Pediatric Head CT: A Diagnostic Challenge?

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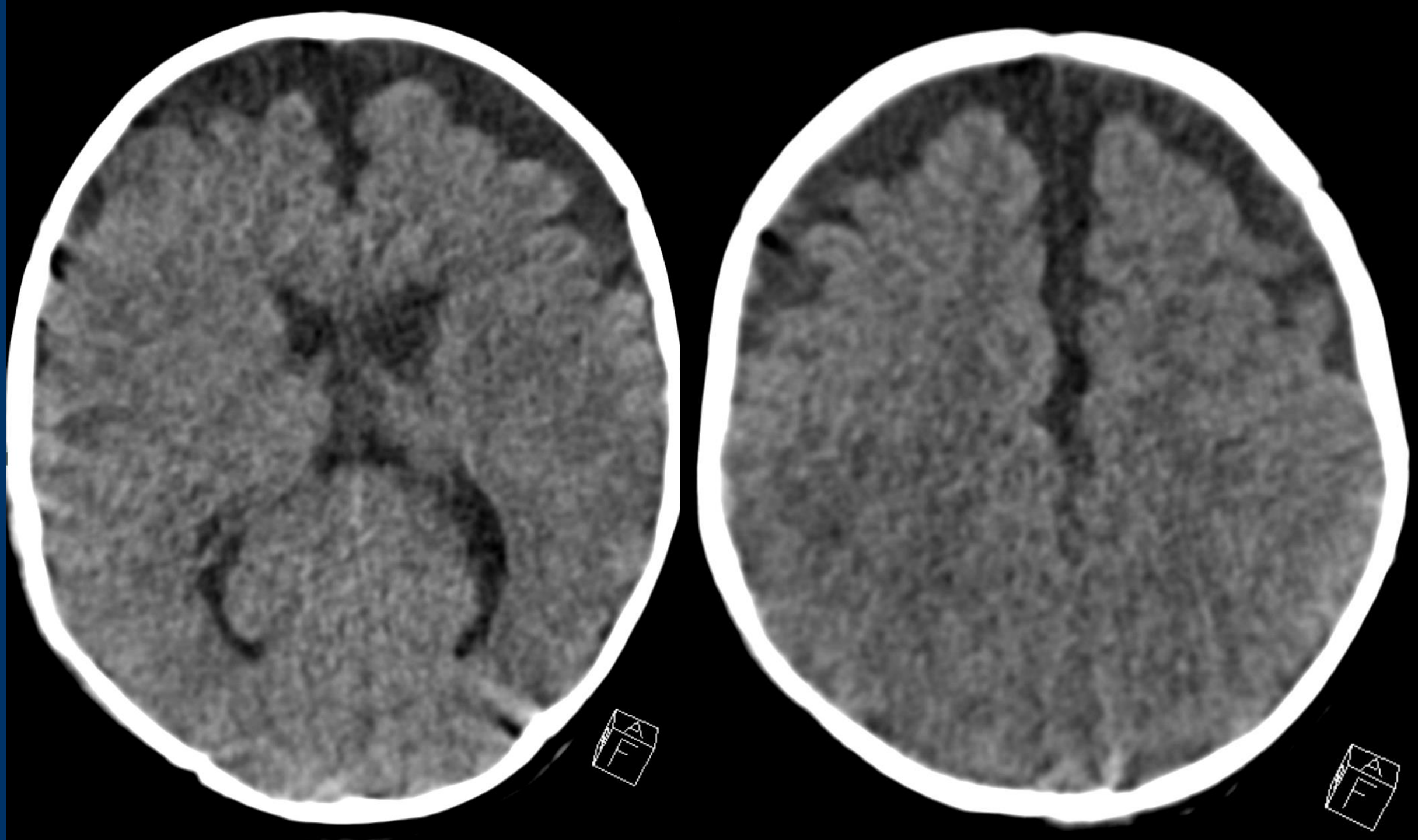
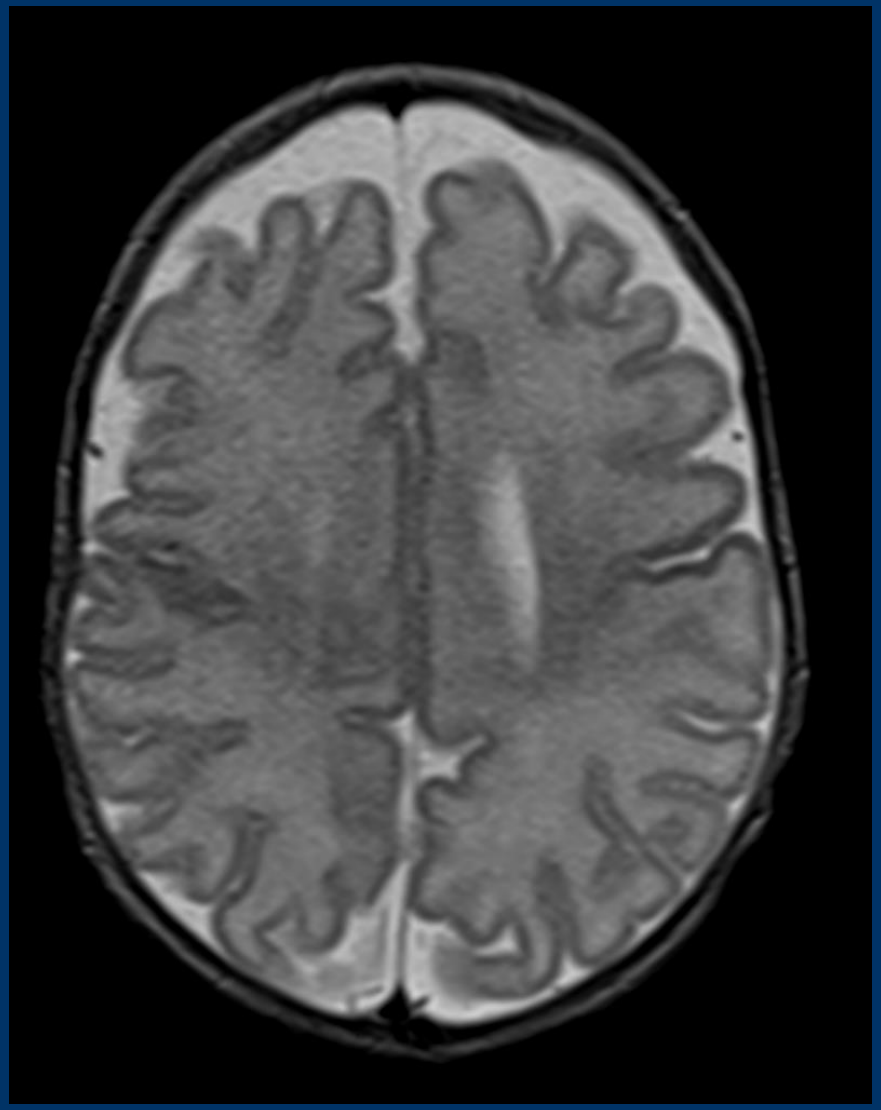
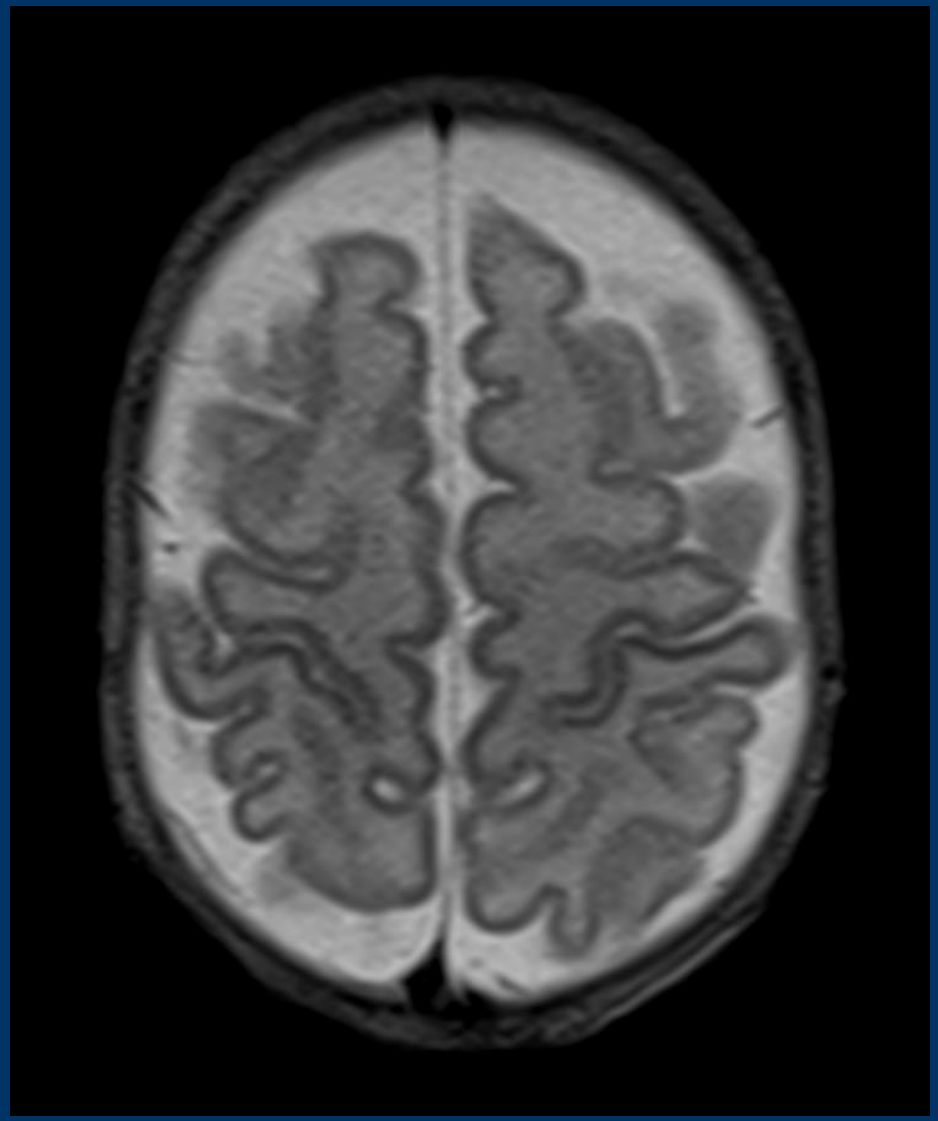
Learning Objectives

