



Louis Rivera, HMS III

Gillian Lieberman, MD

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Imaging of Acute Cerebral Trauma

Louis Rivera, Harvard Medical School, Year III

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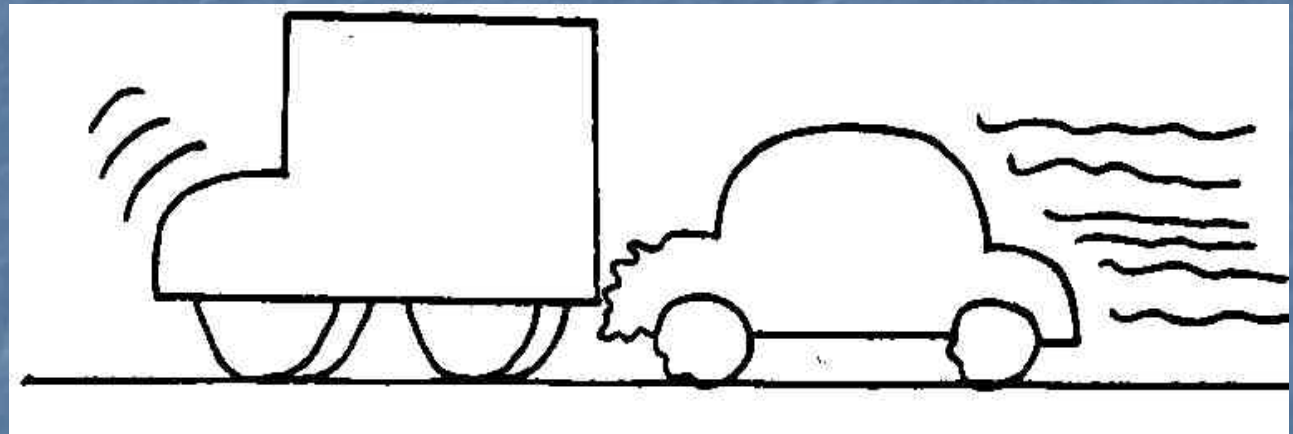
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46 y/o Female s/p Trauma

- Unrestrained? MVC requiring Med Flight
- Facial bruising/swelling
- **DEEP COMA**
- **SEIZURES**

What is the
imaging
modality of
choice?



<http://pluto.fss.buffalo.edu/classes/psy/segal/416f2001/compdevice/olsonfilby.html>



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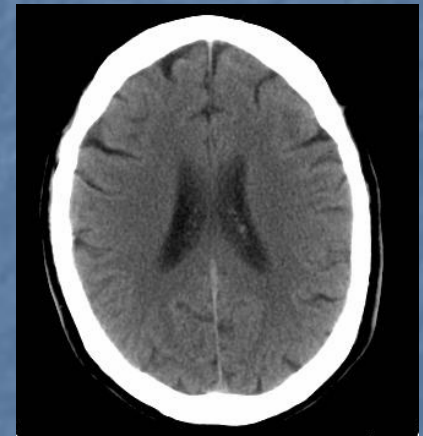
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CT is the Modality of Choice for Acute Head Trauma

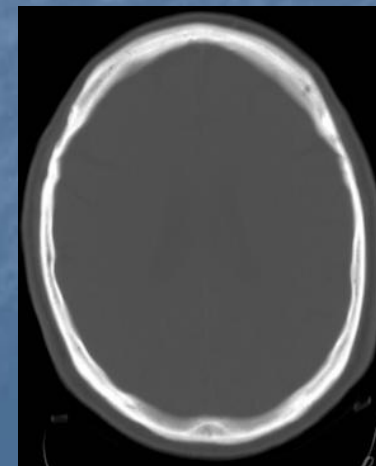
Advantages:

- **FAST** - start w/o contrast
- Ability to change window allows simultaneous scanning of bone/soft tissue
- Traumatic concerns are easily visualized
 - Fxs are often evident on bone window
 - Acute bleeds are hyperdense
 - Even subtle shifts are obvious
- Easier access if pt. decompensates

