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Neuroimaging

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Neuroimaging

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04/20/2023

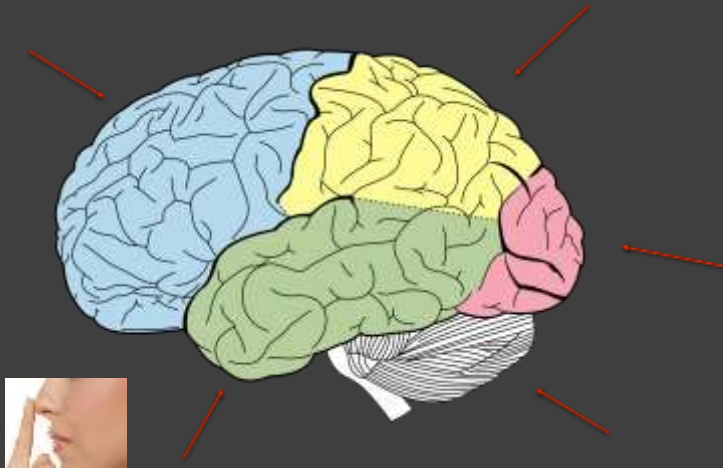
1

What we'll cover today

- Anatomy (Head)
- Cases

2

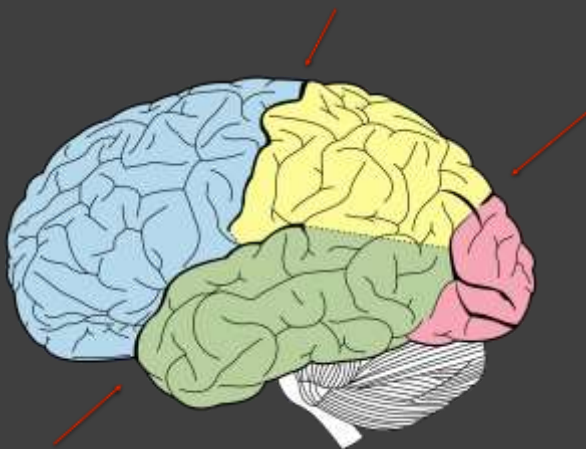
Lobes of the brain



https://commons.wikimedia.org/wiki/File:Lobes_of_the_brain_NL.svg

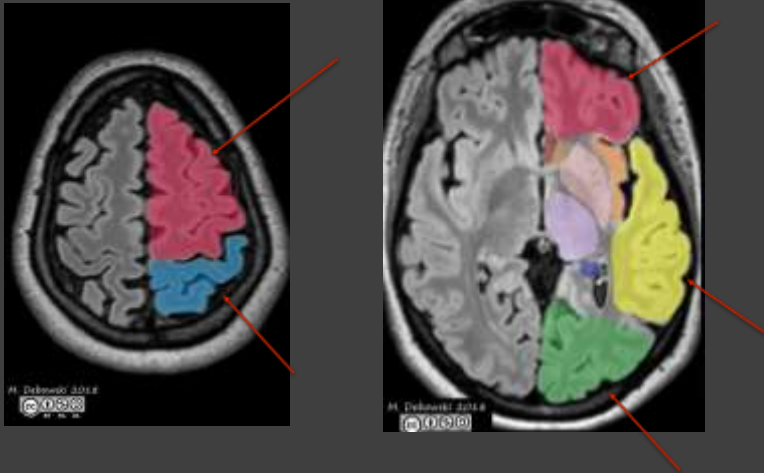
3

Major Fissures (Sulcus)



4

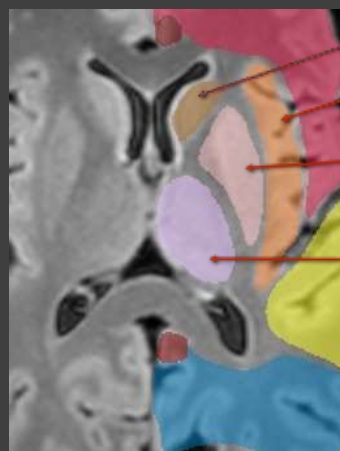
Axial anatomy



Case courtesy of Maciej Debowski, Radiopaedia.org, rID: 61691

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Axial anatomy



Caudate

Insula

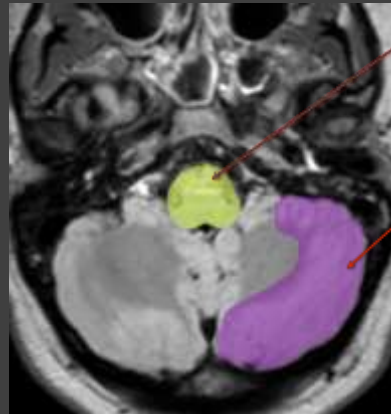
Lentiform Nucleus
Putamen + Globus Pallidus