- Extra-axial spaces
  - Abusive head trauma
- Parenchymal appearance
- Sutures vs fractures
- What is normal for age?

Extra-Axial Spaces

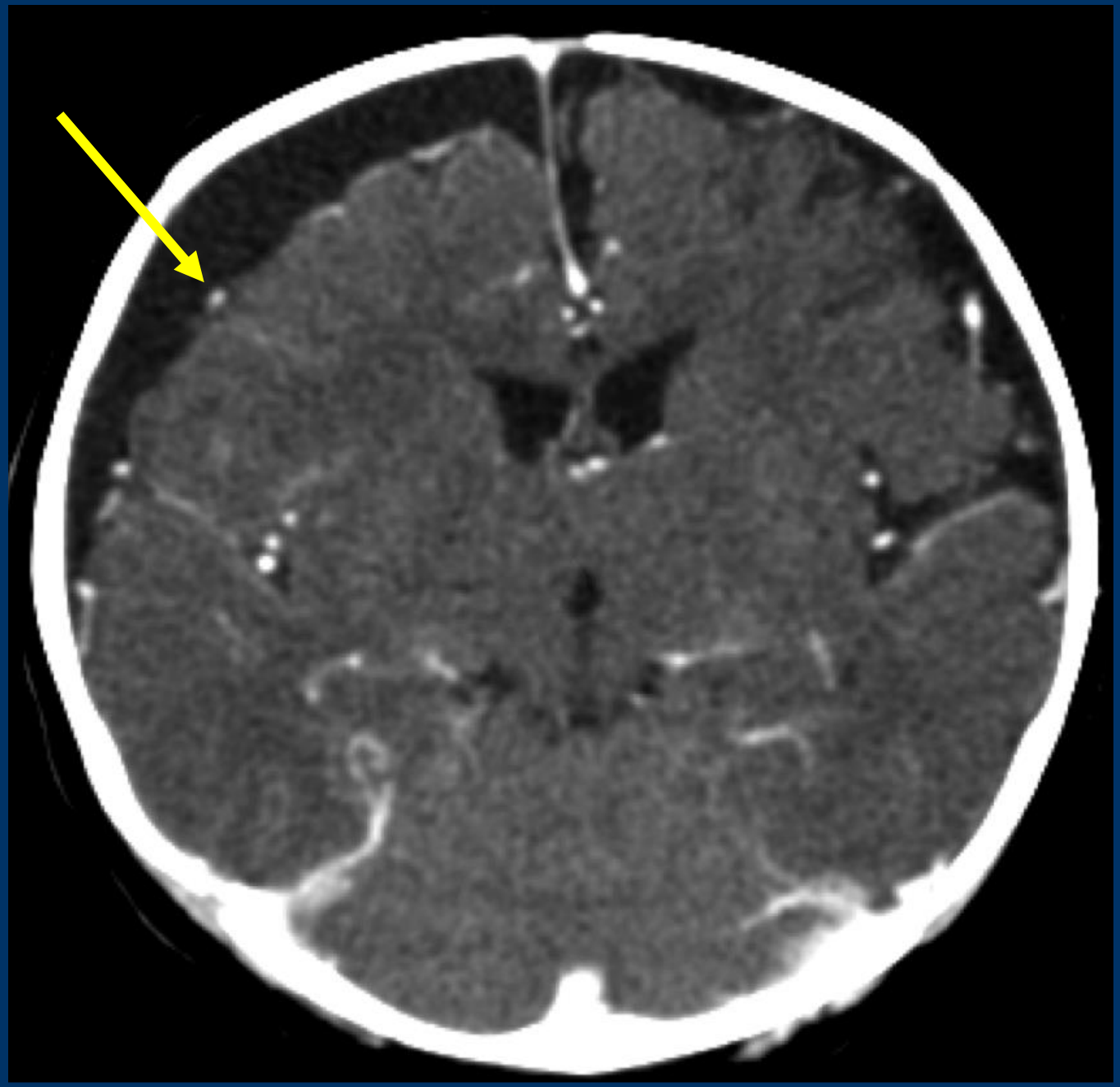


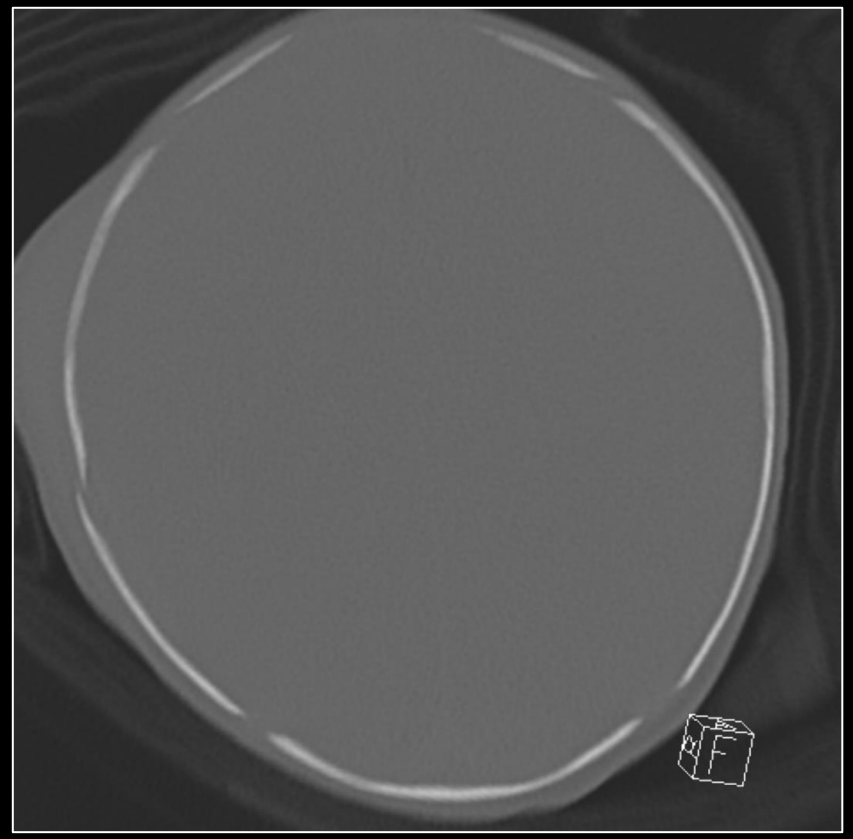


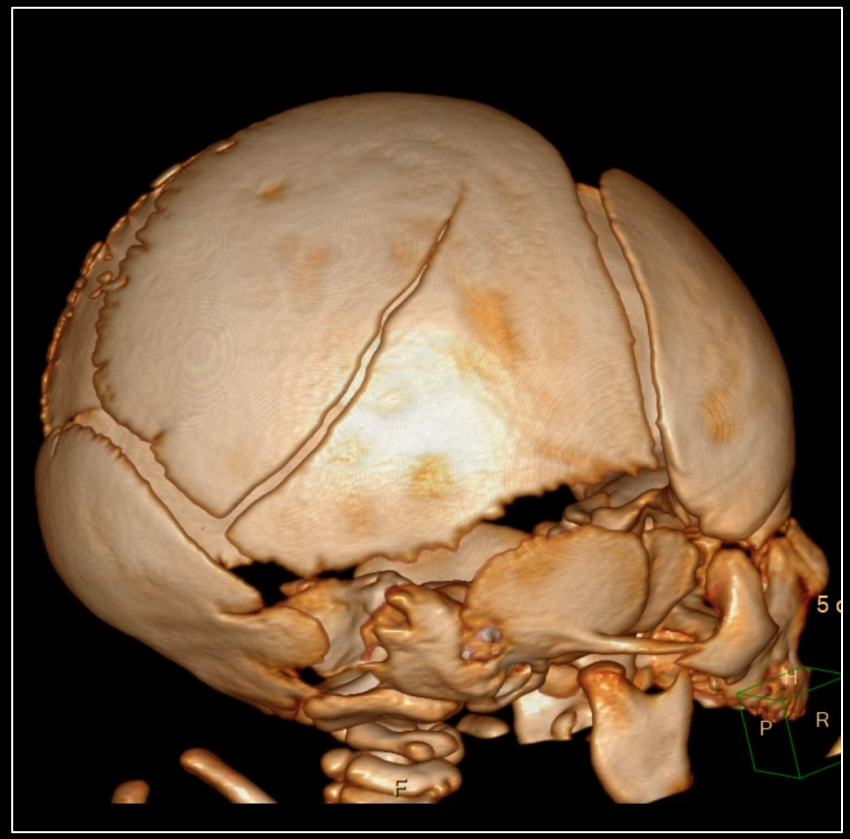


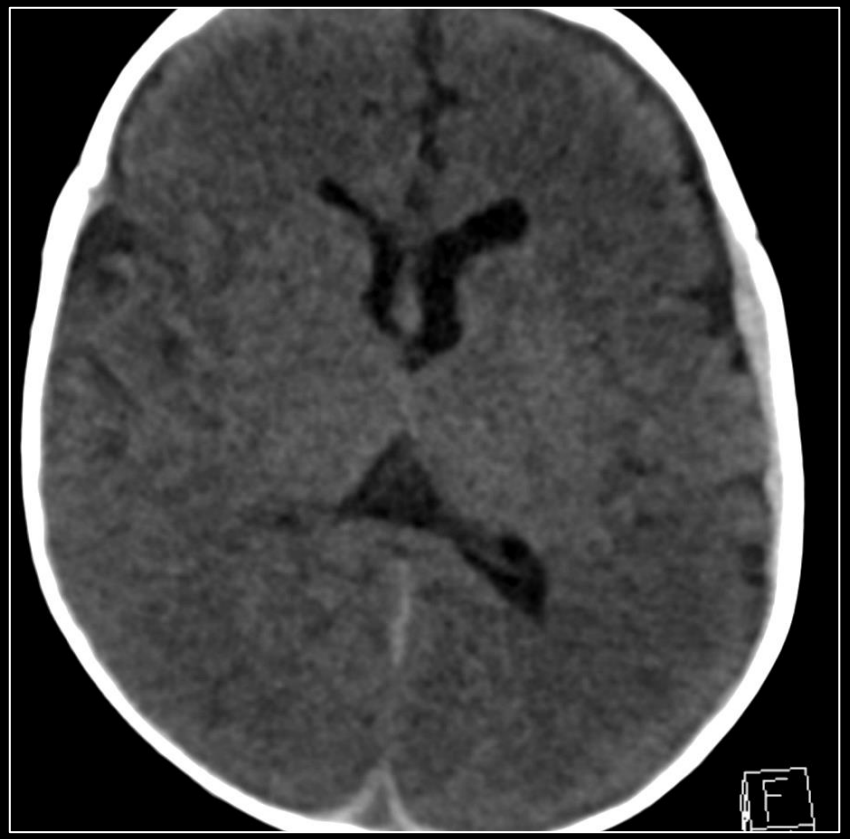
