT

GCS cont.

- Eyes 4 points
  - 4 = open spontaneously
  - 3 = open to voice
  - 2 = open to painful stimuli
  - 1 = closed

GCS

- Minor head injury—15-13
- Moderate head injury—13-9
- Severe head injury <=8
- Even if you are dead you have a score of at least 3, usually 3T

Secondary Neuro Survey

- Assess motor strength in all extremities
- Assess sensation
- Assess reflexes
- Cranial nerve exam

In Babies

- Are they appropriate for age?
- Track, regard
- Tone, movement of extremities
- Fontanelle if present

In Children

- Again, appropriate for age?
- Cooperation with exam if possible

Types of Injuries

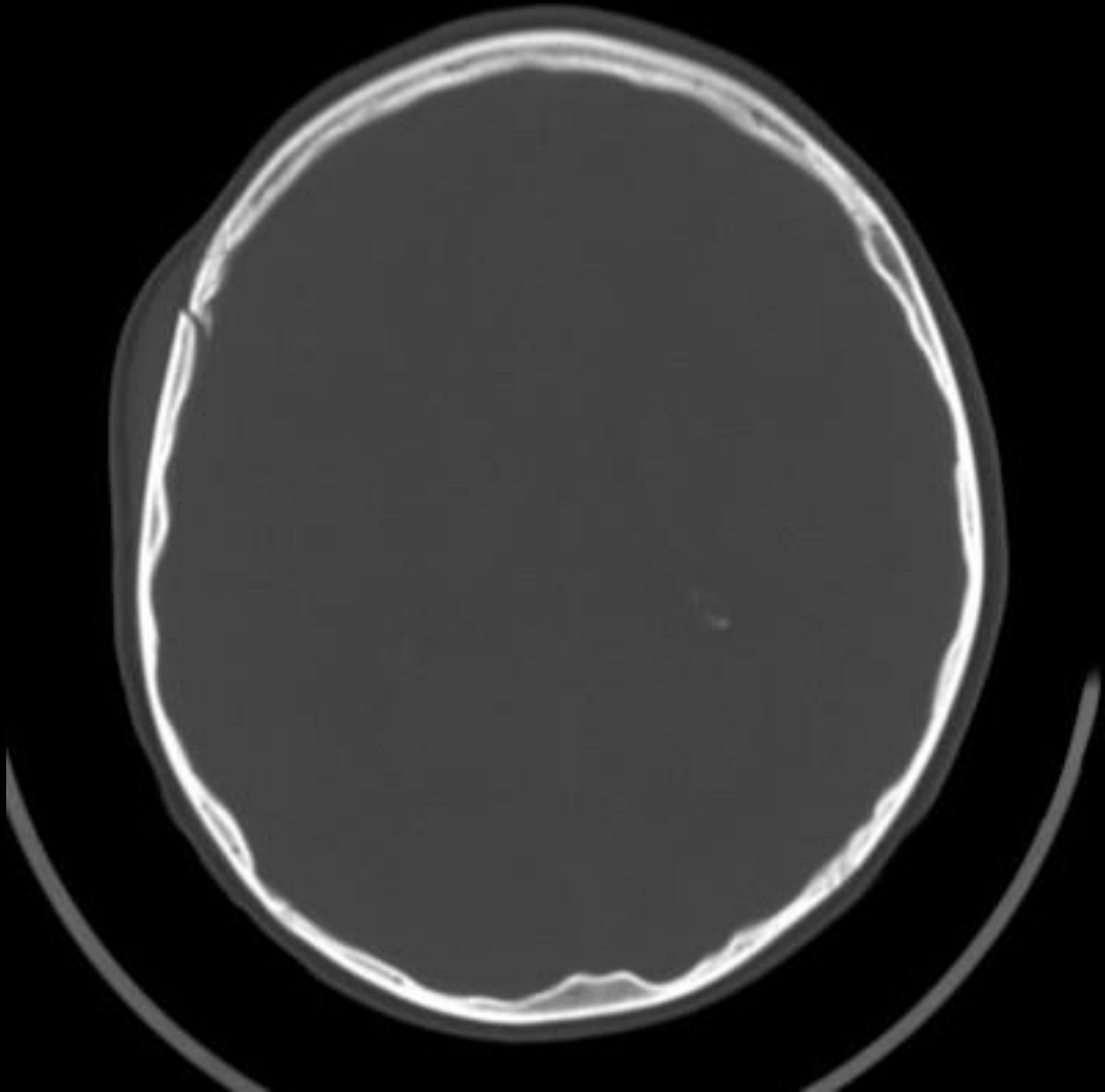
- Closed vs open head injury
- Skull fractures
- Hematomas
- Diffuse injury
- Non-accidental
- Penetrating injury