Thalamus

Case courtesy of Maciej Debowski, Radiopaedia.org, rID: 61691

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Axial anatomy



Pons

Cerebellum

Case courtesy of Maciej Debowski, Radiopaedia.org, rID: 61691

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Sagittal

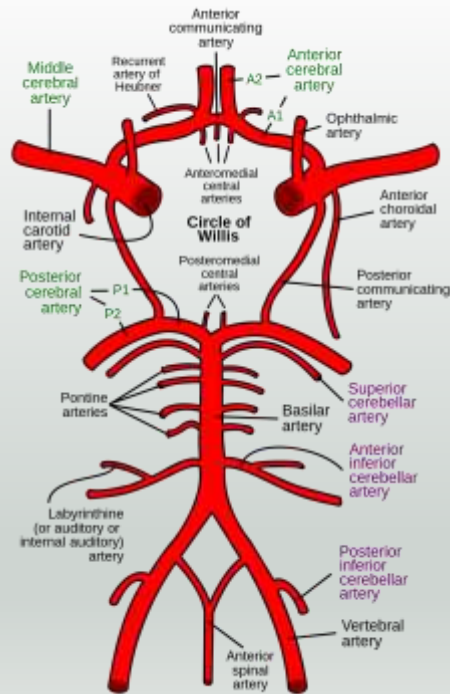


Cingulate gyrus
 Corpus callosum
 Pituitary
 Midbrain
 Pons
 Medulla
 Anterior/posterior cerebellum

Case courtesy of Maciej Debowski, Radiopaedia.org, rID: 61691

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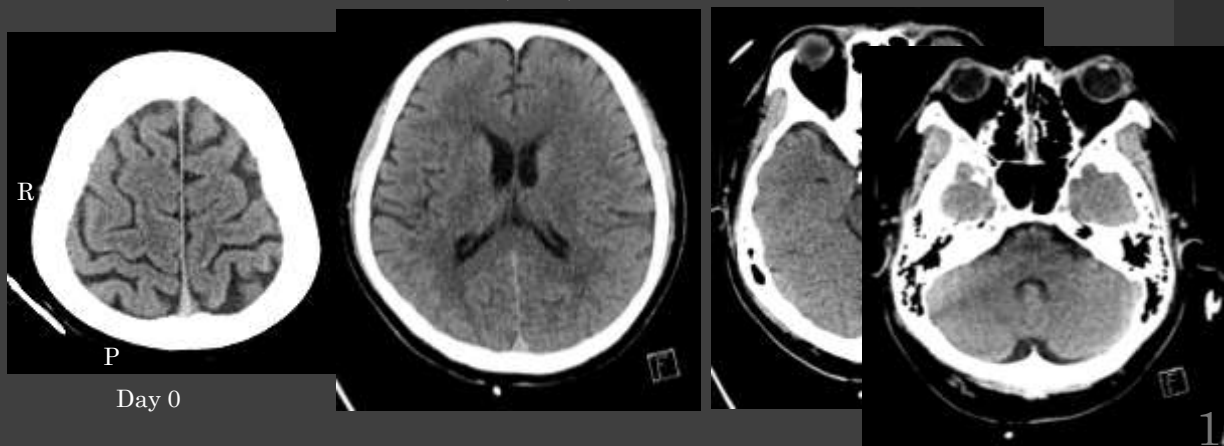
Arteries



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Case 1: 45yoM

- Cardiac arrest, Pulseless electrical activity on day 0, circulation returned after 40m, new left ventricular (heart) thrombus.

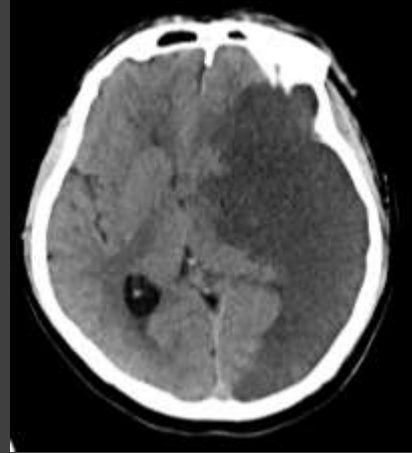


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Case 1: 45yoM – 3 days later

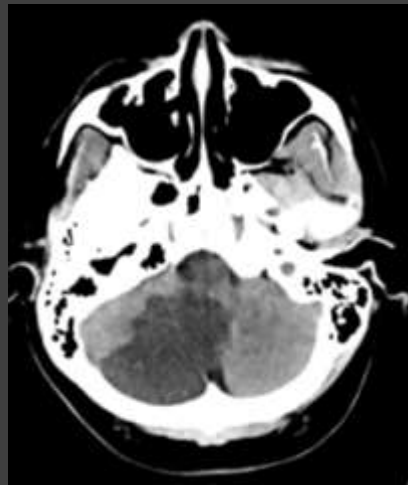
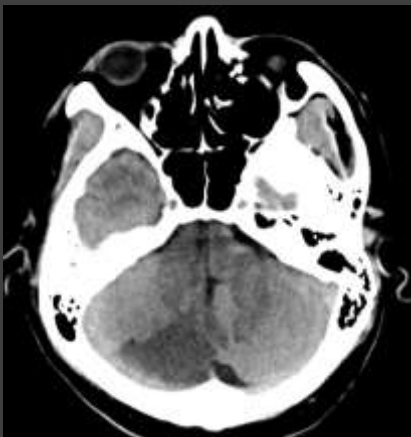