Mass effect

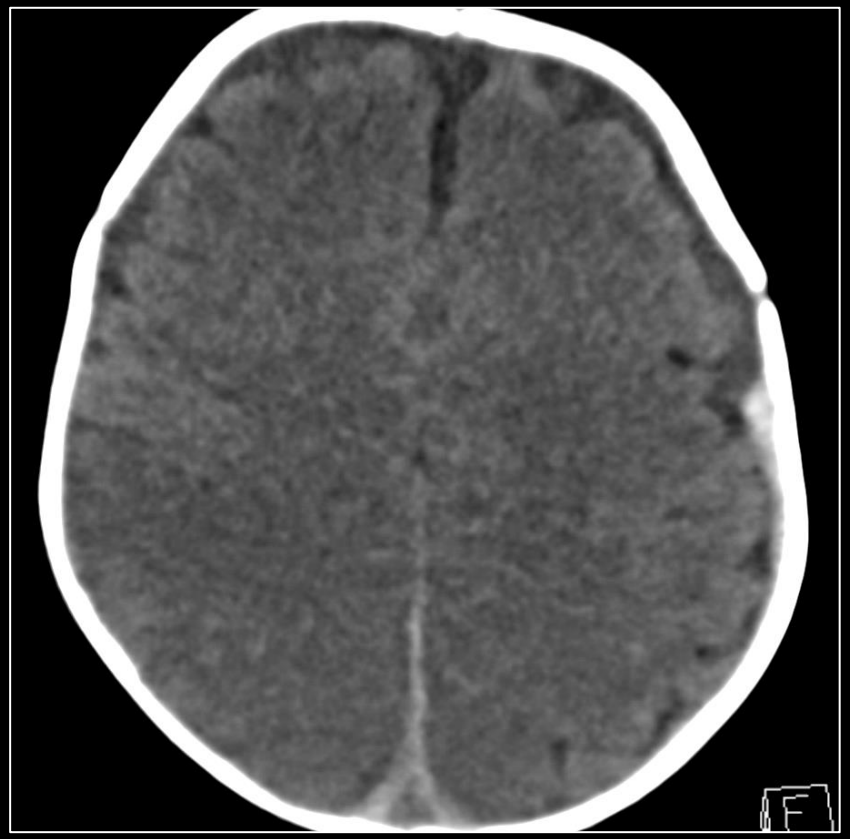
Displacement of vessels

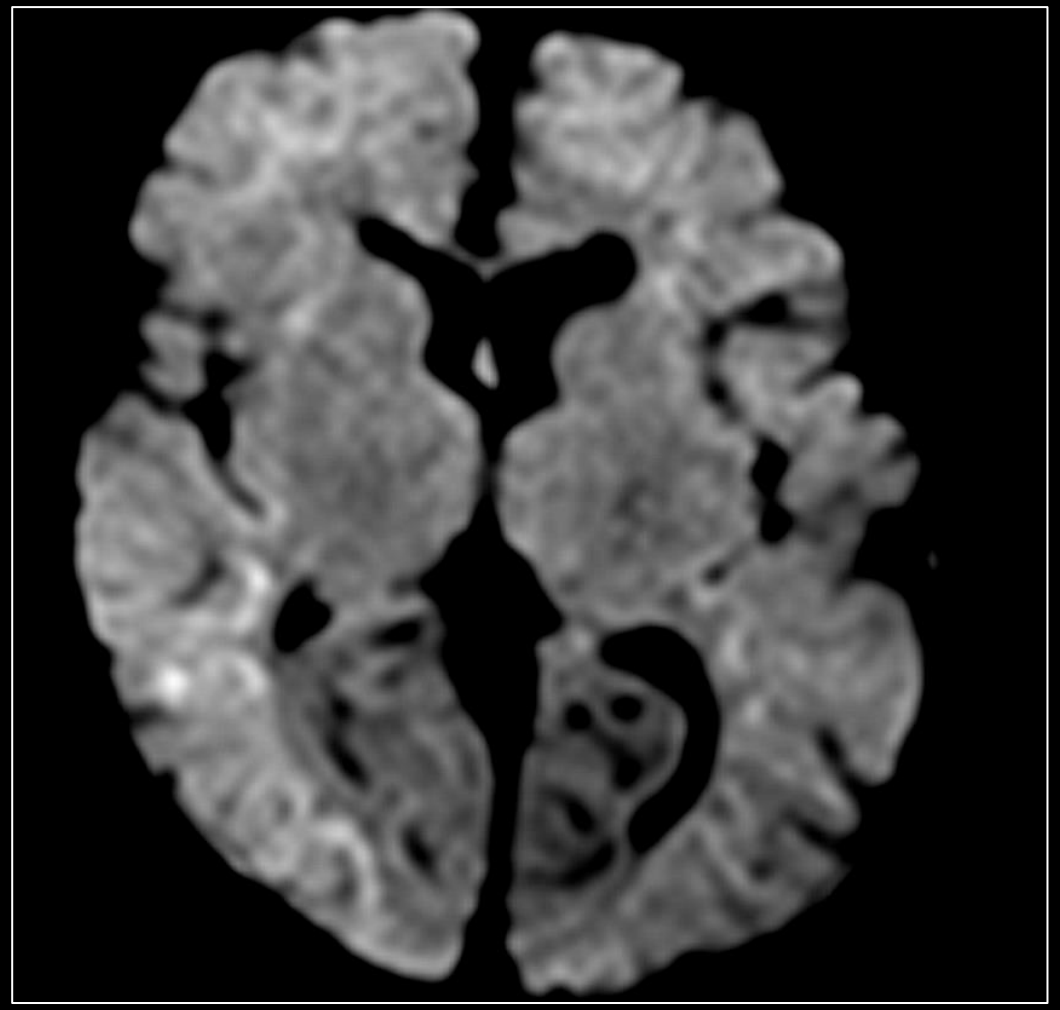


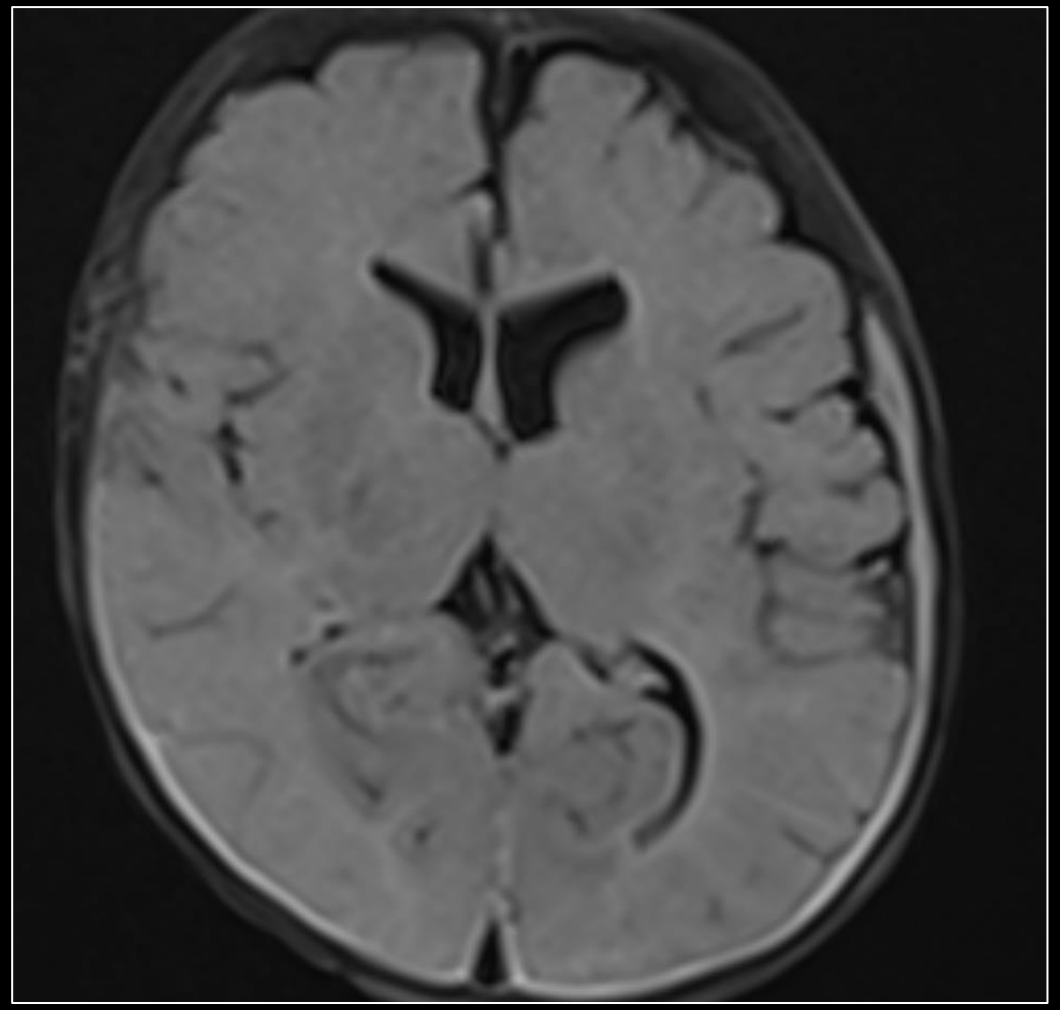


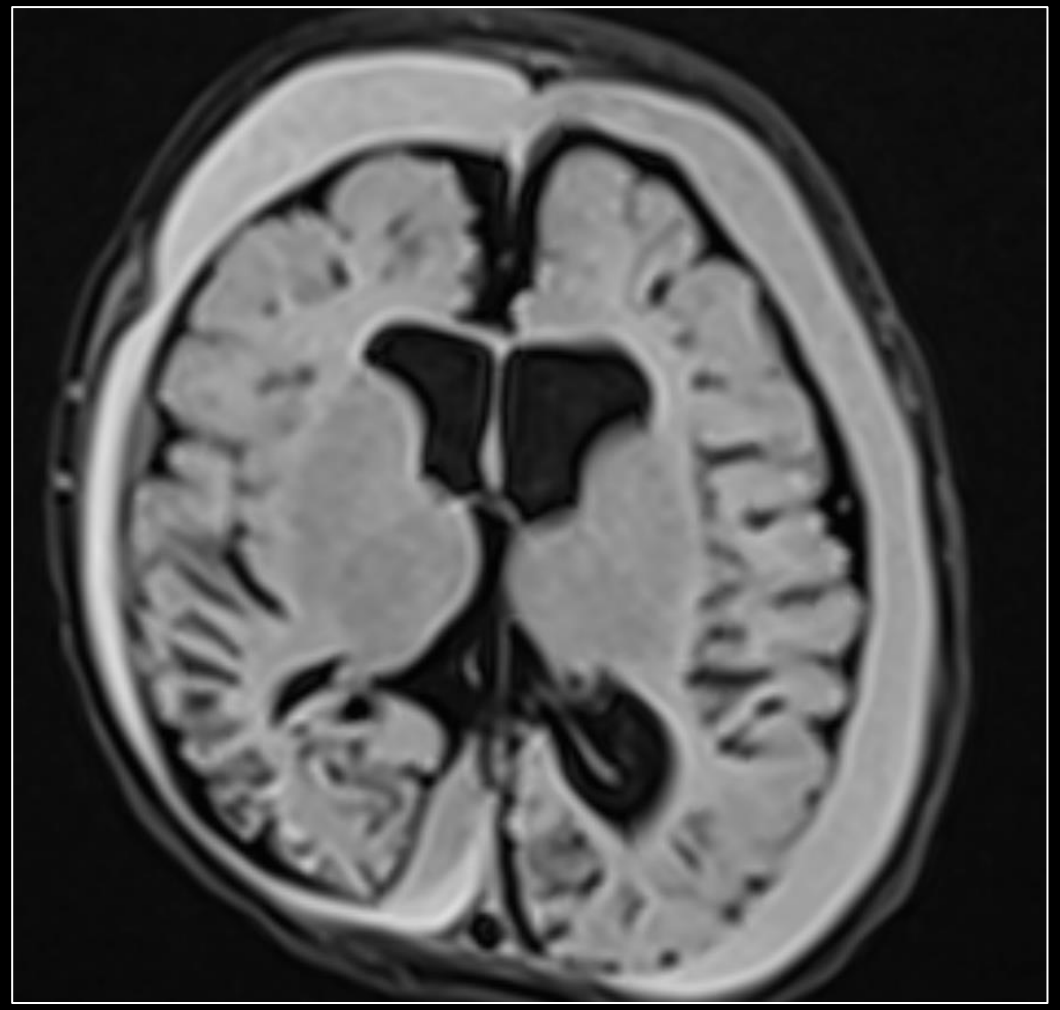




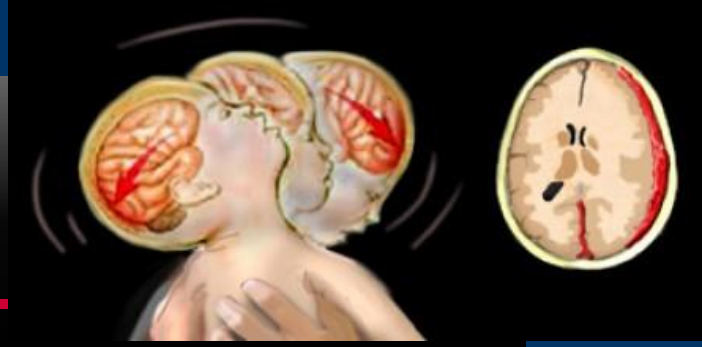








Imaging Findings:



- Most common finding: Subdural hematoma (90%)