40/80
Window



PACS, BIDMC



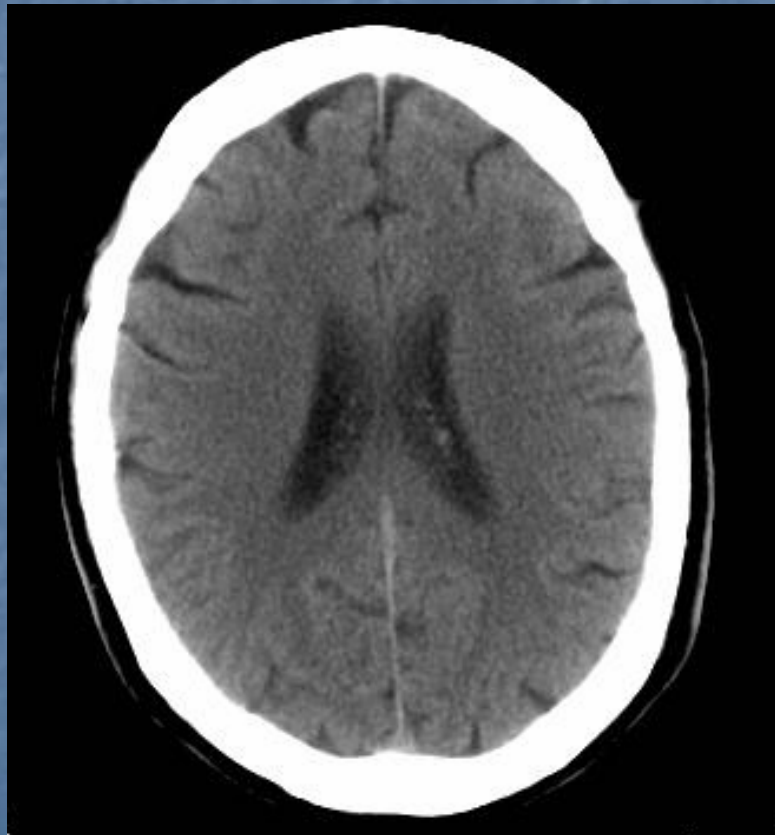
400/2000
Window



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Normal Brain Appearance on CT



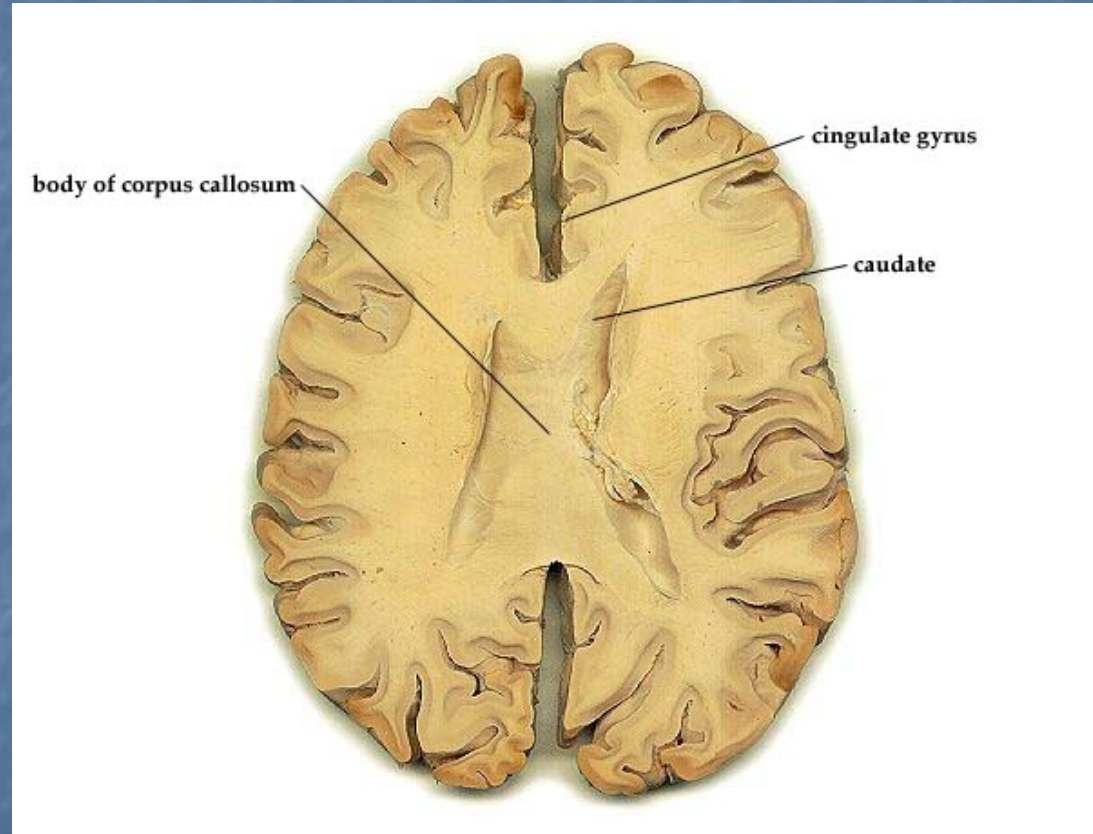
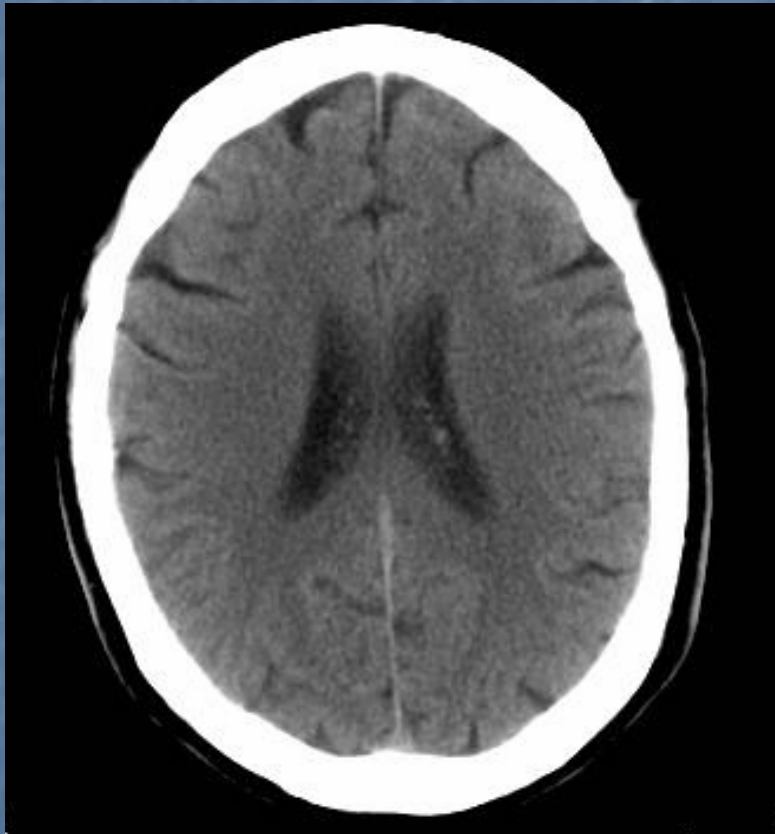
- Preservation of grey/white matter interfaces (white matter is DARKER than grey on CT)
- CSF in the ventricles is very dark grey
- No shift of midline structures
- Prominent sulci