Day 3



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Case 1: 45yoM – 3 days later



12

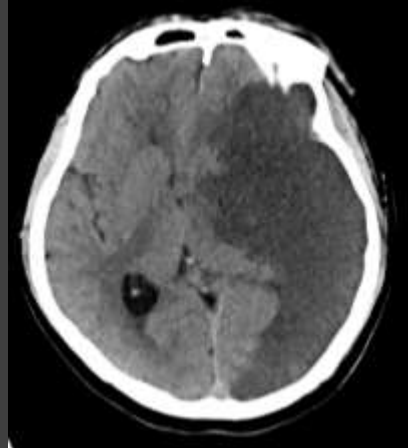
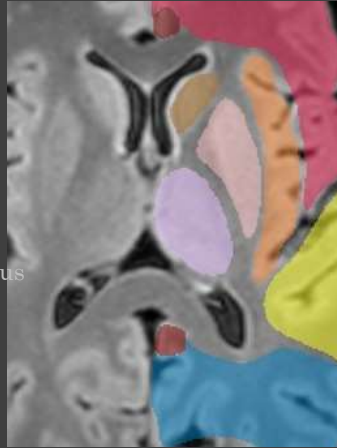
Case 1: 45yoM – 3 days later

Caudate

Insula

Lentiform Nucleus
Putamen + Globus Pallidus

Thalamus



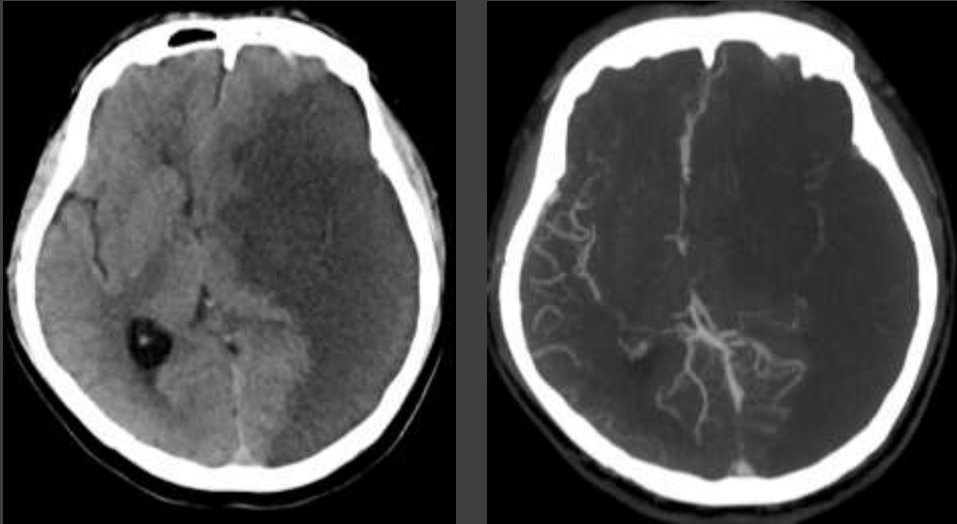
13

Case 1: 45yoM – 3 days later



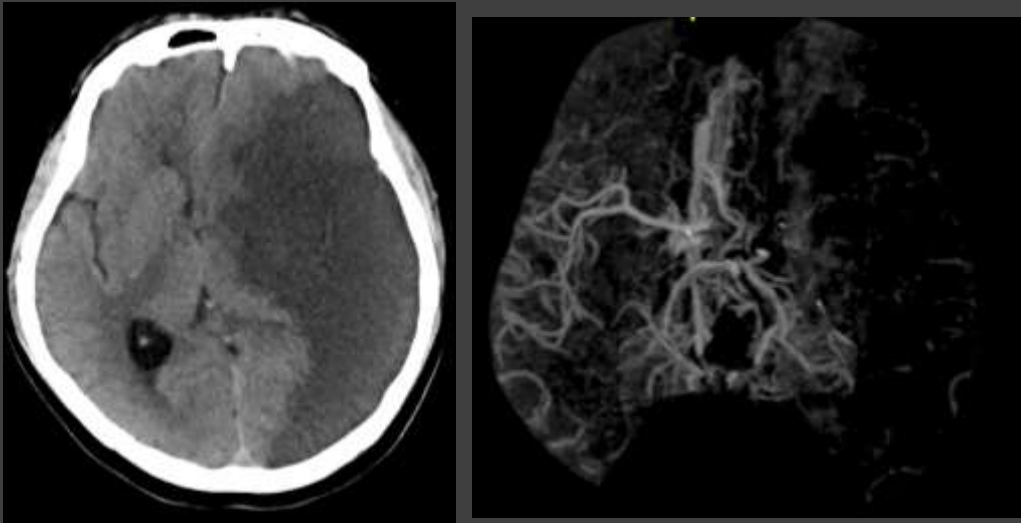
14

Case 1: 45yoM – 3 days later



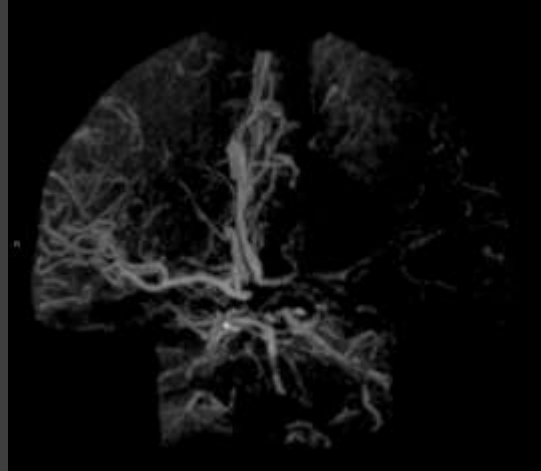
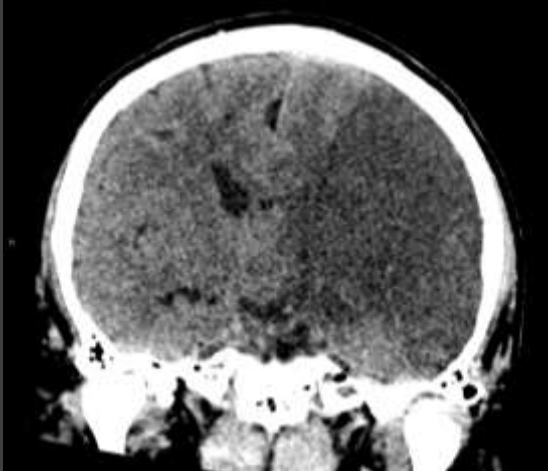
15

Case 1: 45yoM – 3 days later



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Case 1: 45yoM – 3 days later



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Case 1: Summary

- 45 yo M with cardiac arrest, resuscitation for 40 minutes before spontaneous circulation, awake, able to move limbs. Mobile LV thrombus on cardiac echo.
- Day 0 CT head appears normal
 - Normal gray-white matter differentiation.
- Day 3 CT/CTA Head