- Mixed attenuation SDH:
  - More in AHT
  - Acute on chronic VS Hematohygroma
- Precise estimation of age of the mixed-attenuation SDH on the initial CT should be avoided
- Tearing of the bridging veins

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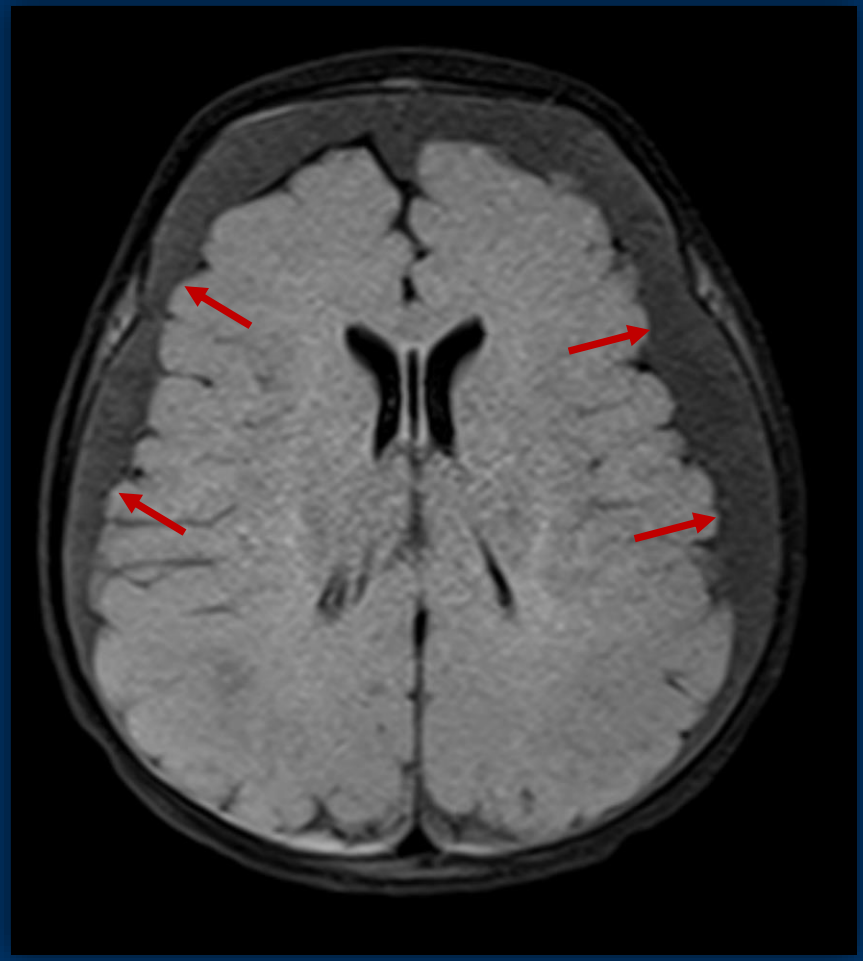