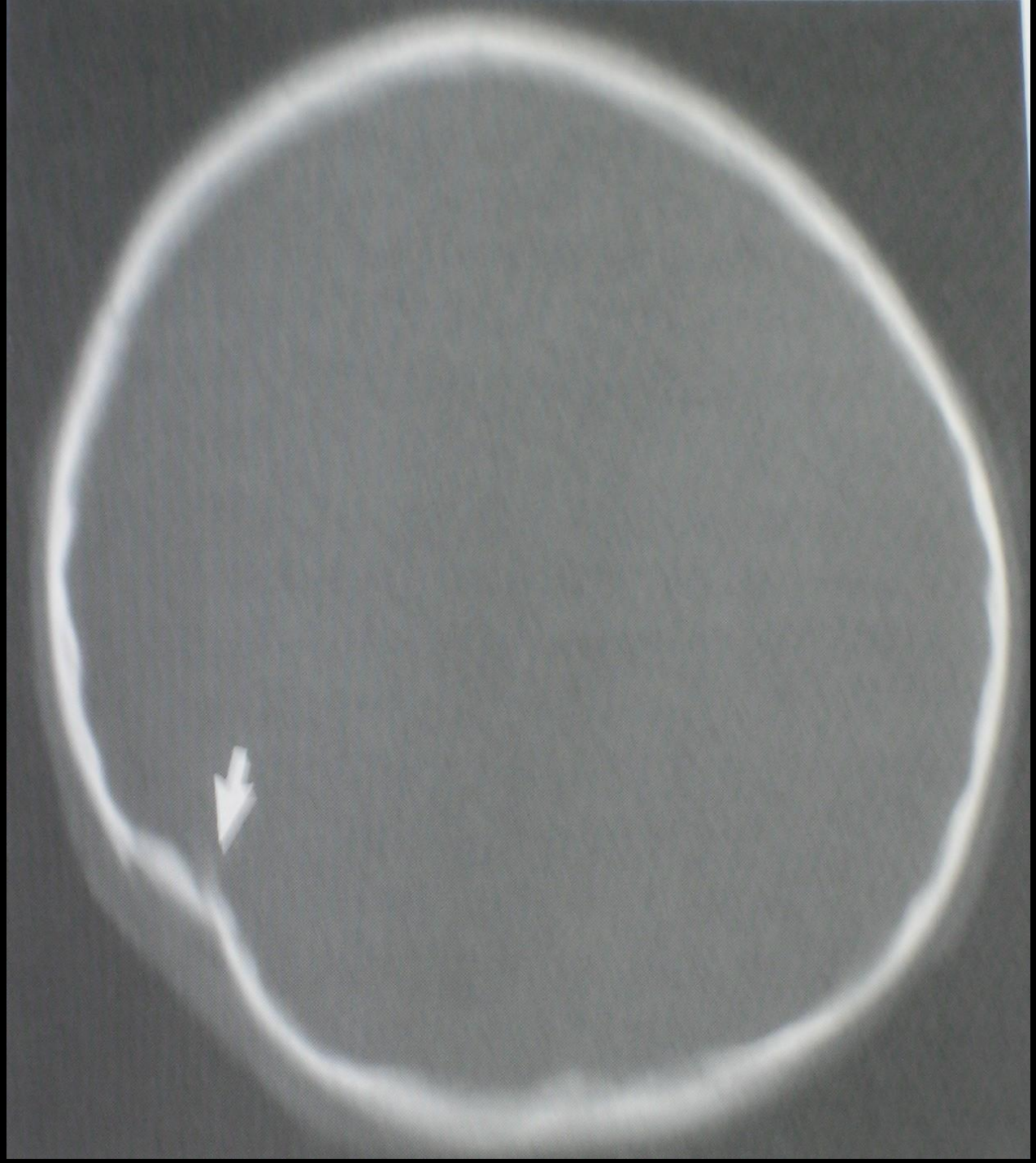
Scalp Bleeding

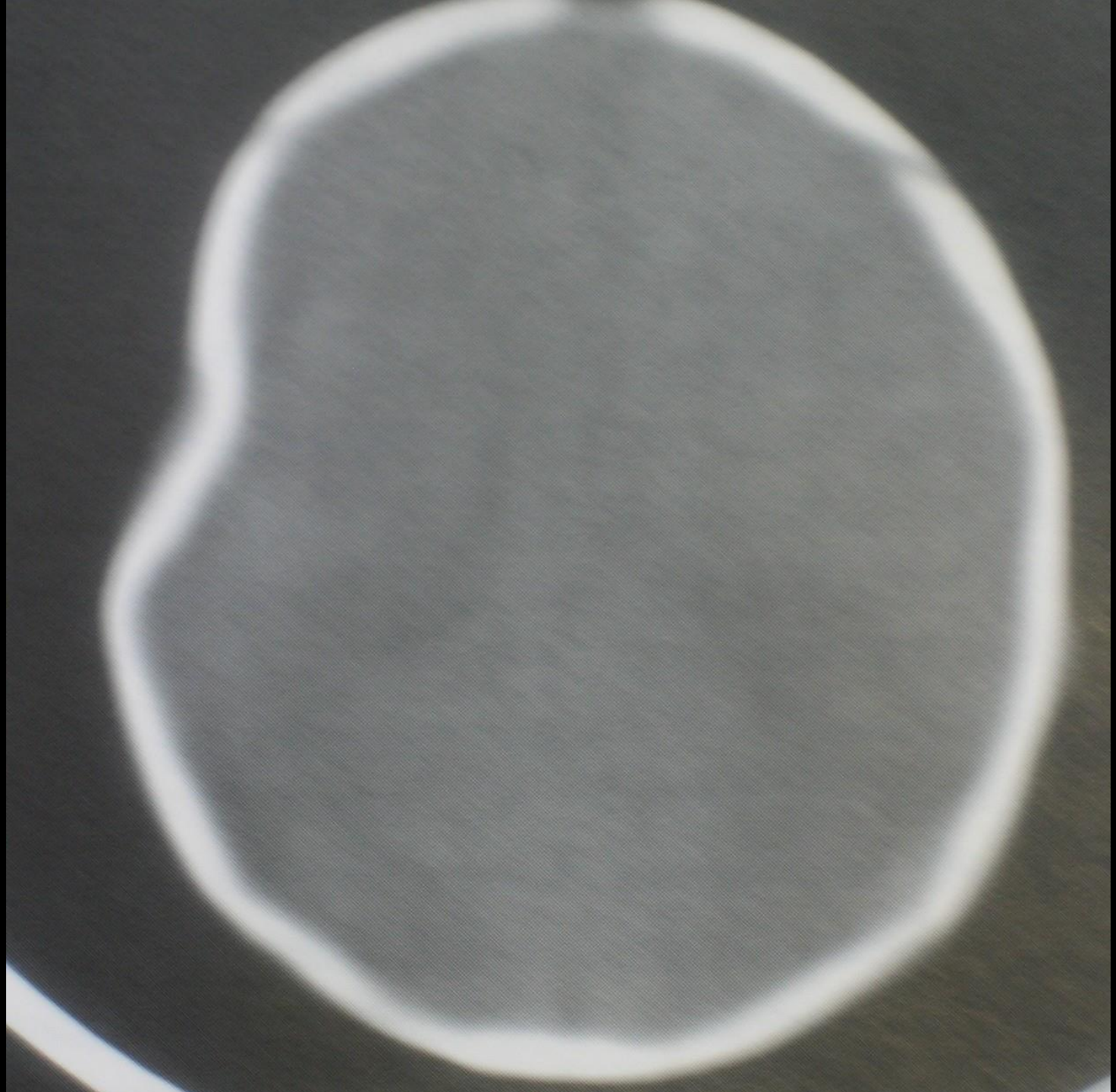
- Baby or small child can "bleed out" from a scalp hematoma even if no open laceration. Follow H/H closely
- Any patient can bleed out from scalp laceration, do not ignore amount of blood loss from scalp

Skull Fractures

- Depressed
  - More significant trauma
  - Judgement about surgery
- Simple, linear, nondisplaced
  - Nonsurgical
  - If through sinus may have air in head or CSF leak