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Axial Anatomy of the Superior Cortex



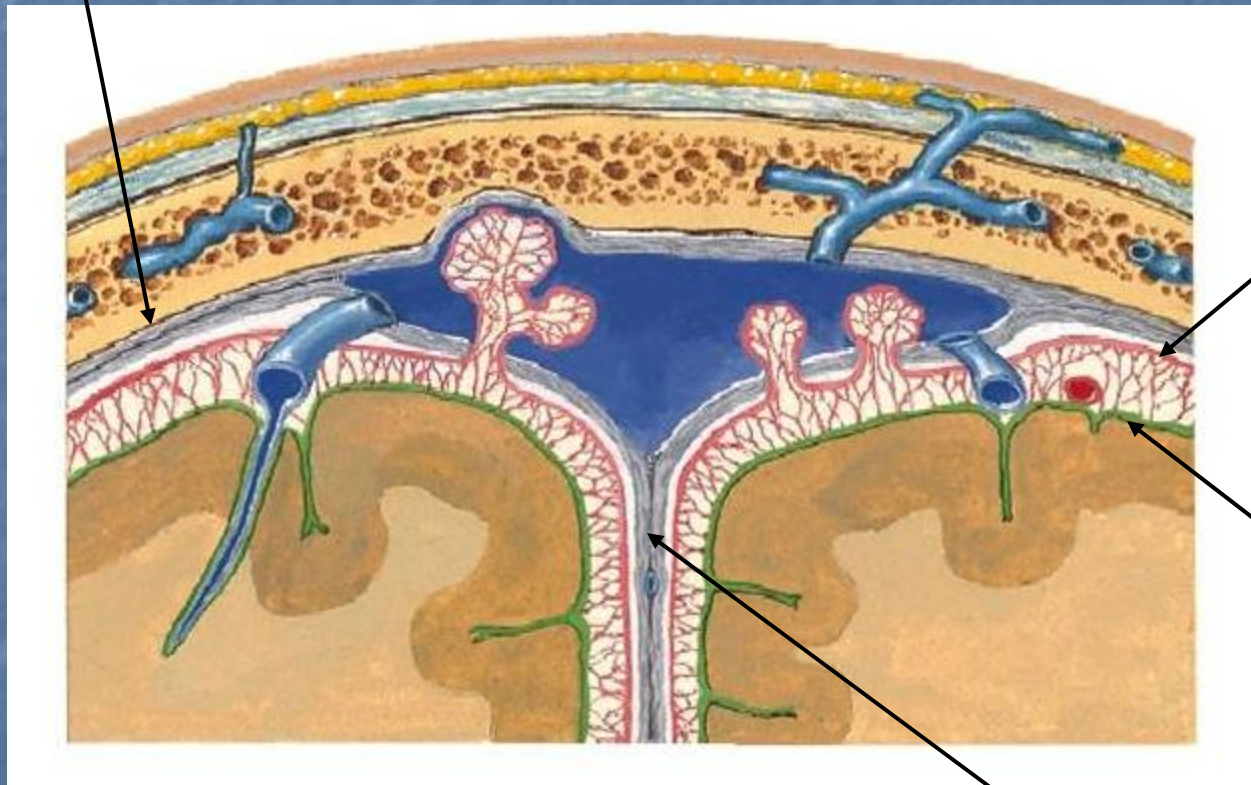


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Meninges

Dura mater



Arachnoid

Pia mater

Falx cerebri

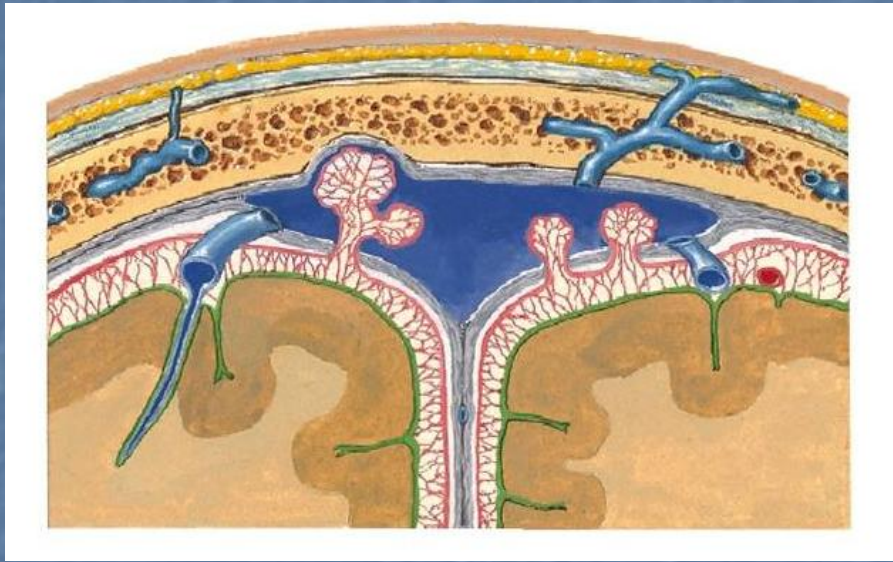
Netter, Frank. *Atlas of Human Anatomy*. 3rd Edition. Icon Learning, 2003.