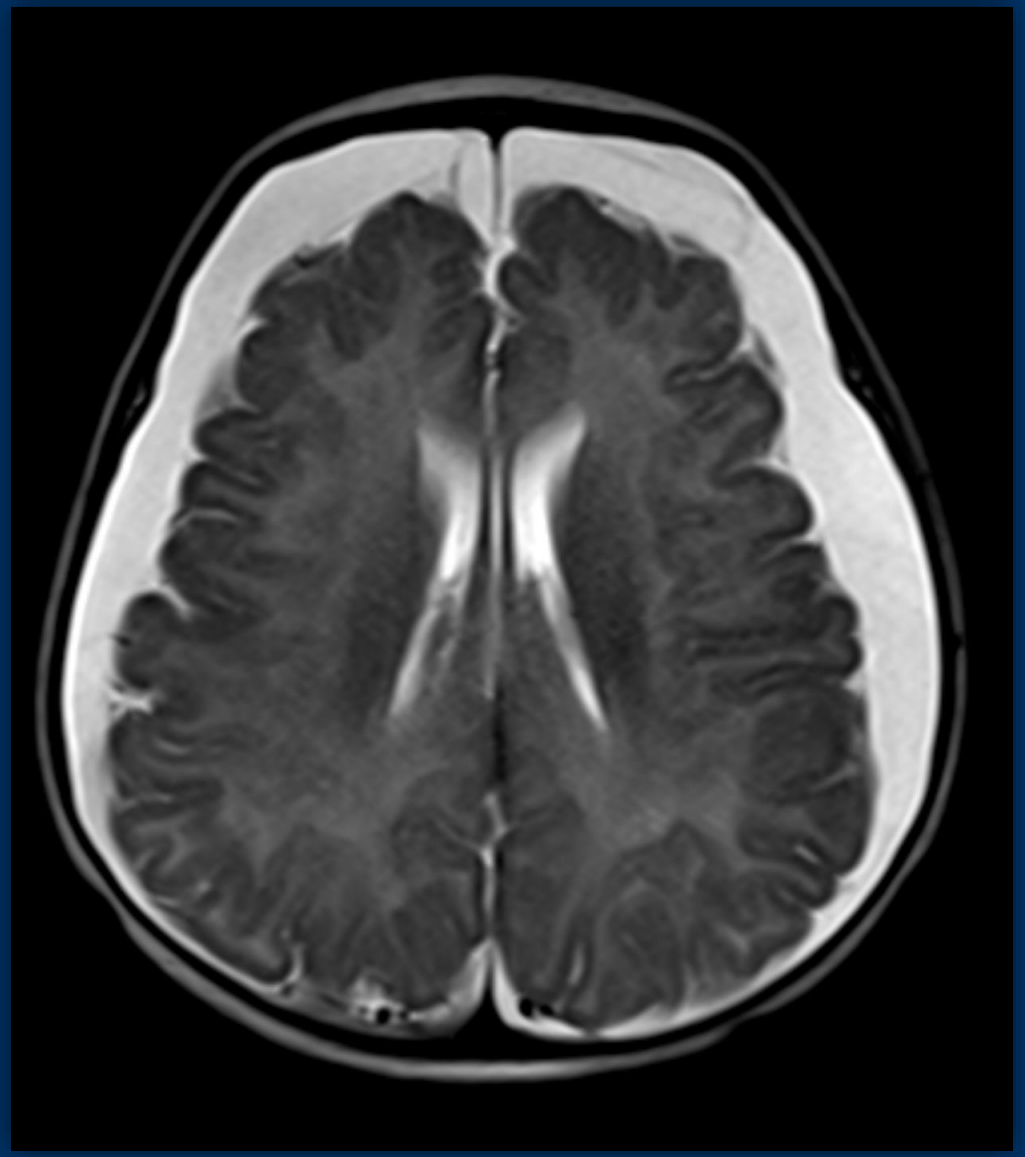

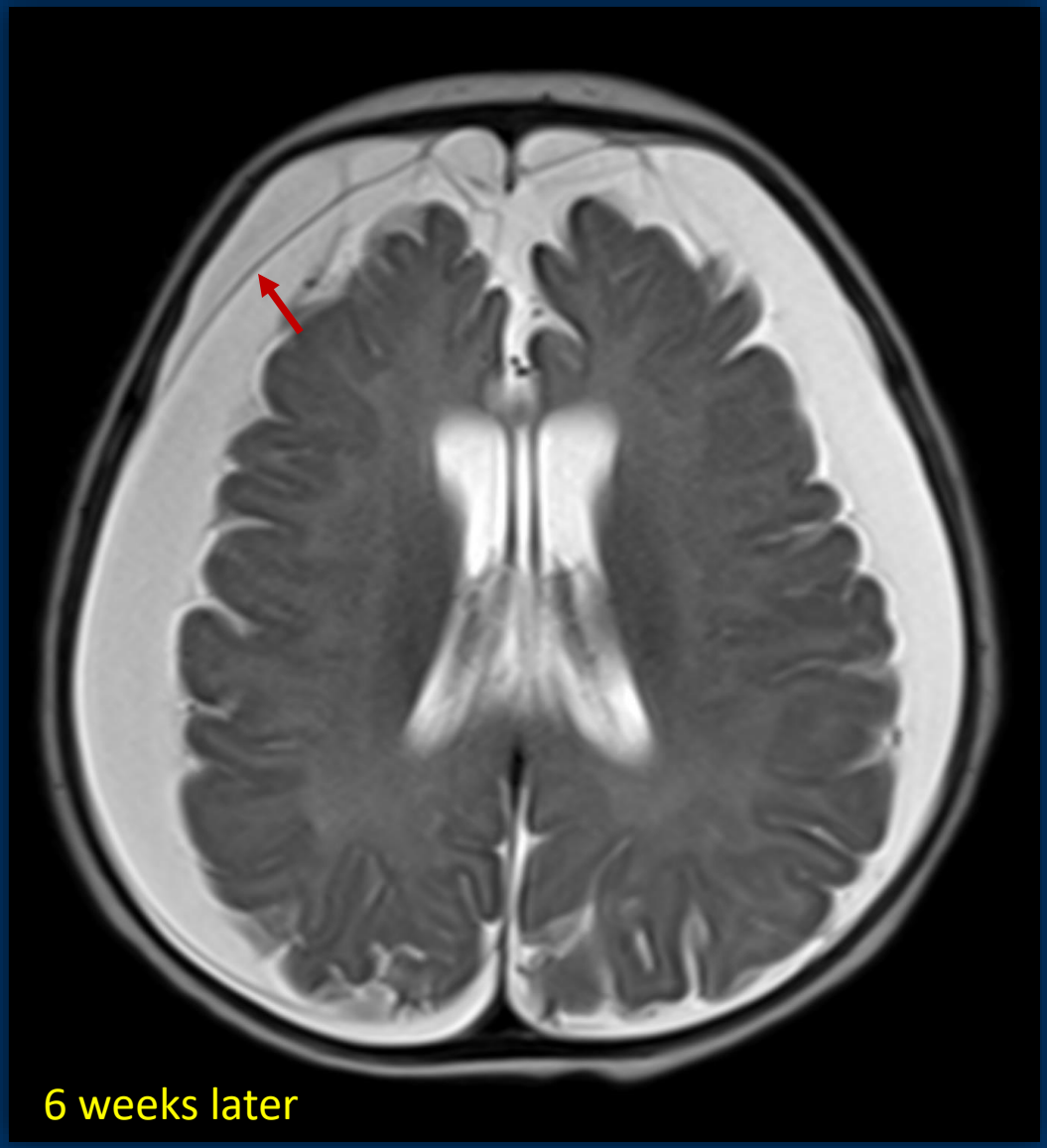
6 weeks later

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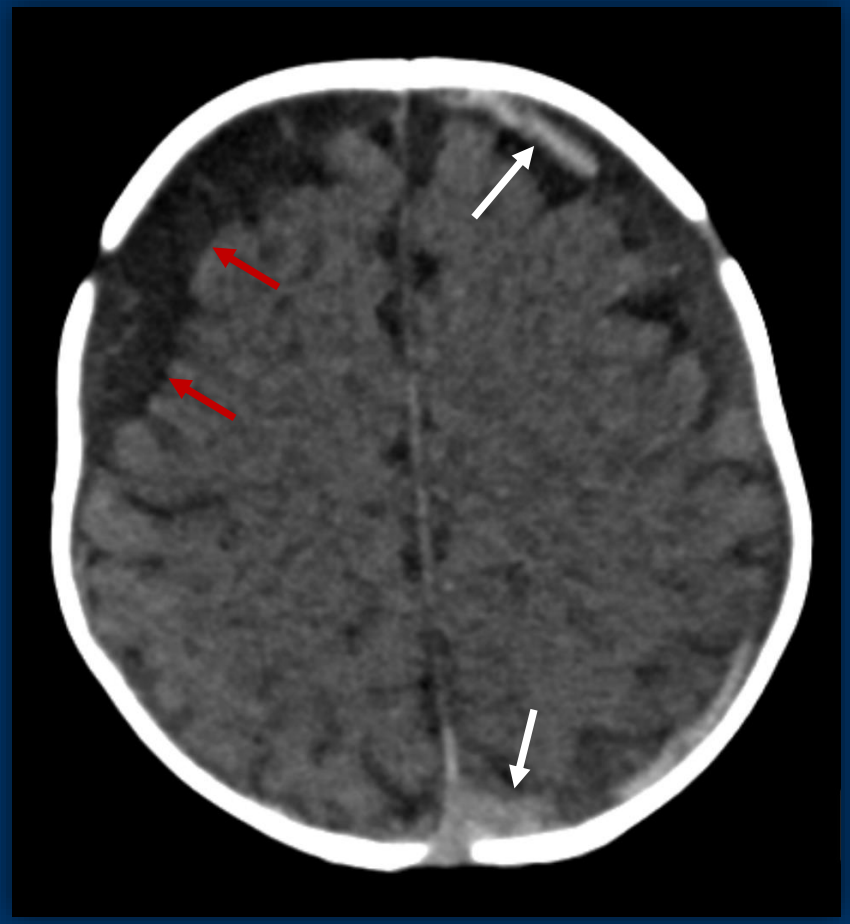