 - Abrupt cut-off in opacification of the proximal L MCA without distal reconstitution
Corresponding acute infarct of the R frontal, temporal, parietal lobes.
 - L basal ganglia, sparing caudate head.
 - Also R posterior inferior cerebellar artery (PICA) infarct.
- Caudate head is perfused by the artery of Heubner (ACA)
- Thalamus perfused via posterior communicating and PCA.

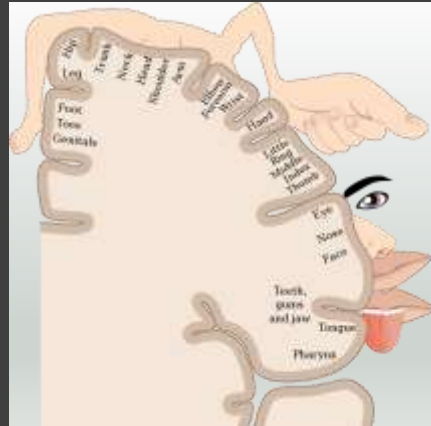
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MCA strokes

- Unilateral weakness/numbness
- Facial Droop
- Speech deficits – Broca and Wernicke.

Tissue Plasminogen Activator (TPA)
within 4.5 hours.

Mechanical thrombectomy 6-24h



By File:1421 Sensory Homunculus.jpg; OpenStax Colleged derivative work: Popadius - This file was derived from: 1421 Sensory Homunculus.jpg., CC BY 3.0, <https://commons.wikimedia.org/w/index.php?curid=88916983>

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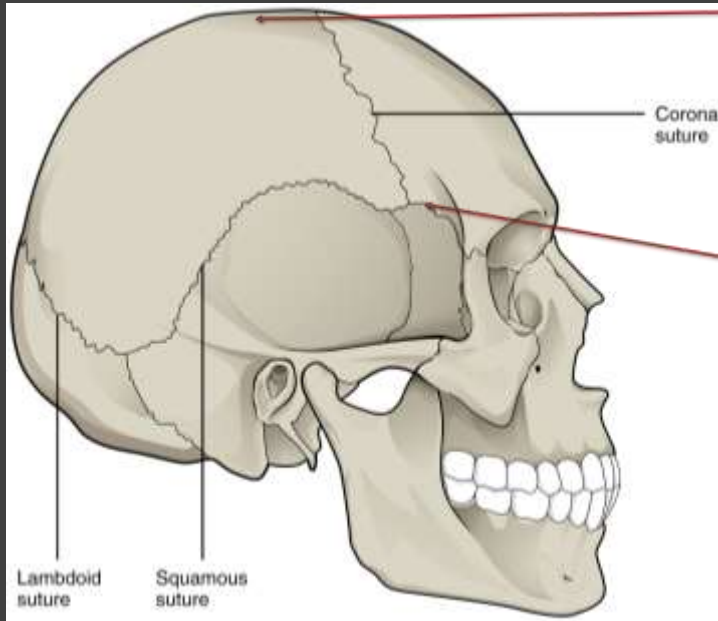
Major calvarial bones