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DDx Traumatic Cranial Bleeds



- Epidural
 - Well-contained by cranial sutures, can cross midline
 - Often "Bi-convex" shape
 - Associated with skull Fxs
- Subdural
 - Contained by falx cerebri and tentorium
 - Often "Crescent" shape
 - Can have venous OR arterial blood
- Subarachnoid
 - Extends into CSF space
 - Fluid on CT best seen in the cisterns and sulci

Also on the DDx:

Tumor

Abscess

Focal Contusion

Hydrocephalus

Netter, Frank. [Atlas of Human Anatomy](#). 3rd Edition. Icon Learning, 2003.



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Our Patient

- Loss of demarcation of the fissures/sulci
- Loss of grey matter/white matter differentiation
- Blood in the third and lateral ventricles
- Mild shift of the septum pellucidum to the left

**What's the
Dx?**



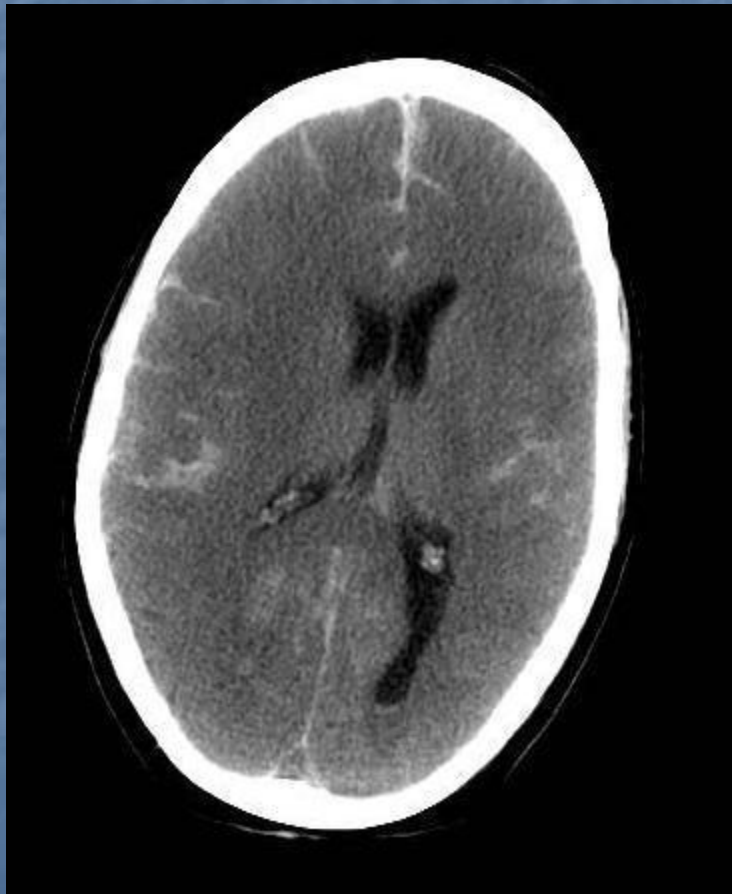
PACS, BIDMC



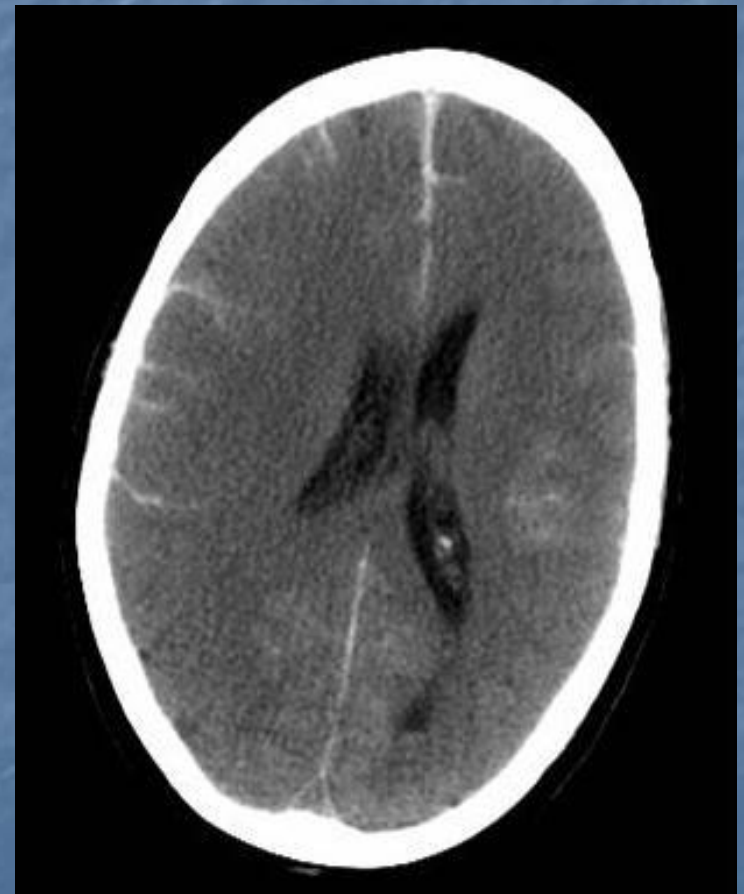
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Subarachnoid AND Subdural Hemorrhages