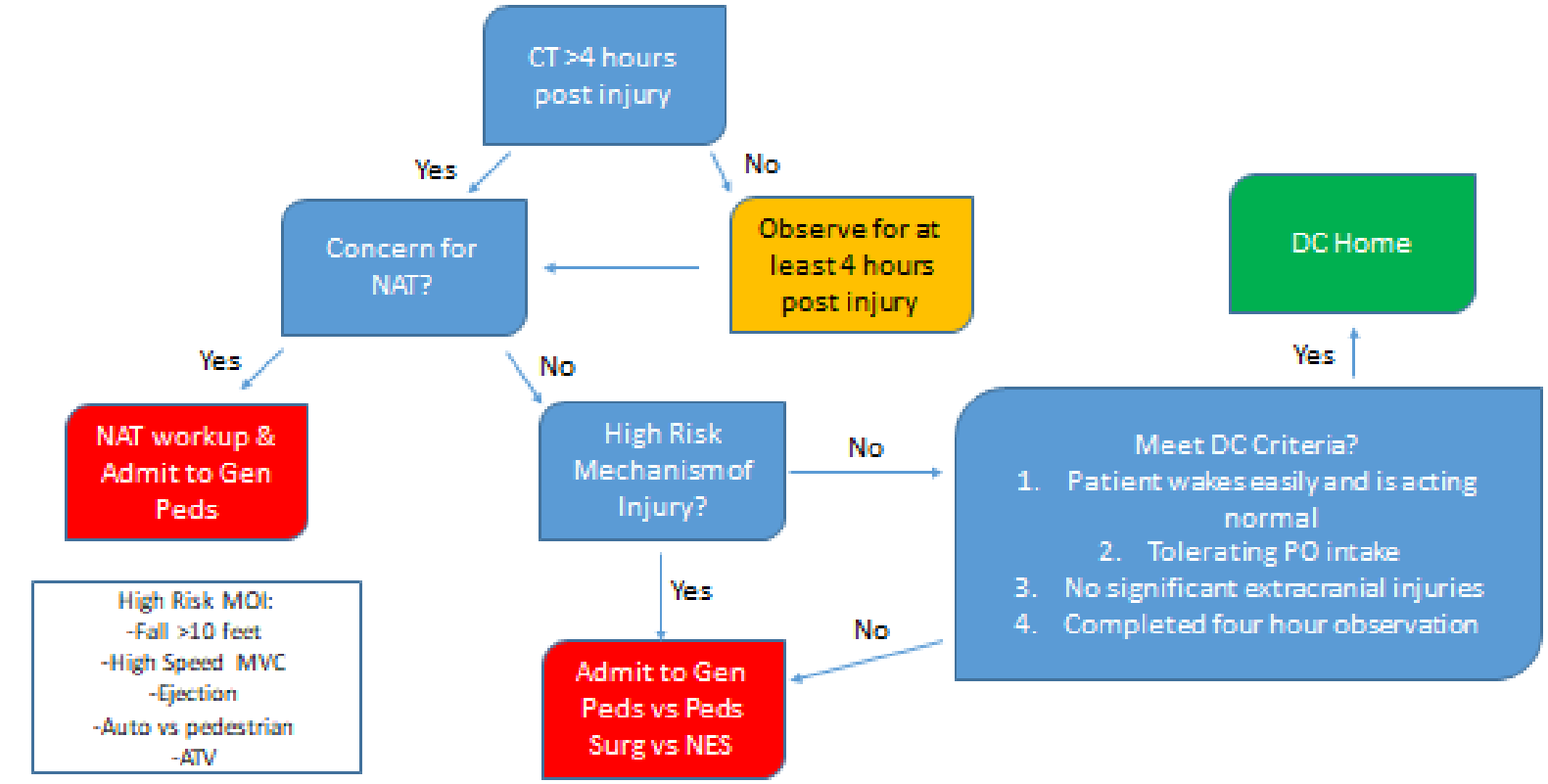






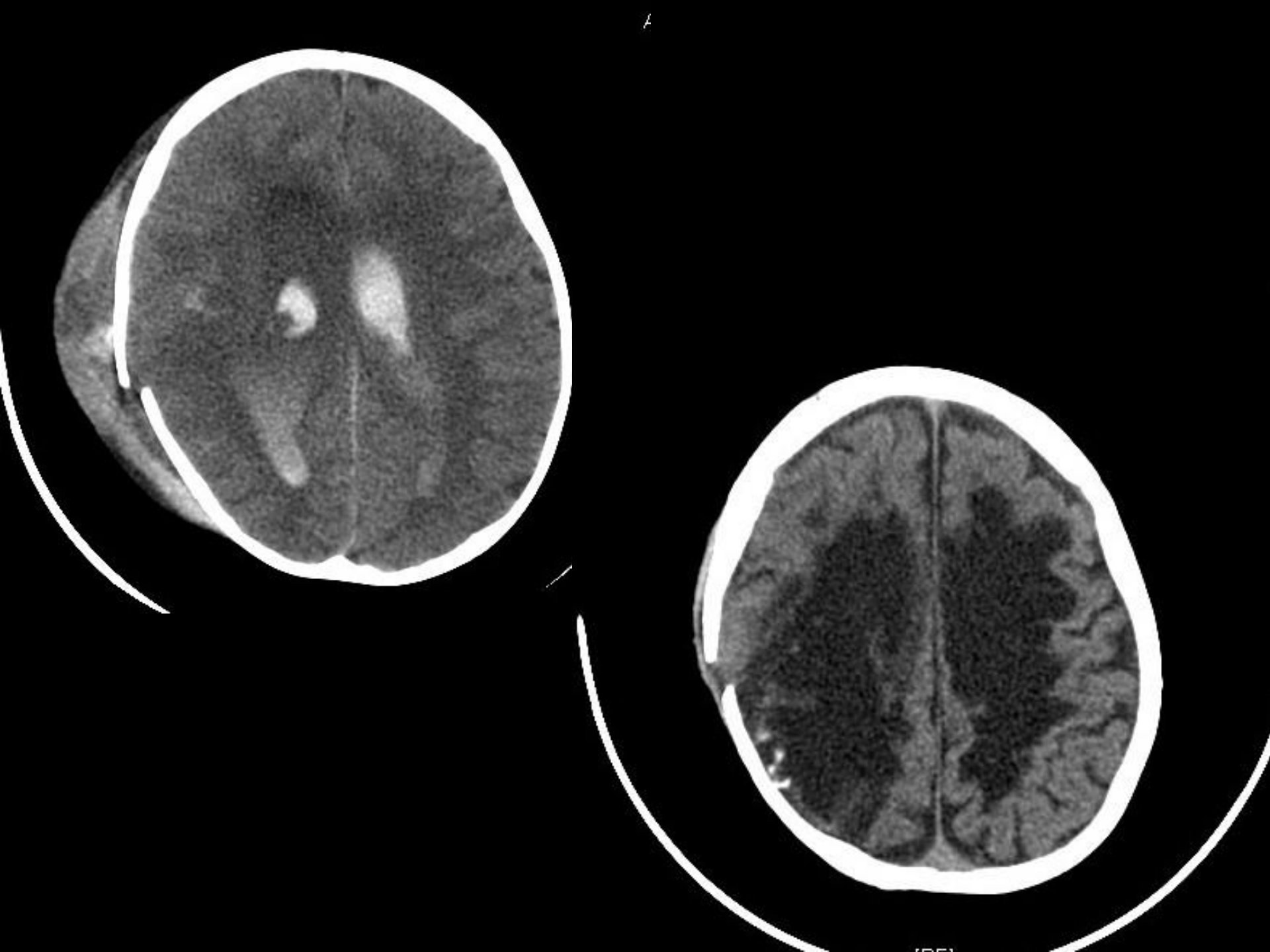
Isolated Skull Fracture Protocol

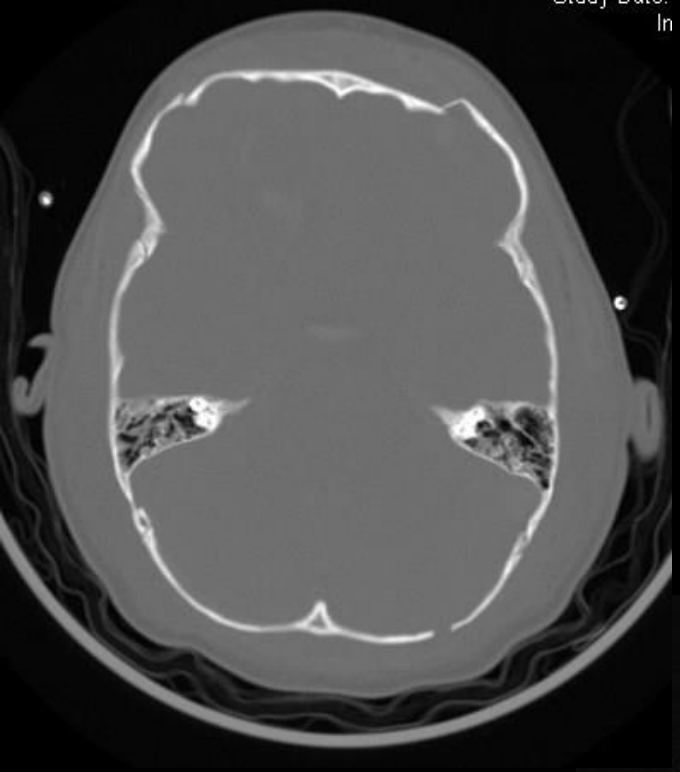
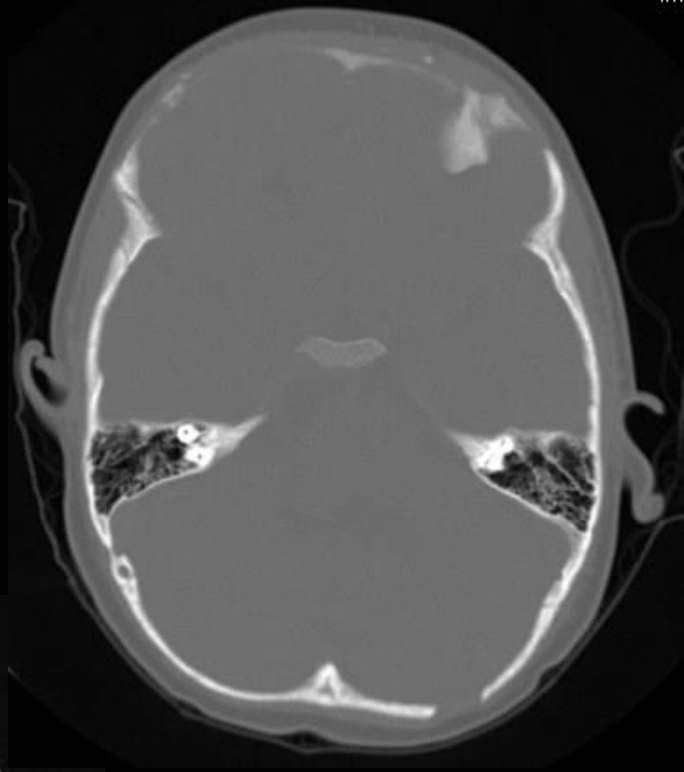
Applies for patients with CT brain showing isolated skull fracture
-No intracranial hemorrhage