Frontal
Parietal
Occipital
Temporal
Sphenoidal
Nasal
Zygomatic
Maxilla
Mandible

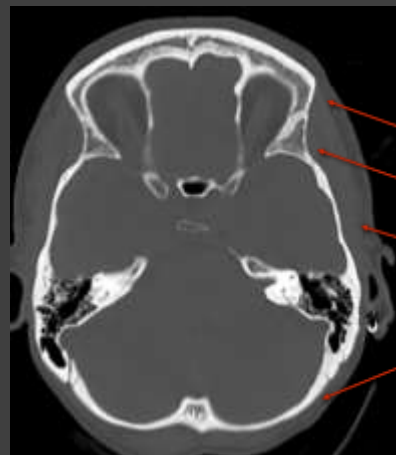
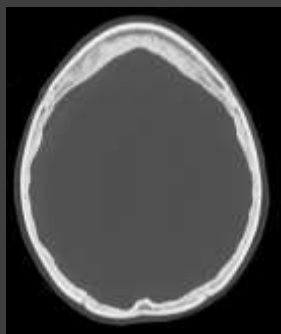
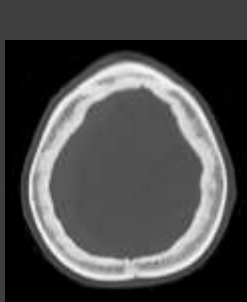
Case courtesy of OpenStax College, Radiopaedia.org, rID: 42758

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Case courtesy of OpenStax College. Radiopaedia.org. rID: 42758

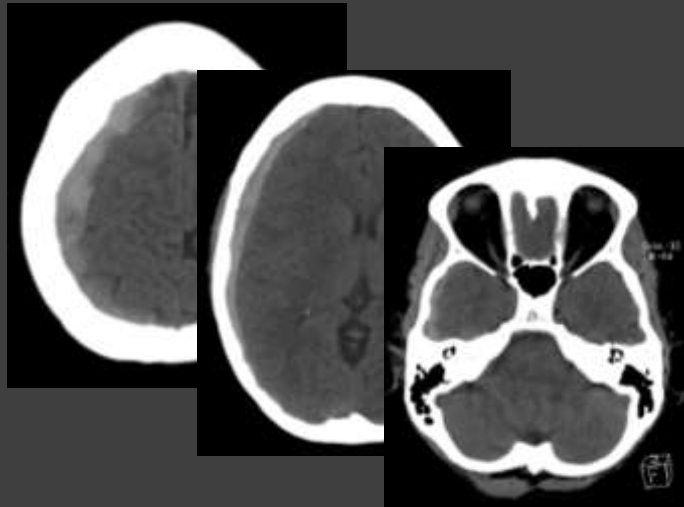
Major calvarial bones



Case 2: 44yoF

Alpha-1 antitrypsin deficiency,
liver transplant, partial hepatic
artery thrombosis, on Pradaxa
(dabigatran).

Weakness for 4 days, falls.



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Case 2: 44yoF

Alpha-1 antitrypsin deficiency,
liver transplant, partial hepatic
artery thrombosis, on Pradaxa
(dabigatran).

Weakness for 4 days, falls.

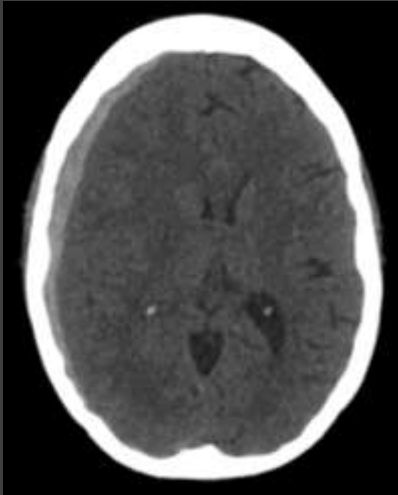
Conservative management,
discharged on Day 5.



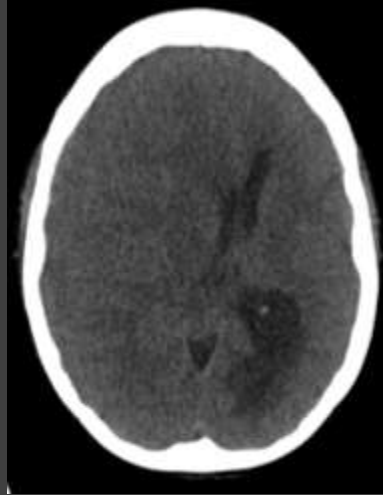
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Case 2: 44yoF

1 week later (Day 12), worsened mental status, confused.



Day 0



Day 12

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Case 2: 44yoF

1 week later (Day 12), worsened mental status, confused.