PACS, BIDMC



PACS, BIDMC



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Connecting the Dots

- The amount of subarachnoid blood was out of proportion to the external injuries.
- The presence of both a subarachnoid bleed and a subdural hemorrhage might be due to two separate events.
- EMS reports indicated that patient had struck a parked truck without breaking or swerving.

Follow-up CTs and angiography were ordered...

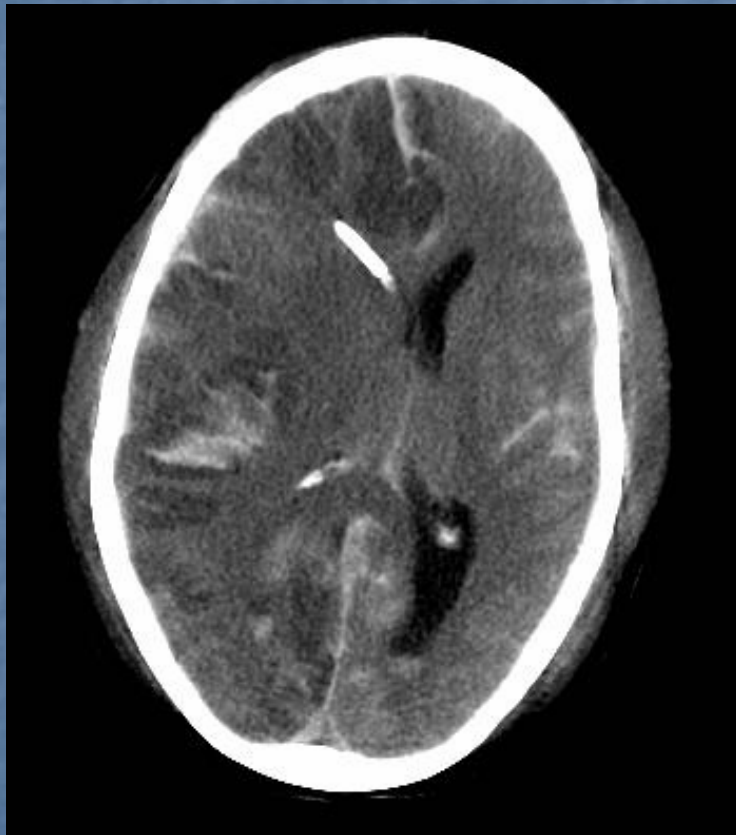




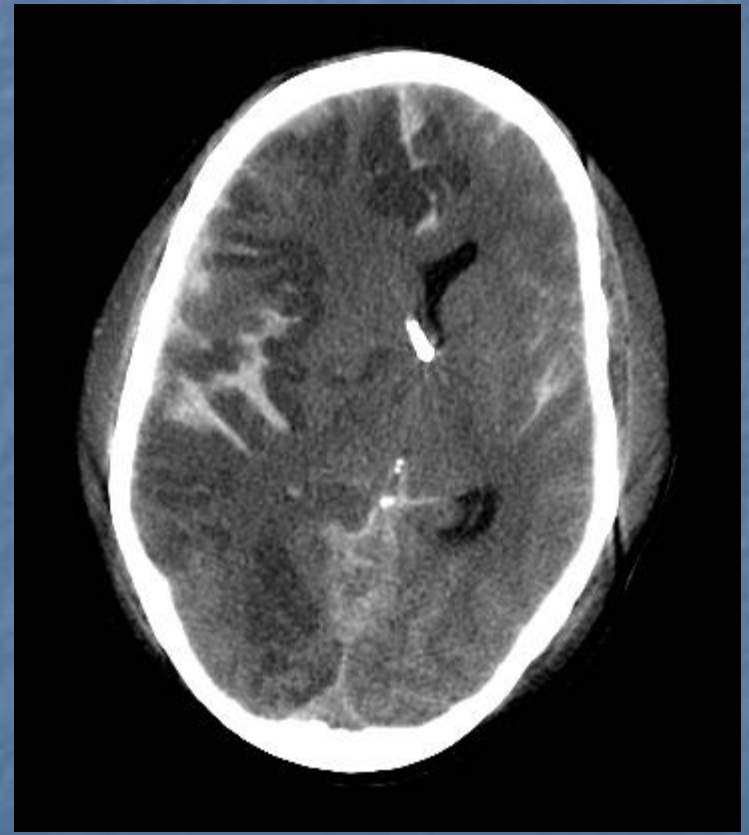
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Day Two – Evolving Infarction