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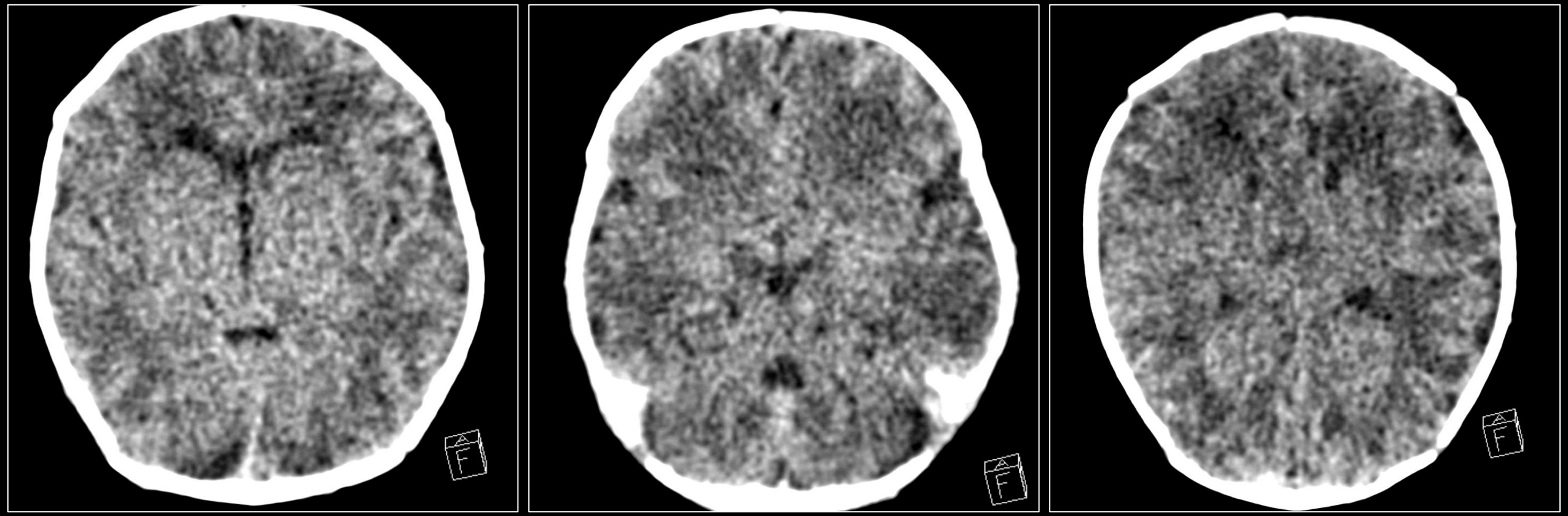
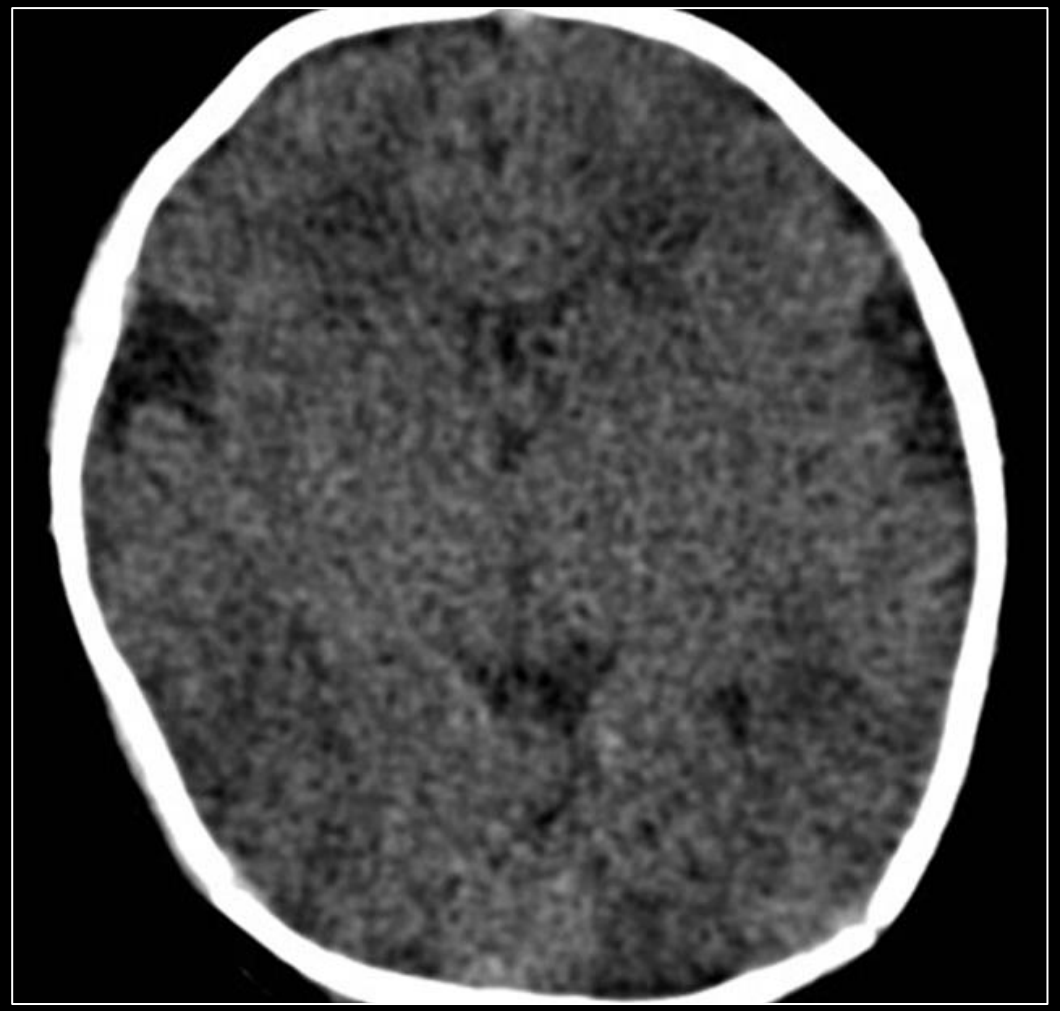