Day 0

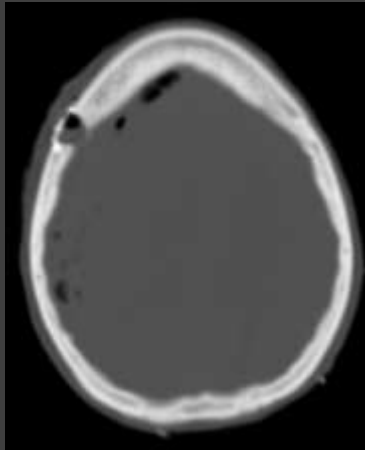
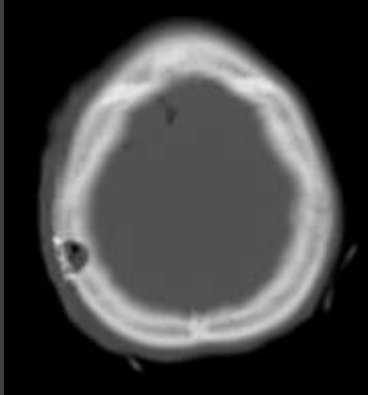


Day 12

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Case 2: 44yoF

1 week later (Day 12), worsened mental status, confused.



Emergent evacuation of subdural.

Burr holes in the R frontal and parietal bones.

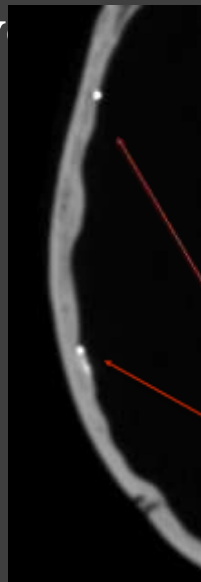
Xanthochromic fluid.



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Case 2: 44y

Day 17



After 5 more days:

Improved midline shift.
Decreased size of the extra-axial fluid.

Middle Meningeal artery embolization

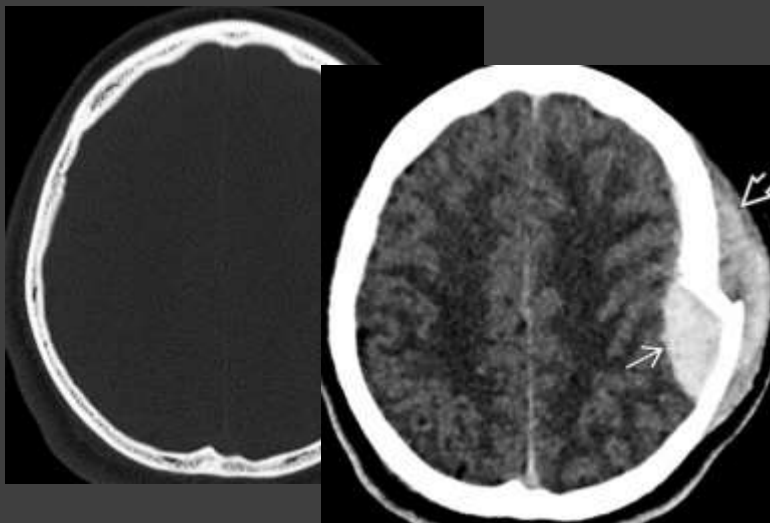
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Case 2: Summary

- Medically complex 44yoF on anticoagulation presents with 4 days of weakness and falls.
- Acute subdural hematoma of the R cerebral convexity
- Expansion seen on Day 12 with mixed density subdural, increased in thickness. Worsened midline shift, now with uncal herniation.
- Emergent Evacuation
- Middle meningeal artery embolization to reduce blood flow to the dura and improve residual/chronic subdural.

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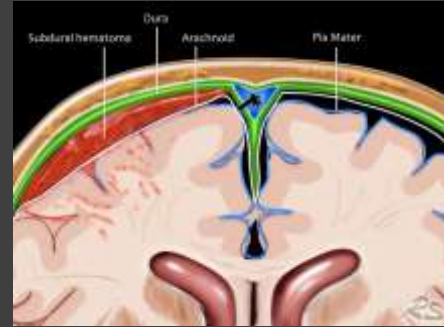
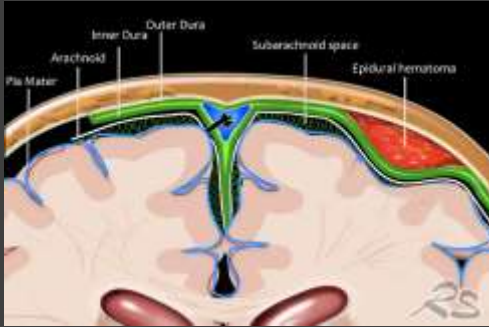
Case 3 (companion to 2)



- Lentiform (lens-shaped)
- Arterial (95%)
 - Middle meningeal artery
- Venous (adjacent to the venous sinuses)
- Clinically – “lucid” intervals.
- Treatment – can be conservative or embolization of the MM artery