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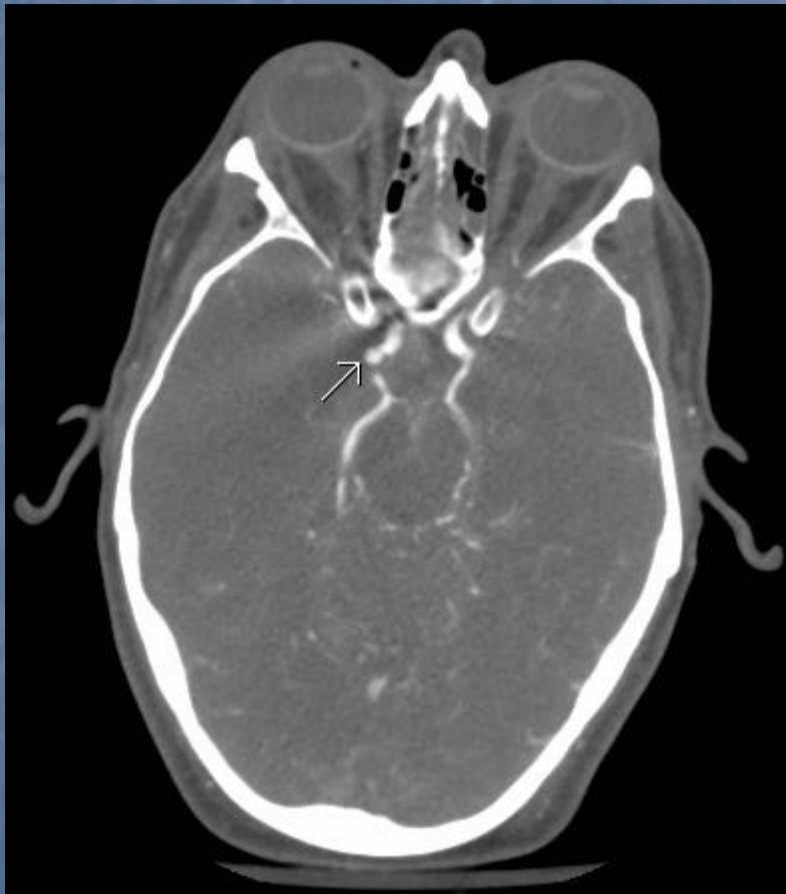
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CT Angiography



We now see a small aneurysm in the Circle of Willis...



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Computerized Reconstruction

Aneurysm is located at the intersection of the R Interior Carotid and the R Posterior Communicating Arteries, directed laterally and inferiorly





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Patient Follow-Up

Perhaps an aneurysm ruptured, causing the MVC and subsequent trauma.

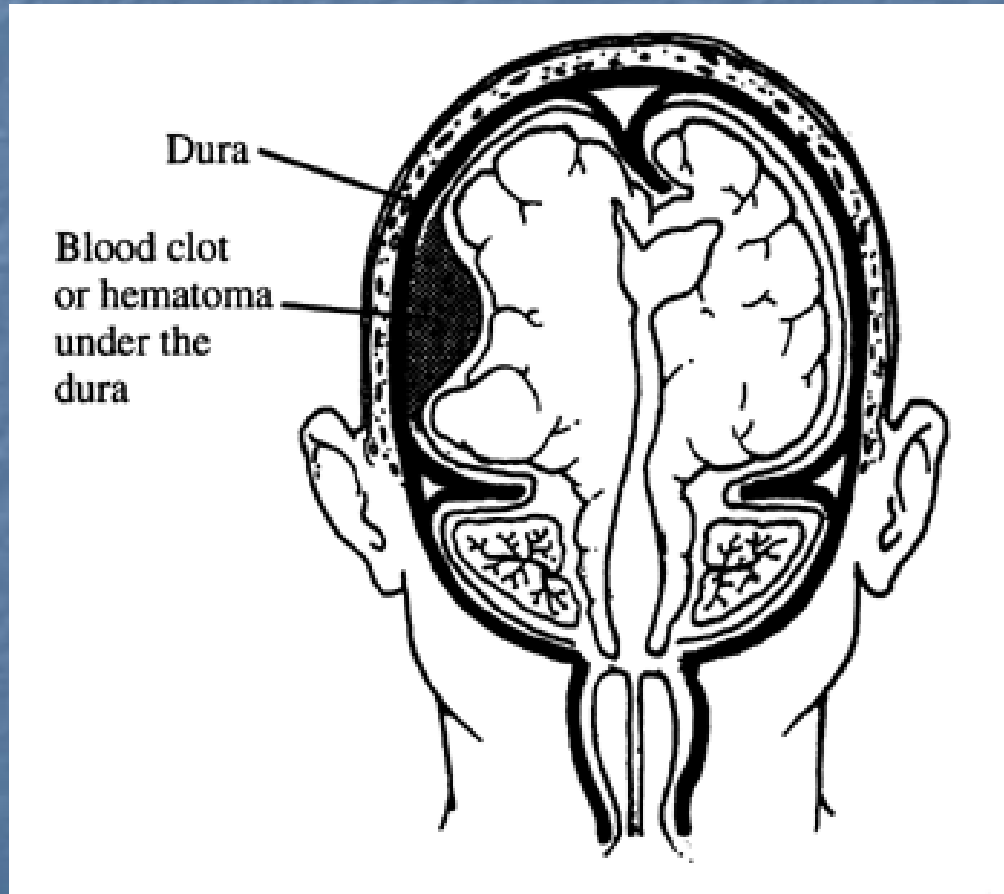
Sadly, the injuries were incompatible with life. Patient was pronounced brain dead and removed from life support on day two.