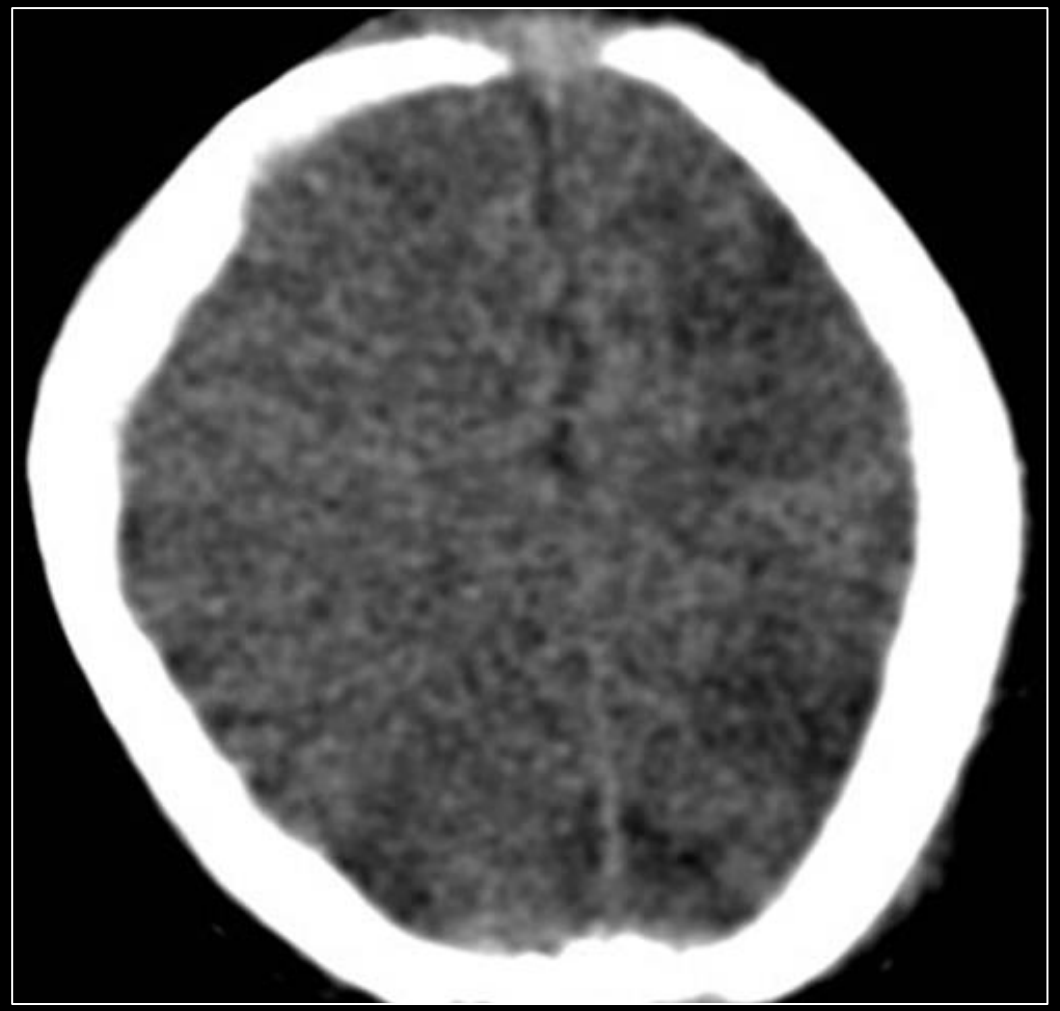
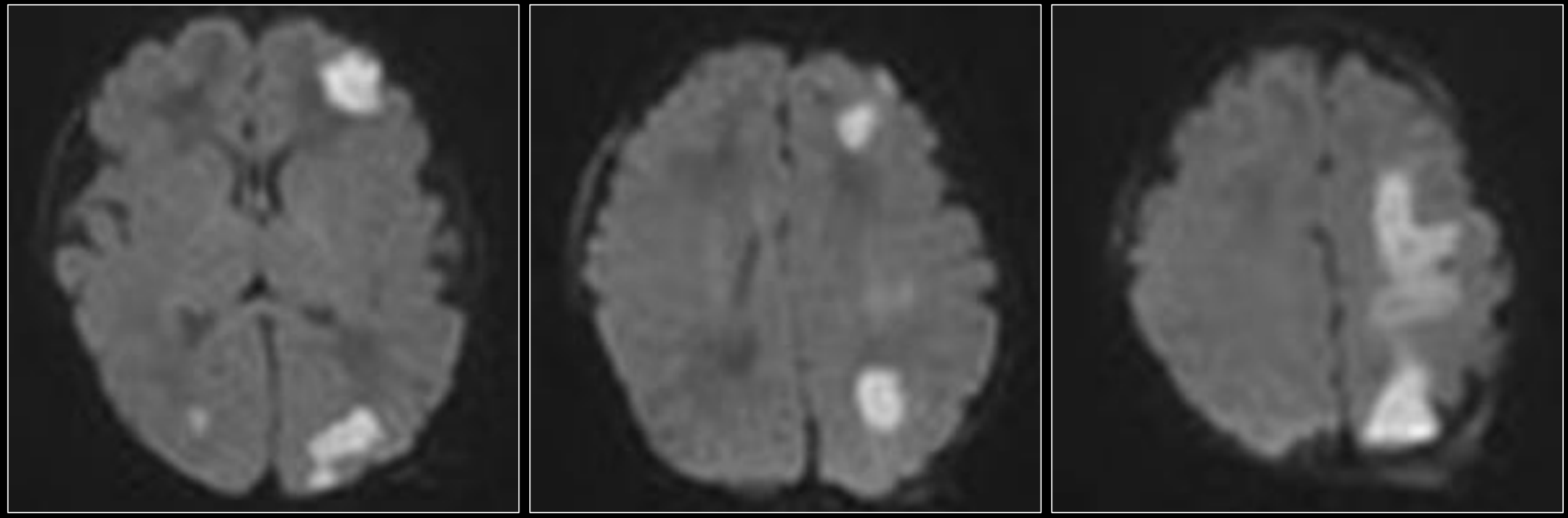
Parenchymal attenuation: Younger children