Diagnostic Imaging: Brain 4th ed. 30

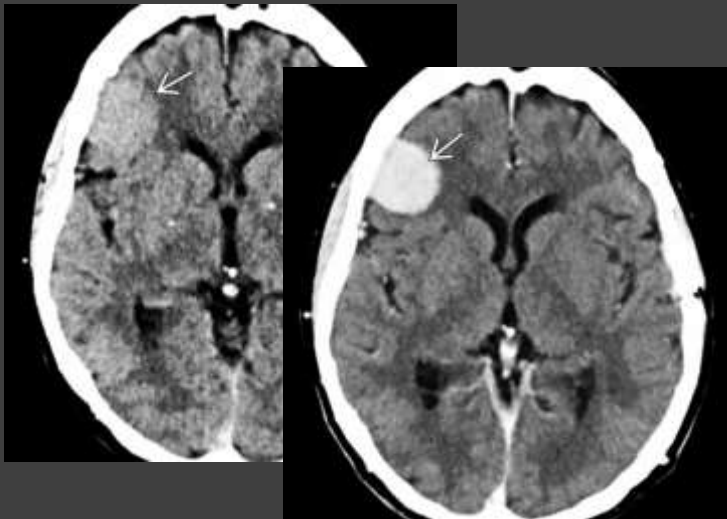
Epidural vs Subdural hematoma



<https://radiologyassistant.nl/neuroradiology/hemorrhage/traumatic-intracranial-haemorrhage>

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Case 4

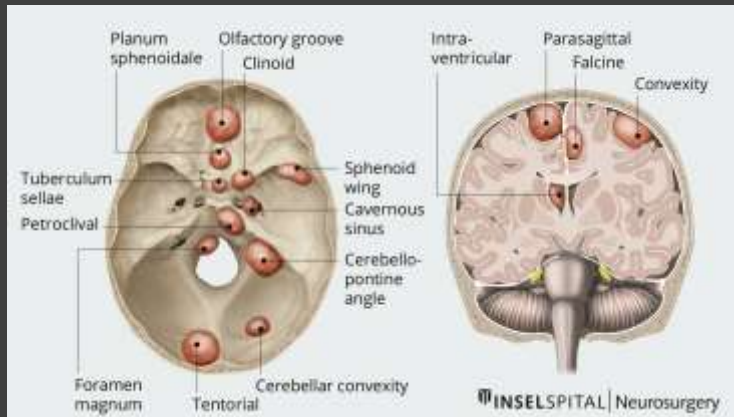


- Dural based (extra-axial) mass
- Avid contrast enhancement
- Mass effect on adjacent parenchyma without significant edema
- Slow growing

Meningioma
Left frontal/parietal
convexity

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Case 4 Meningioma

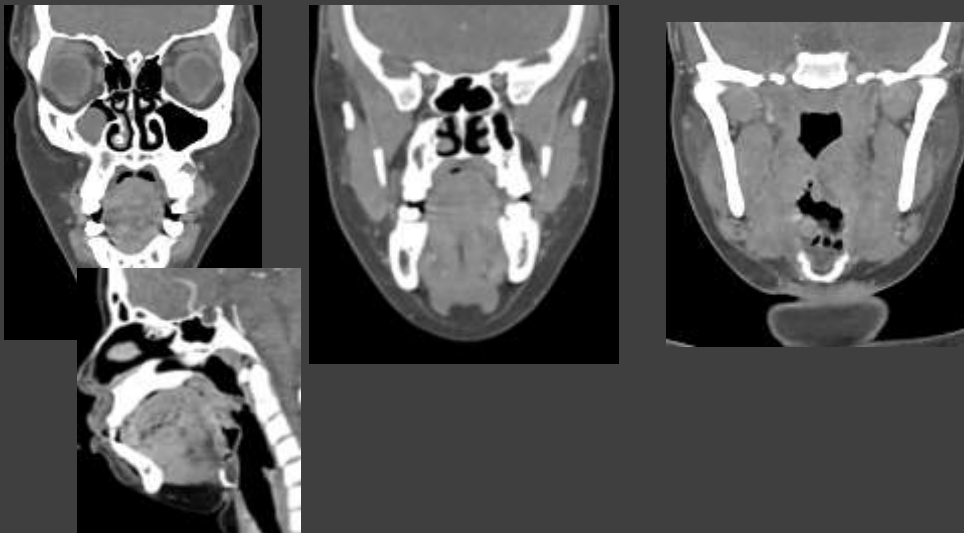


Symptoms depend on site:

- Convexity/parasagittal – seizures, hemiparesis
- Basisphenoid/sella – visual field
- Cavernous sinus – CN deficits
- Frontal - anosmia

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Case 5 – 24yoF Sore Throat



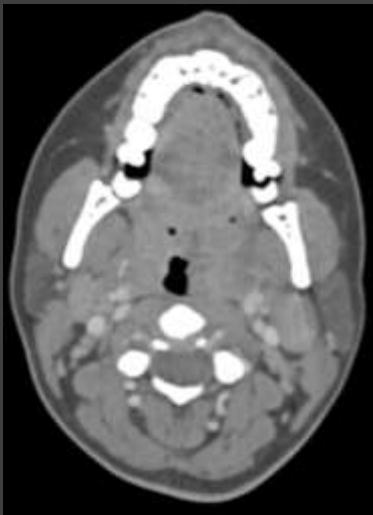
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Case 5 – 24yoF Sore Throat