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Companion Patient 2 – Subdural Hemorrhage



- 66 Year-old man, unconscious, unknown traumatic history

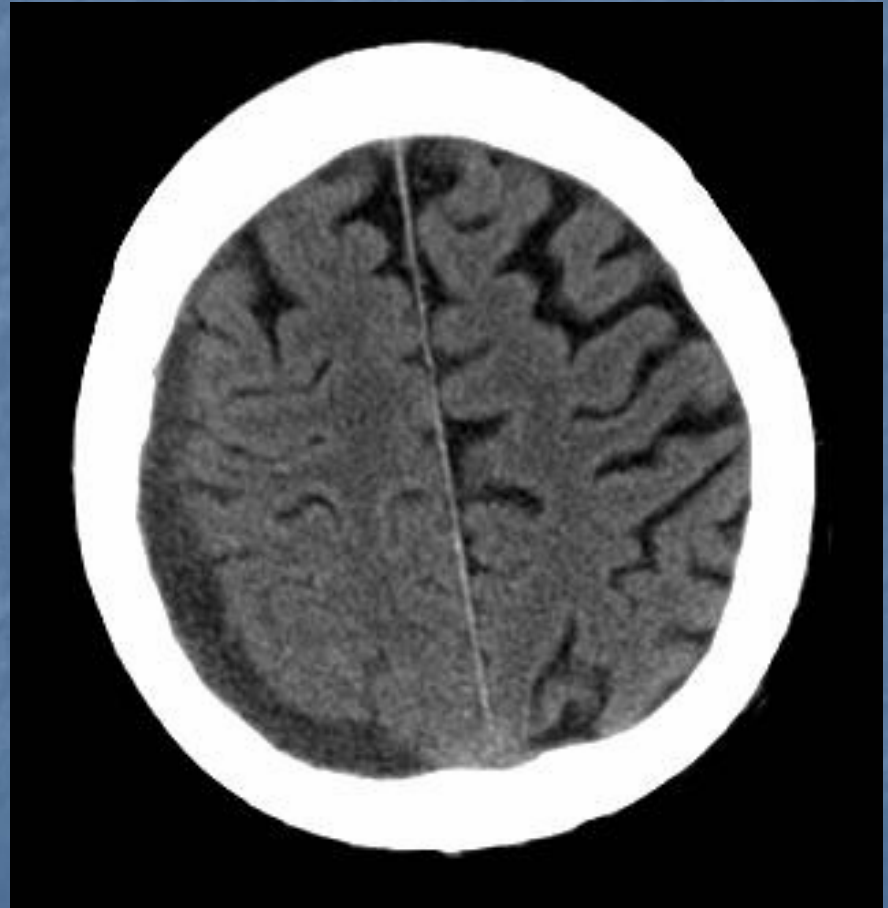


Companion Patient 2 – Subdural Hemorrhage

May be classified as

- 1) hyperacute (HYPOdense) if less than 12 hours
- 2) acute (HYPERdense) if less than few days
- 3) subacute (ISOdense) from a few days to 2-3 weeks
- 4) chronic (HYPOdense) if more than 3 weeks

We need to put this together with clinical observations and Hx to tell for certain if this is hyperacute or chronic.





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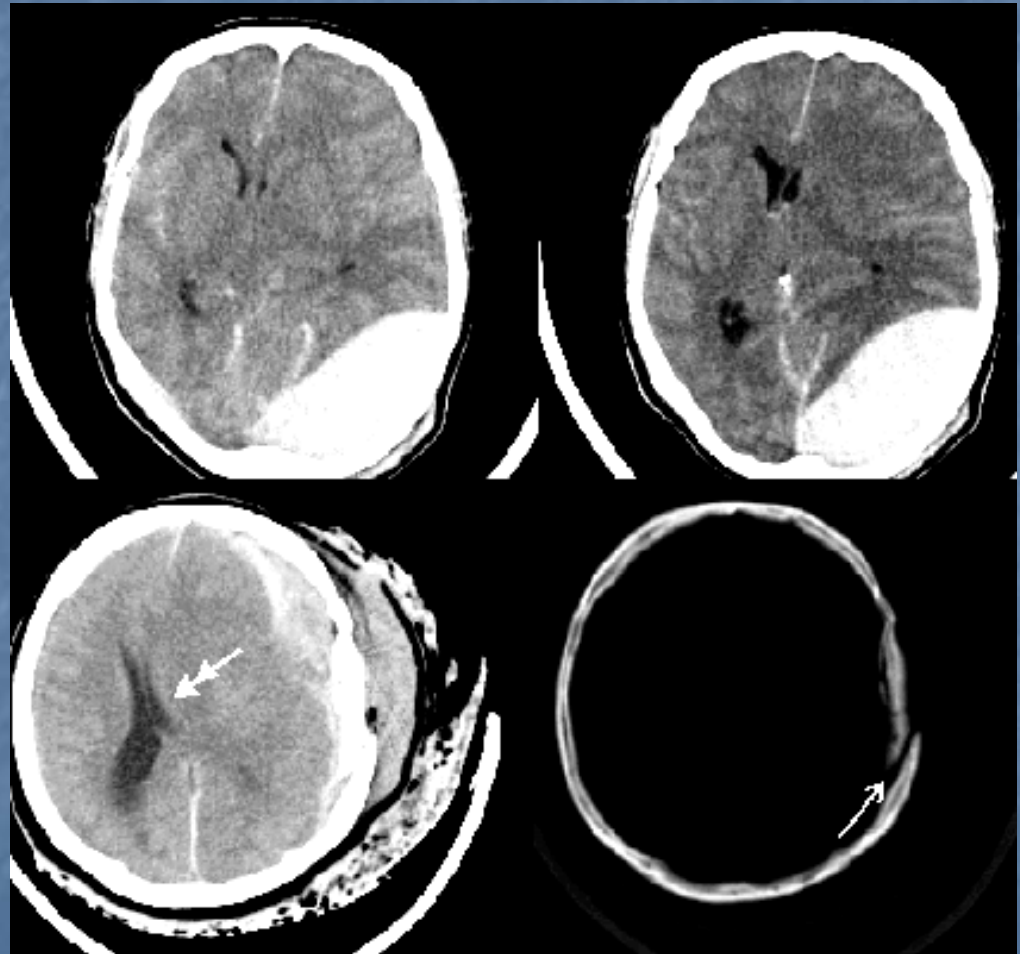
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Companion Patient 3