Growing Skull Fractures

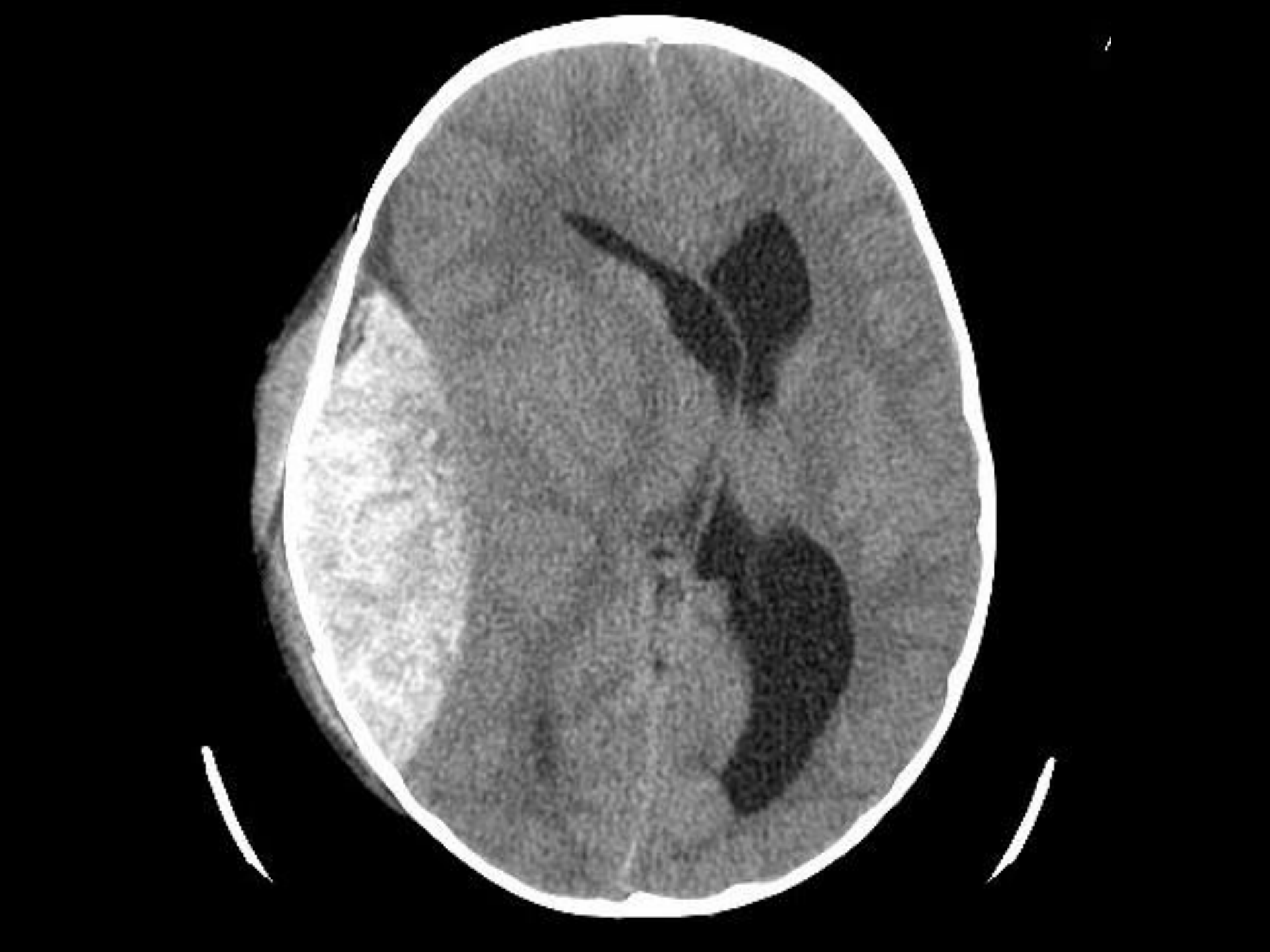
- Involves dural tear
- Usually involves severe underlying brain injury
- One theory skull folds in, tears dura and brain, and then pops back out
- Delayed repair necessary




Epidural Hematoma

- Lucid interval
- Usually associated with a skull fracture
- Crescent-shaped on CT
- Usually disruption of middle meningeal artery



Subdural Hematoma

- Associated with immediate change in conscious level
- Follows contours of brain on CT
- Often underlying brain injury involved
- Tearing of bridging veins of brain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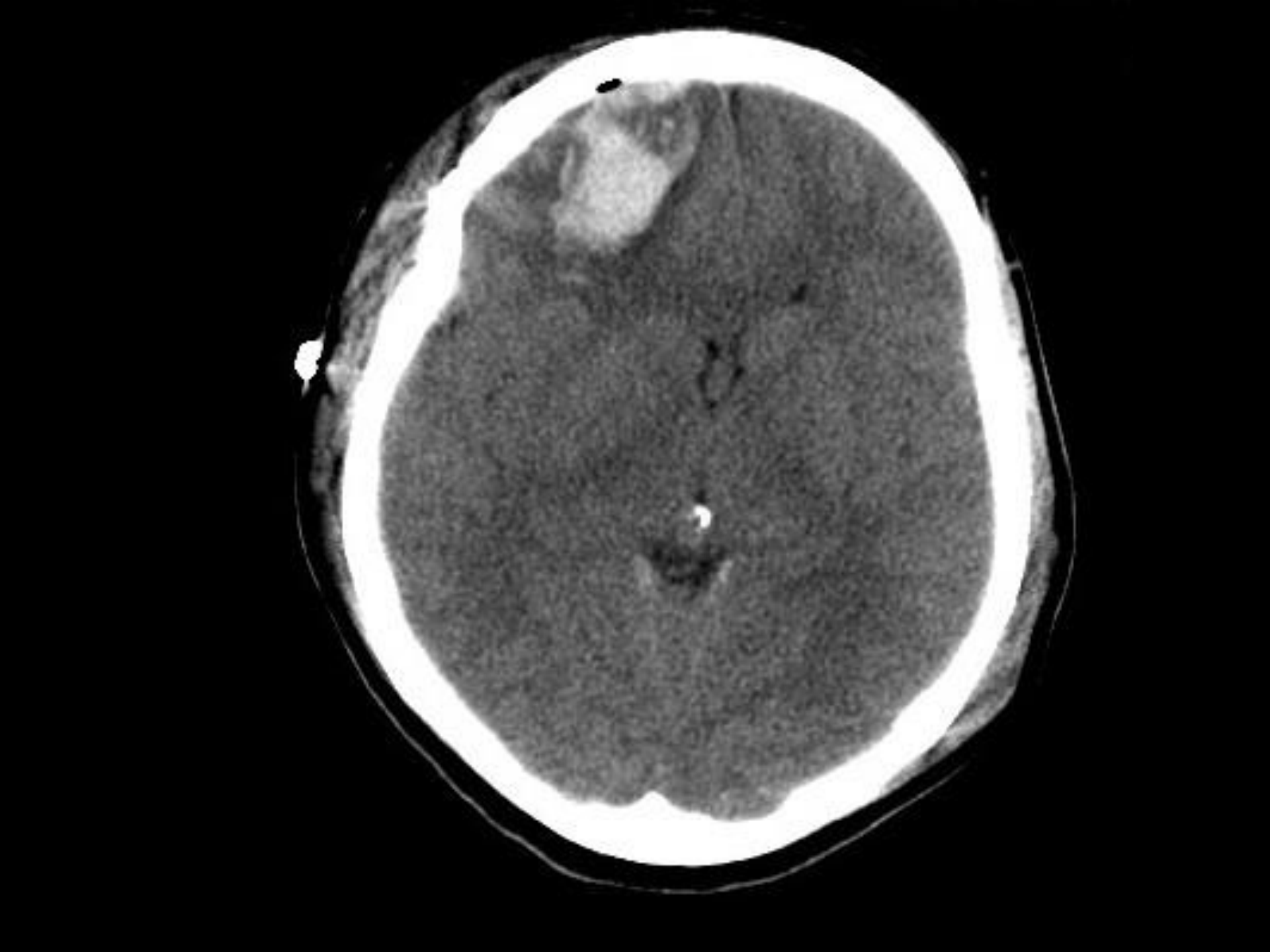
Subarachnoid Hemorrhage