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Case 5 – 24yoF Sore Throat



Tonsillitis

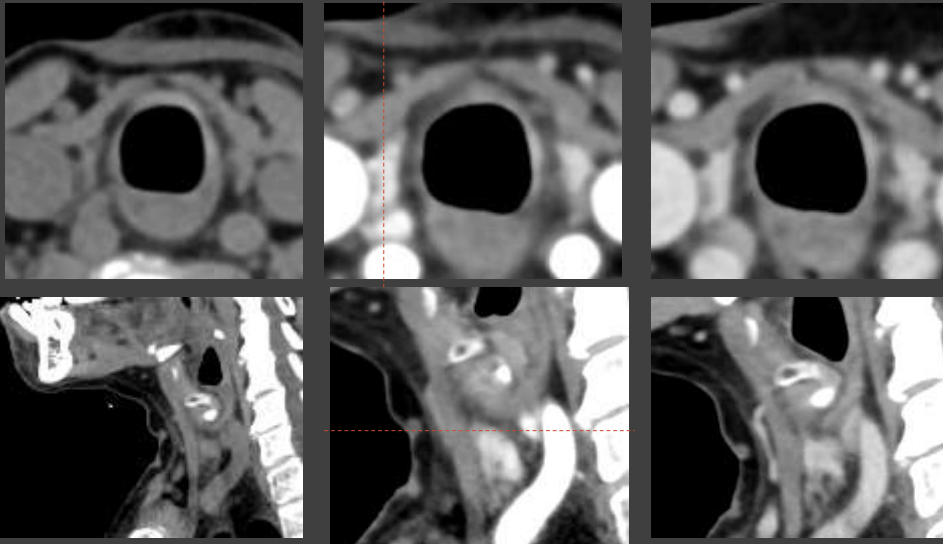
- Enlarged, heterogeneous, “tigriform”, “kissing tonsils”
- CT may be helpful in identifying peritonsillar abscess
- Fat stranding (edema) obscuring the adjacent fat planes (parapharyngeal space)



Case courtesy of The Radswiki, Radiopaedia.org, rID: 11761

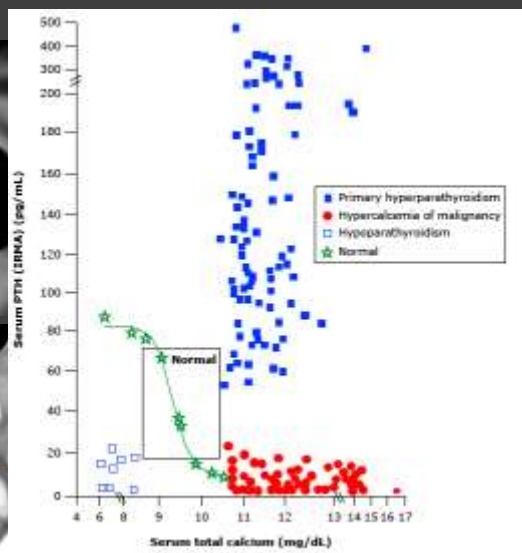
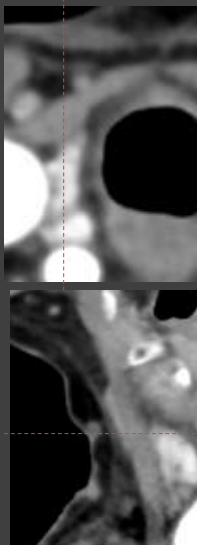
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Case 6 – Hypercalcemia, elevated PTH



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Case 6 – Hypercalcemia, elevated PTH

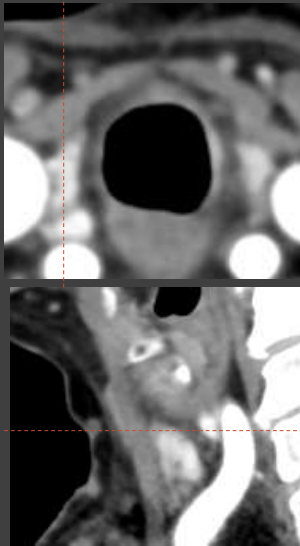


PTH may be WNL in primary hyperparathyroidism

Uptodate.com
Data from: Haden ST, Brown EM, Hurwitz S, et al. The effects of age and gender on parathyroid hormone dynamics. *Clin Endocrinol* 2000; 52:329.

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Case 6 – Hypercalcemia, elevated PTH



Parathyroid adenoma
Main cause of primary hypercalcemia due to oversecretion of PTH

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Summary

- Covered Head/Brain anatomy
- Importance of CT in stroke work-up, prognostication.
- Utility of CT in surgical planning, post-op evaluation.
- Various cases of head and neck.

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Resources / References

- Radiopaedia.com
- Radiologyassistant.nl
- Diagnostic Imaging: Brain 4th edition (Jhaveri et al).
- Uptodate.com