46 y/o man s/p motorcycle crash

- Bi-convex, very large
- Mostly contained within L parieto-occipital region along sutures
- Crosses midline?
- Associated Fx
- Hyperdense

**What's the
Dx?**



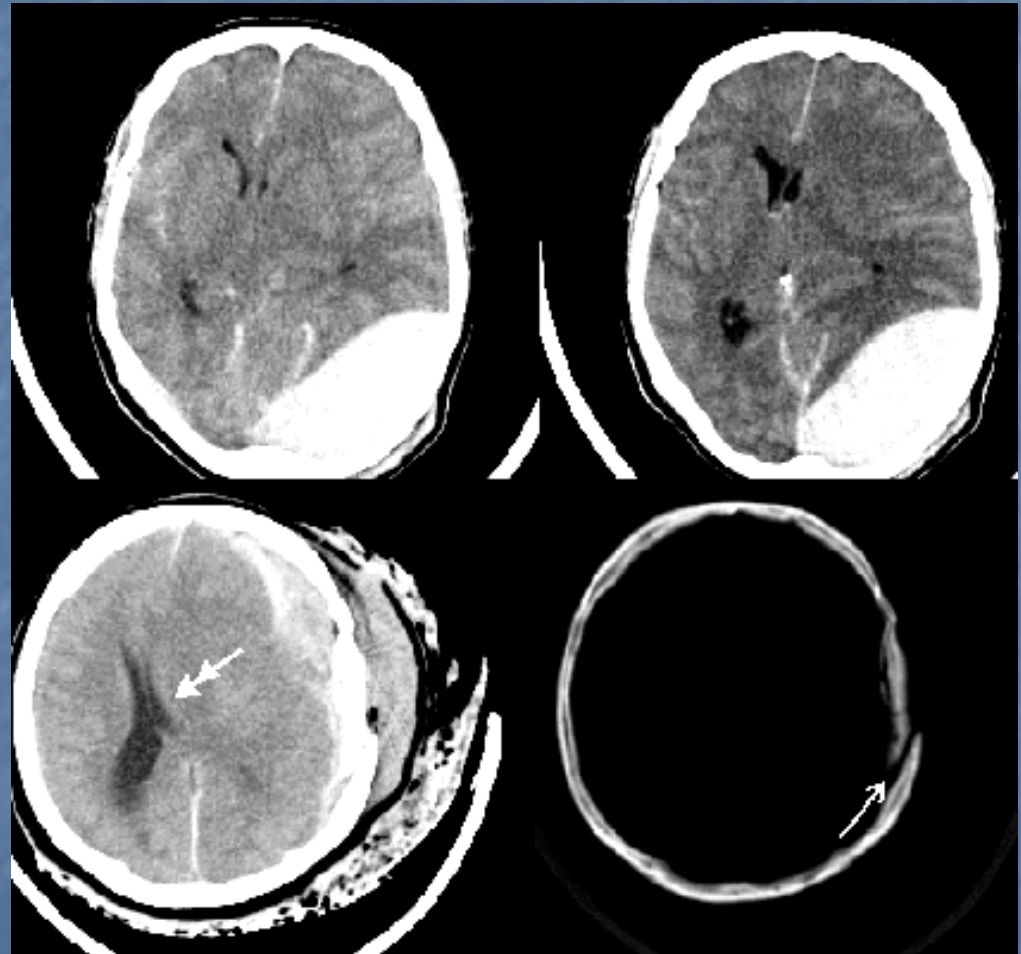


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Companion Patient 3

Acute Epidural Hemorrhage





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Companion Patient 4 – Hemorrhagic Contusion

39 y/o male s/p 15-foot fall

- No shift of structures
- Focal blood/edema



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Traumatic Brain Injury (TBI)

- 1.6 million people/year in the U.S. have a TBI.
- 150,000 of those suffer “severe” (comatose) head injury.
- 50,000 people/year die from TBI.
- CT radiology is the standard for rapid evaluation of the post-trauma brain.
- The most common causes of TBI are MVCs, bicycle/pedestrian accidents, falls, and violence.
- Gunshot wounds are a small percentage of TBIs, but account for half of the fatalities.
- Intracranial pressure monitoring is key in comatose patients.



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Acknowledgements

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