- Often minor head trauma
- Within arachnoid folds

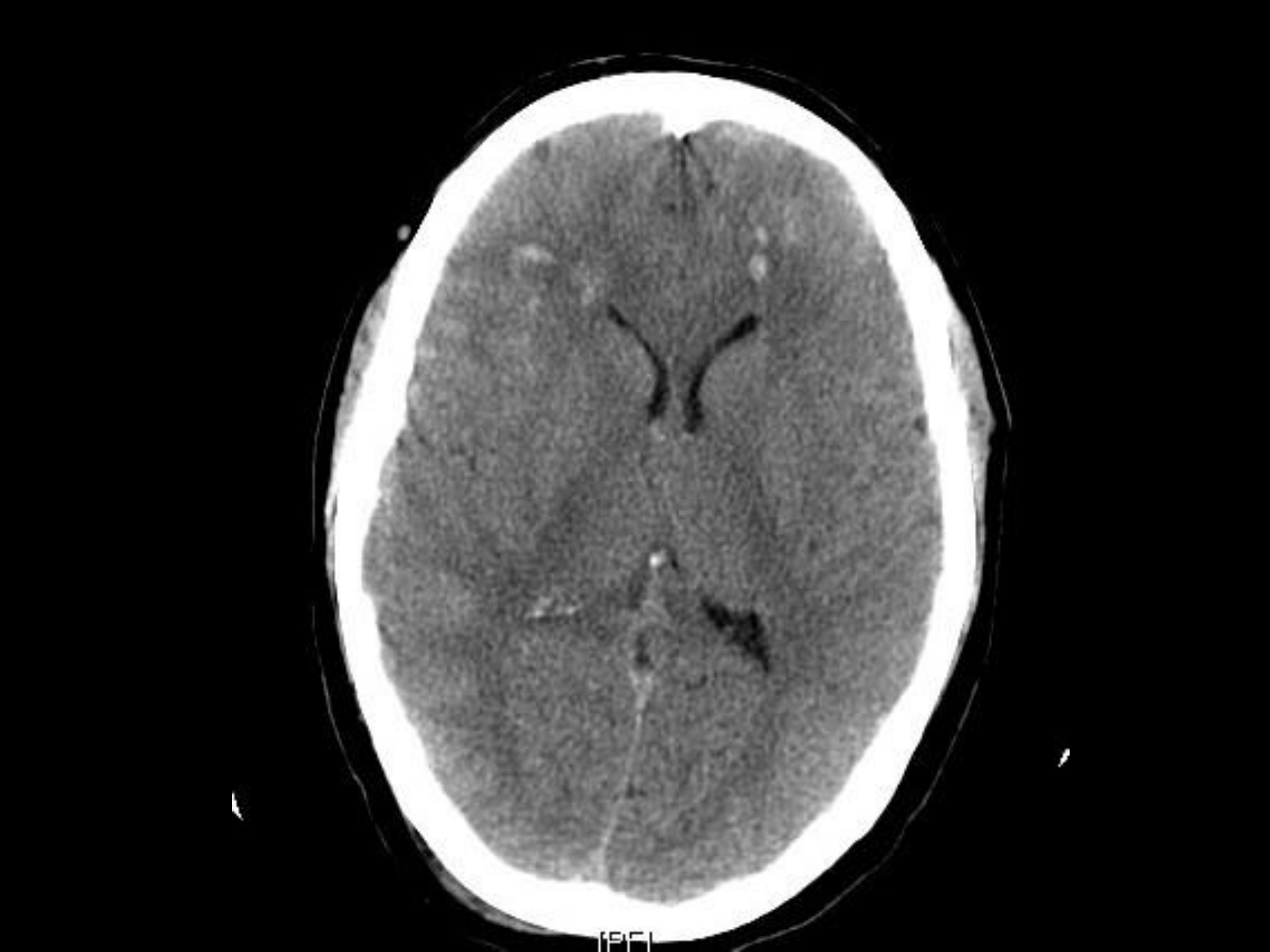
Intraparenchymal Hemorrhage

- Usually moderate to severe trauma
- Essentially bruise of brain often near bony prominences
- Rounded white spot on CT



Diffuse Axonal Injury

- Sloshing of brain in skull shears axons
- Cellular level damage
- Severe injury with little to no CT findings
- May not even have increased ICP despite poor neurological exam

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Non-Accidental Trauma

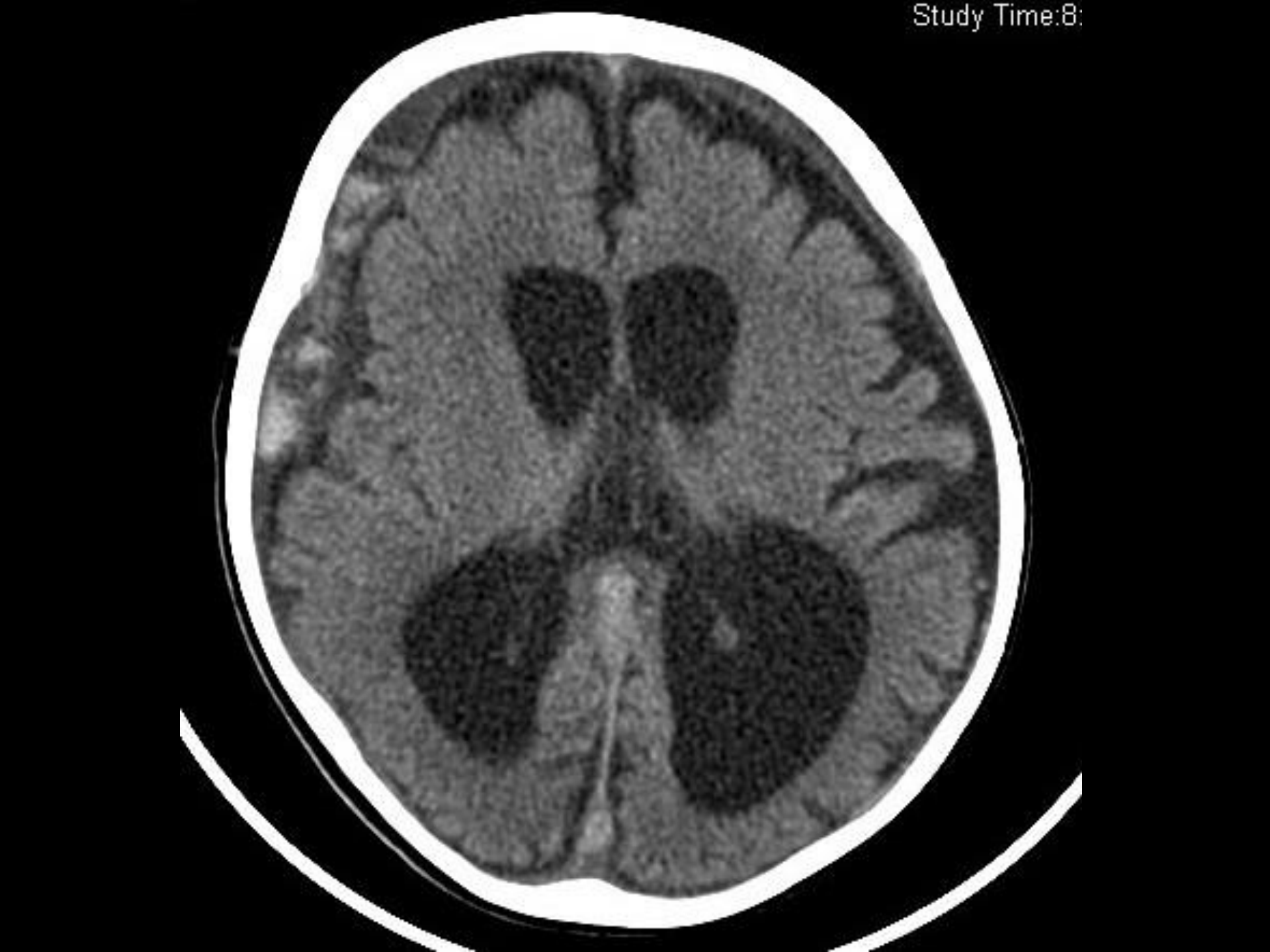
- Story is important
  - Often not consistent
  - Common scenario of baby found not breathing or scalp swollen with no h/o trauma given

NAT

- Any level of damage from simple fractures to DAI

Shaken Baby Syndrome

- Often child brought in sleepy or found "down" with no history
- DAI leading to strokes, SDHs
- "The incredibly shrinking brain"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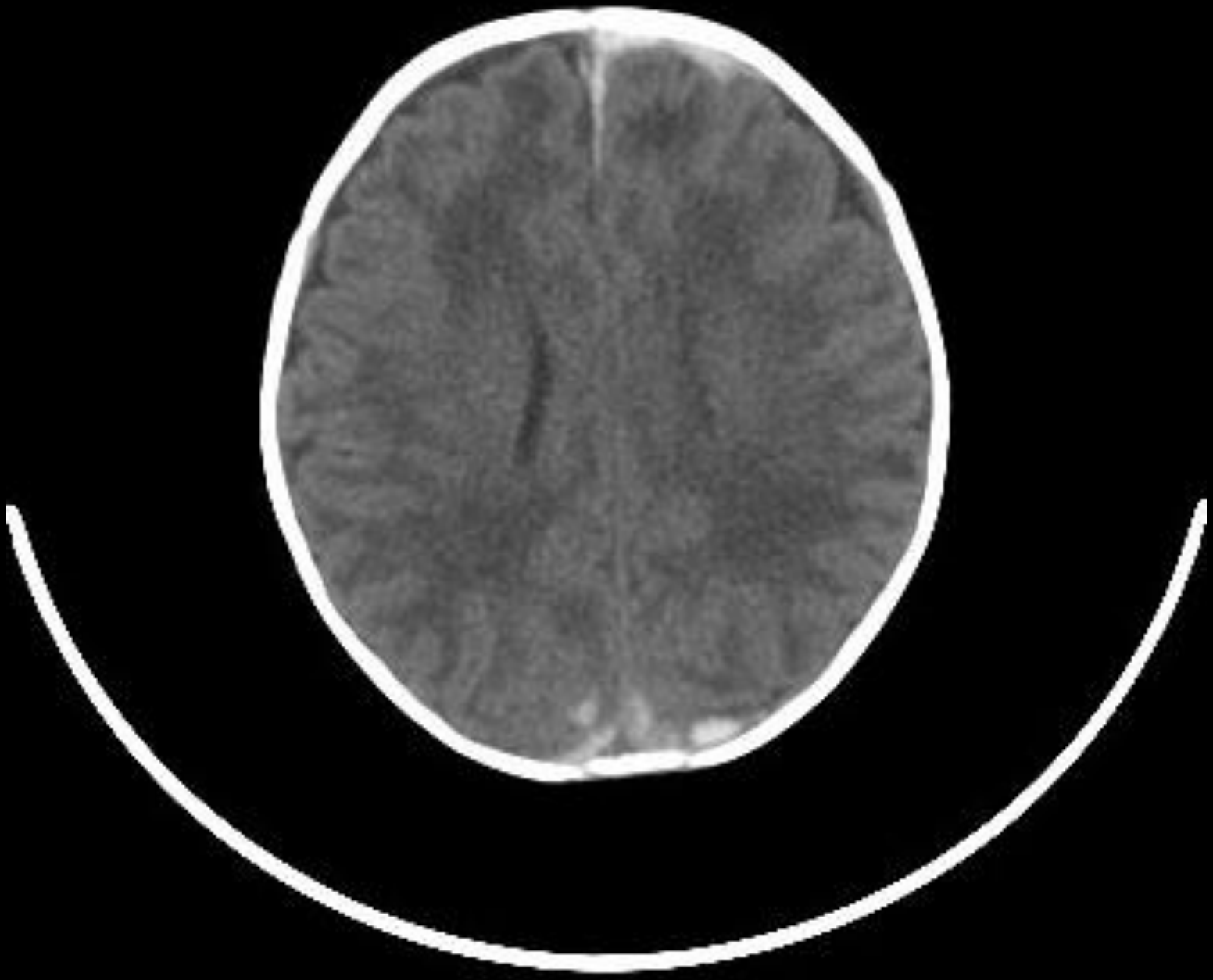
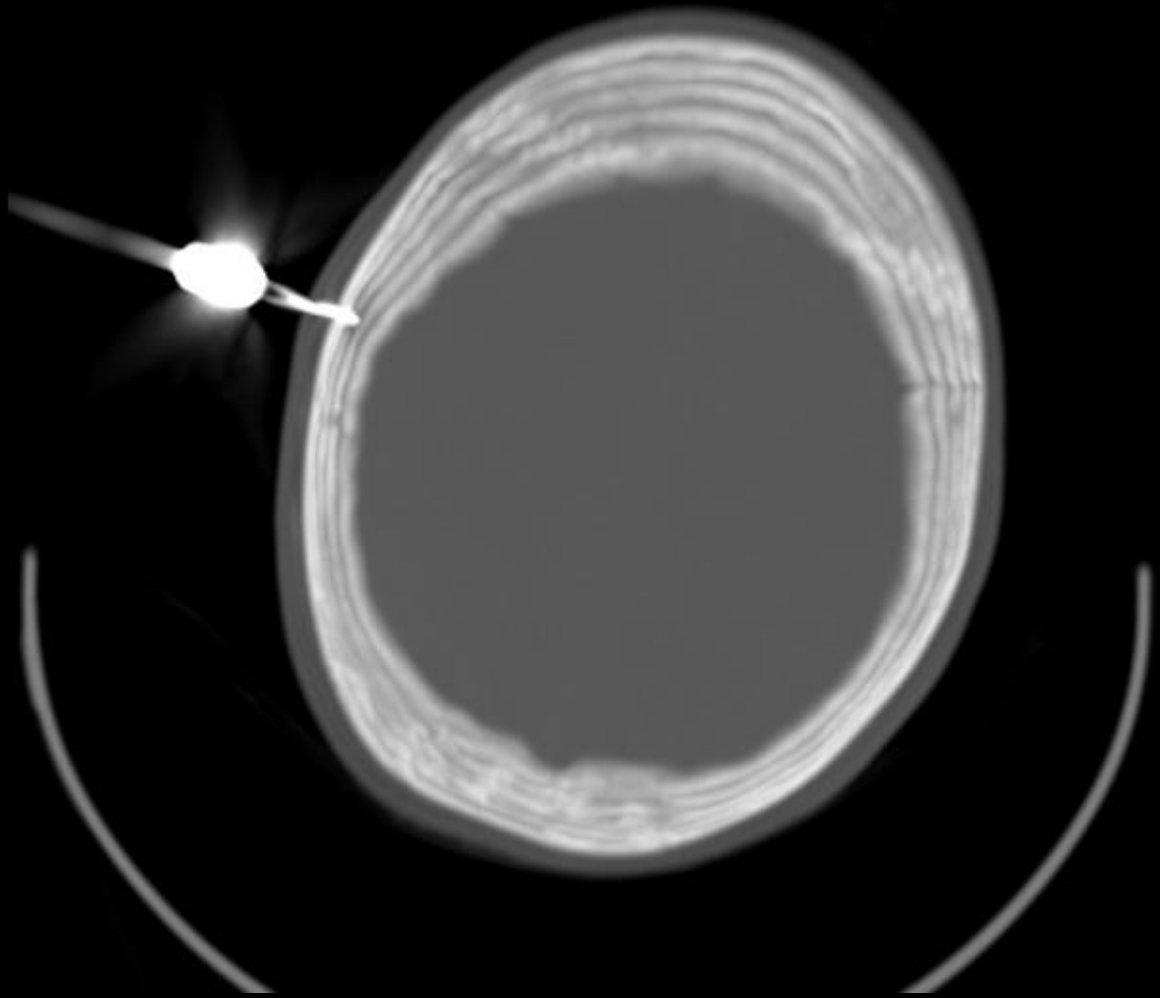
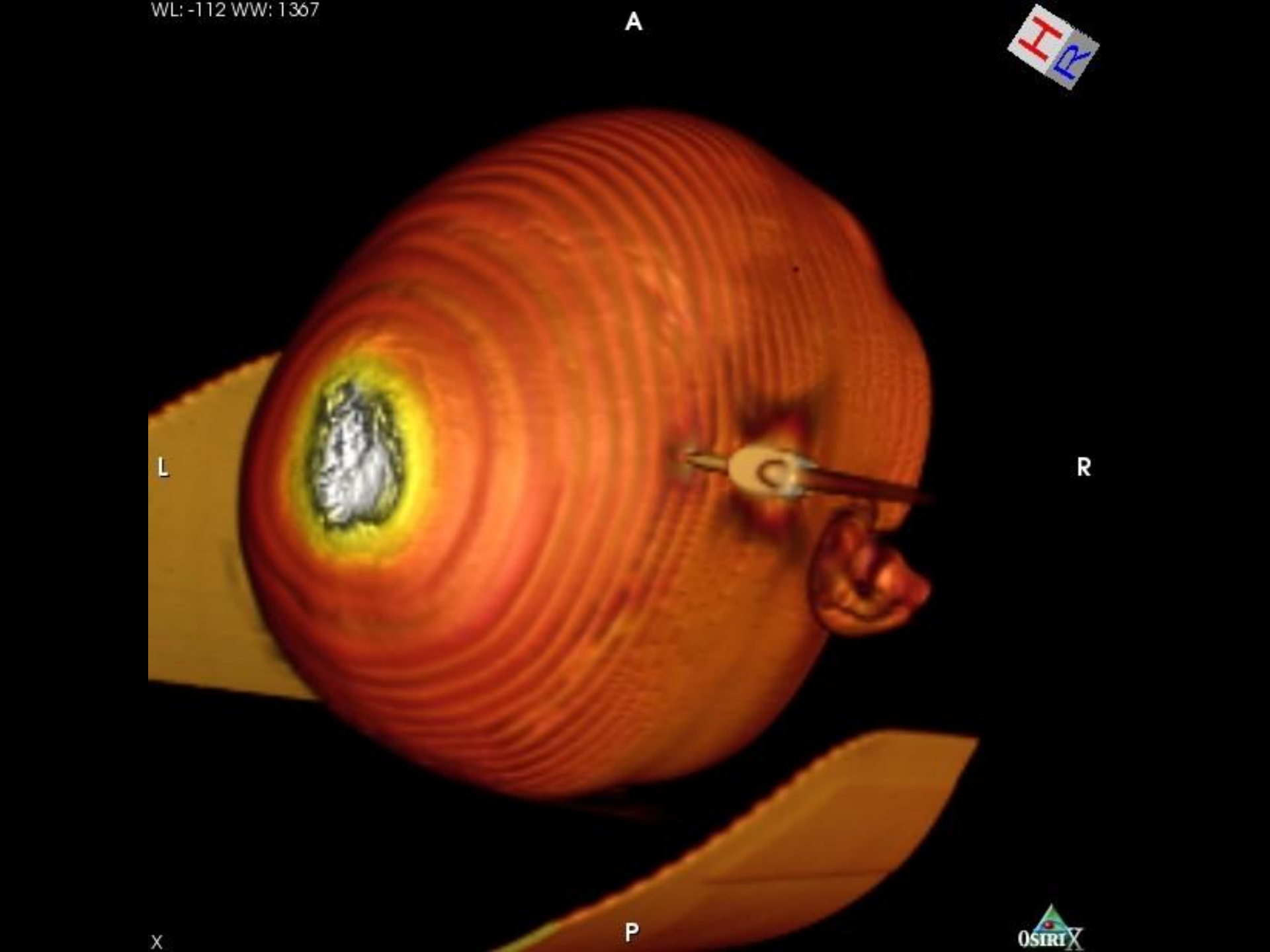


Penetrating Trauma

- It happens with multiple objects
  - Bullets, BBs
  - Sprinkler spikes
  - Darts
  - Knives
- Worry about infection with dirty objects
- Vascular injuries (pseudoaneurysms)

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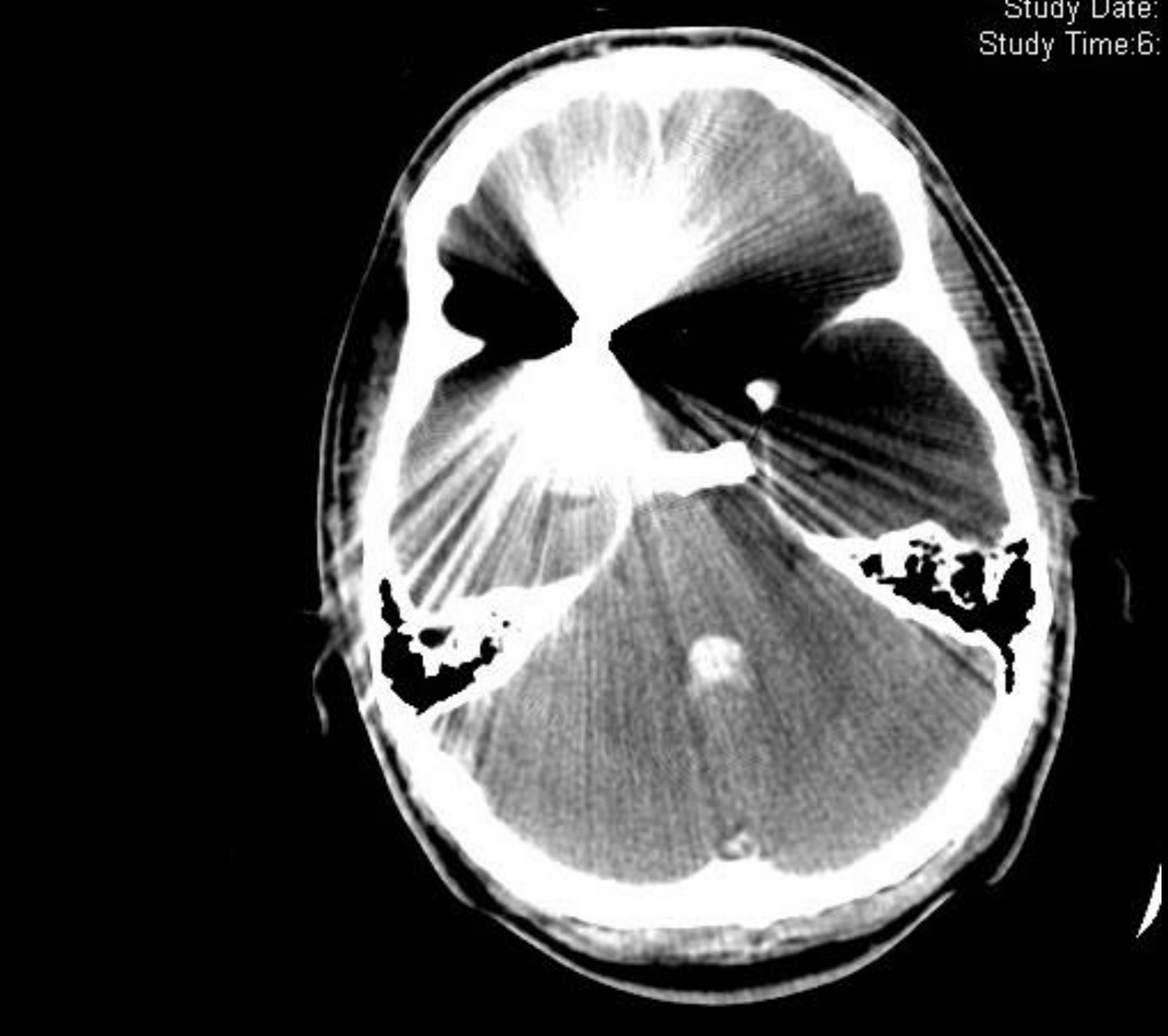
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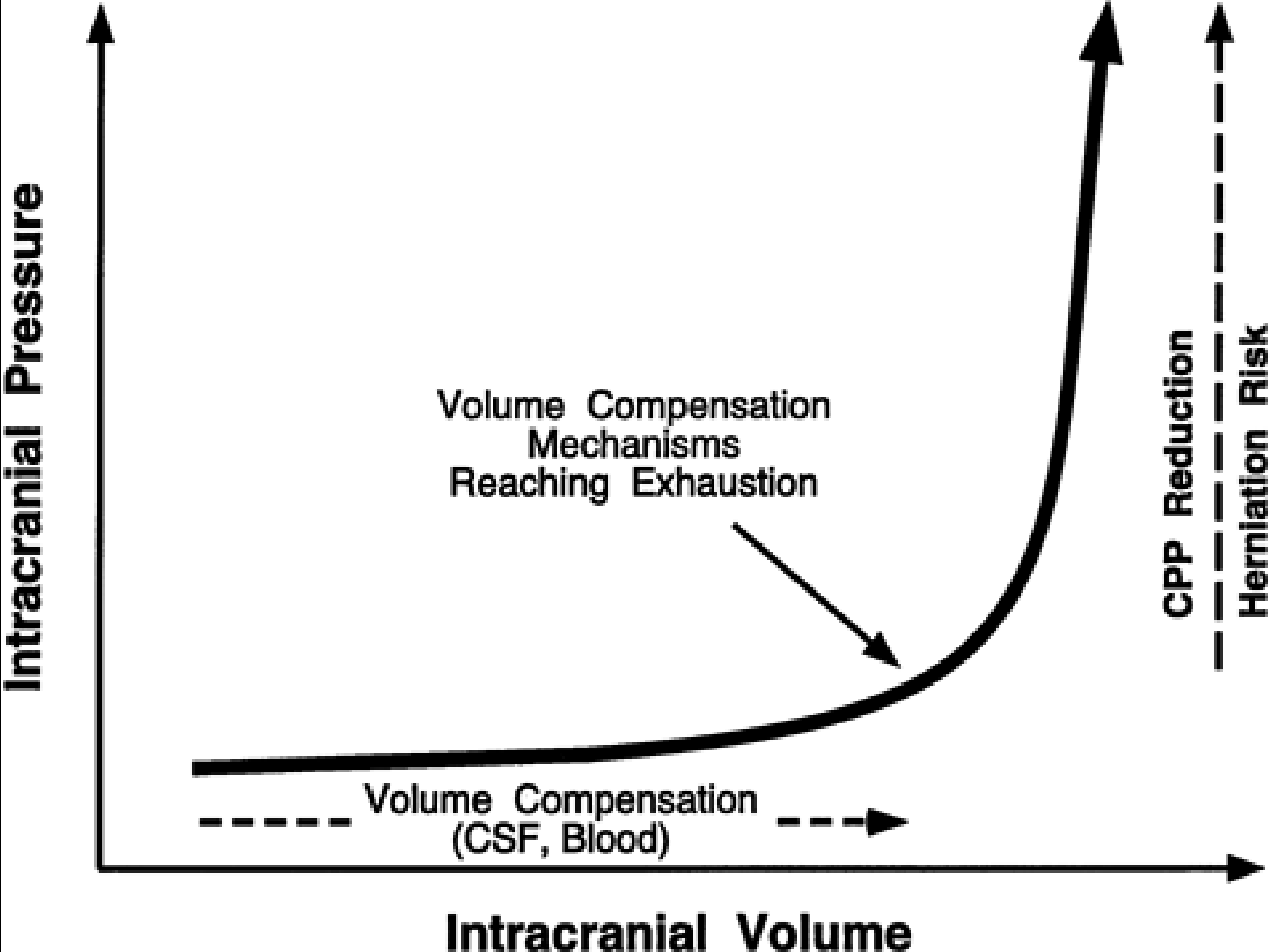
ICP

- Skull fixed space/box
- Volume of skull
  - Blood in vessels
  - Brain tissue
  - CSF
  - Other space occupying lesions (blood, tumor)


Intracranial Pressure
Volume Compensation
Mechanisms
Reaching Exhaustion
CPP Reduction
Herniation Risk
Volume Compensation
(CSF, Blood)
Intracranial Volume

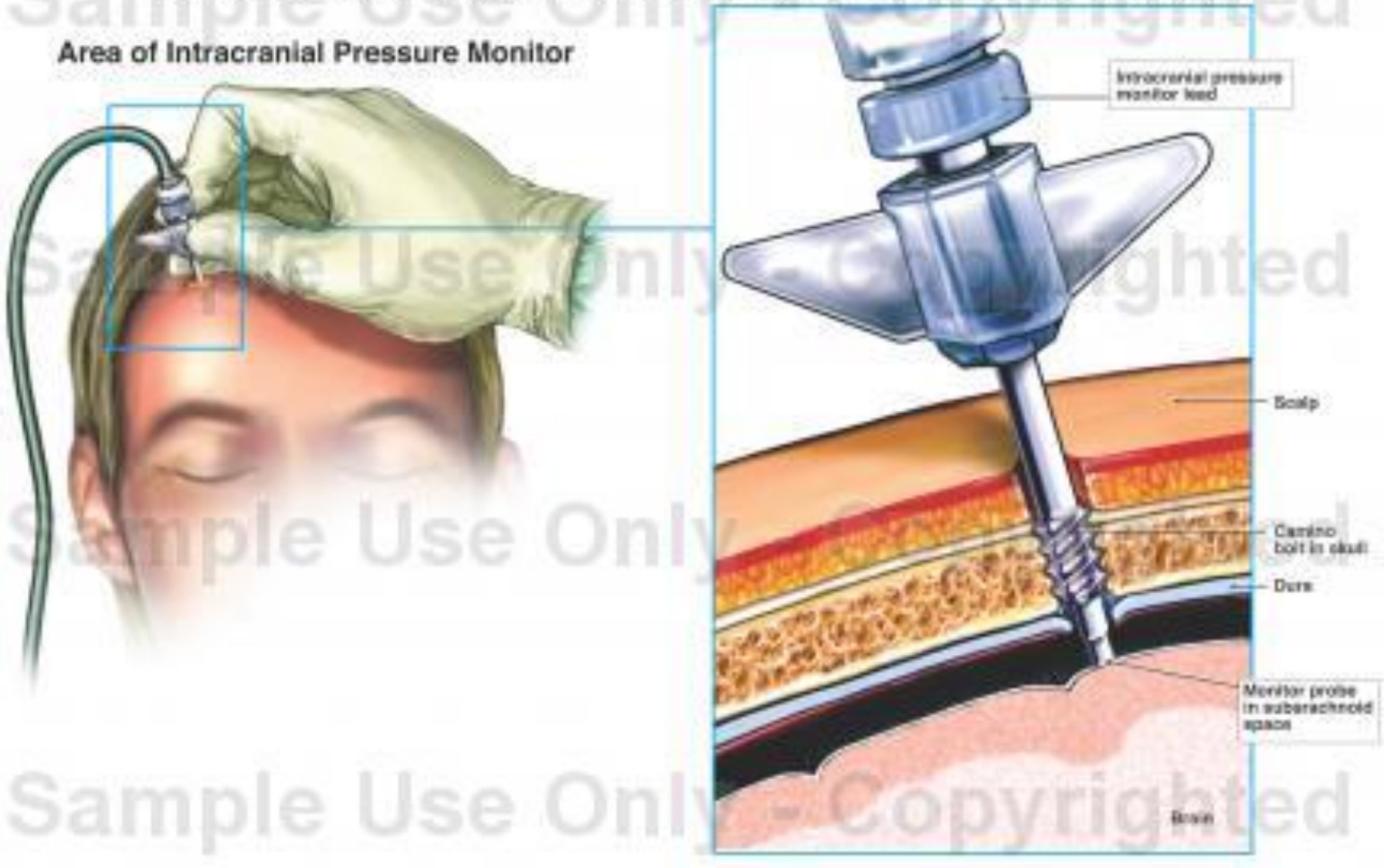
ICP Monitoring

- Ventriculostomy (EVD)
  - Catheter into ventricle of brain, like arterial line only column of fluid is CSF
  - Can also treat high ICP by draining CSF and reducing brain volume

ICP Monitoring

- "Bolt"
  - Fiberoptic wire/cable that measures pressure of brain
  - Placed a few centimeters into the brain itself, not into ventricle

Brain Surgery - Placement of Intracranial Pressure Monitor



Second Hit Syndrome

- After a brain injury, even a concussion, brain has a chemical imbalance
- Second injury during that imbalance period sets off cascade
- Malignant cerebral edema
- Leads to severe neurological injury or even death

Questions?