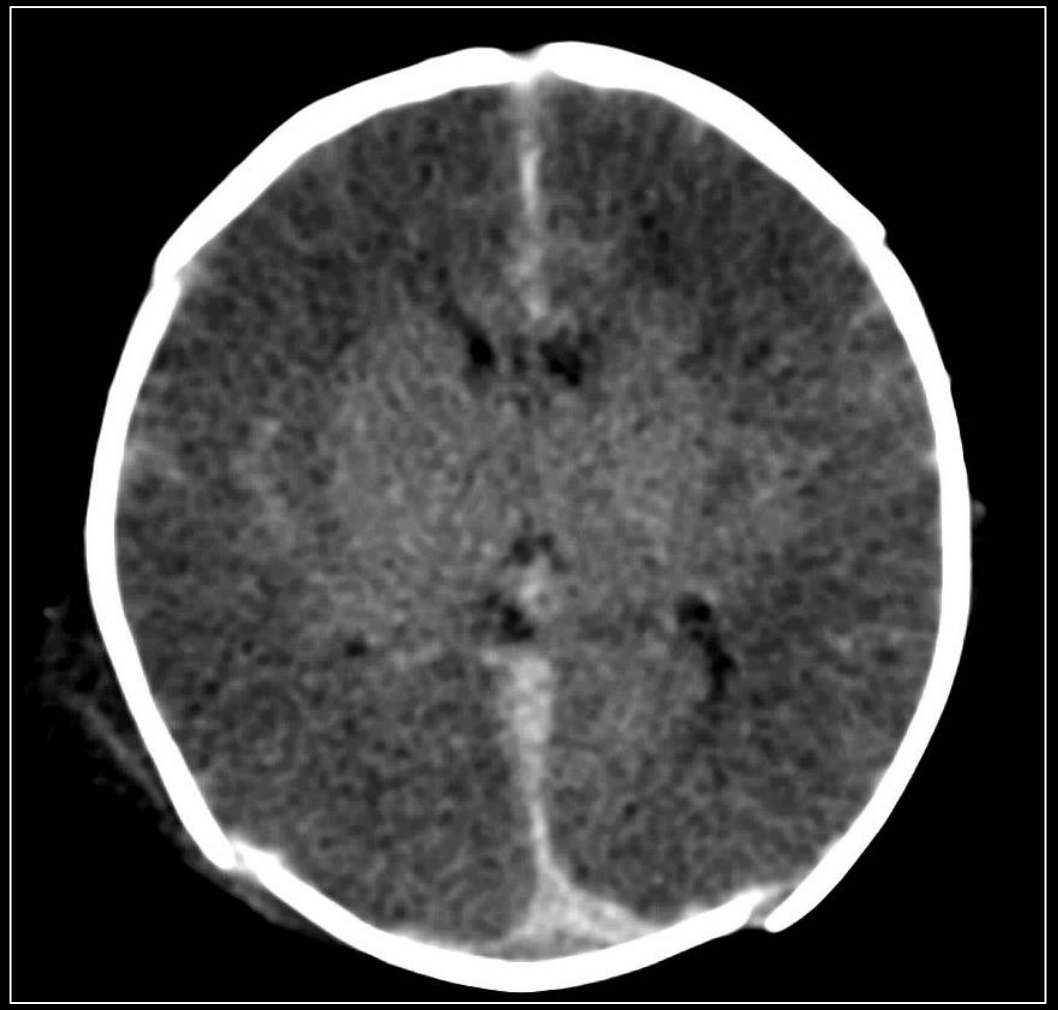


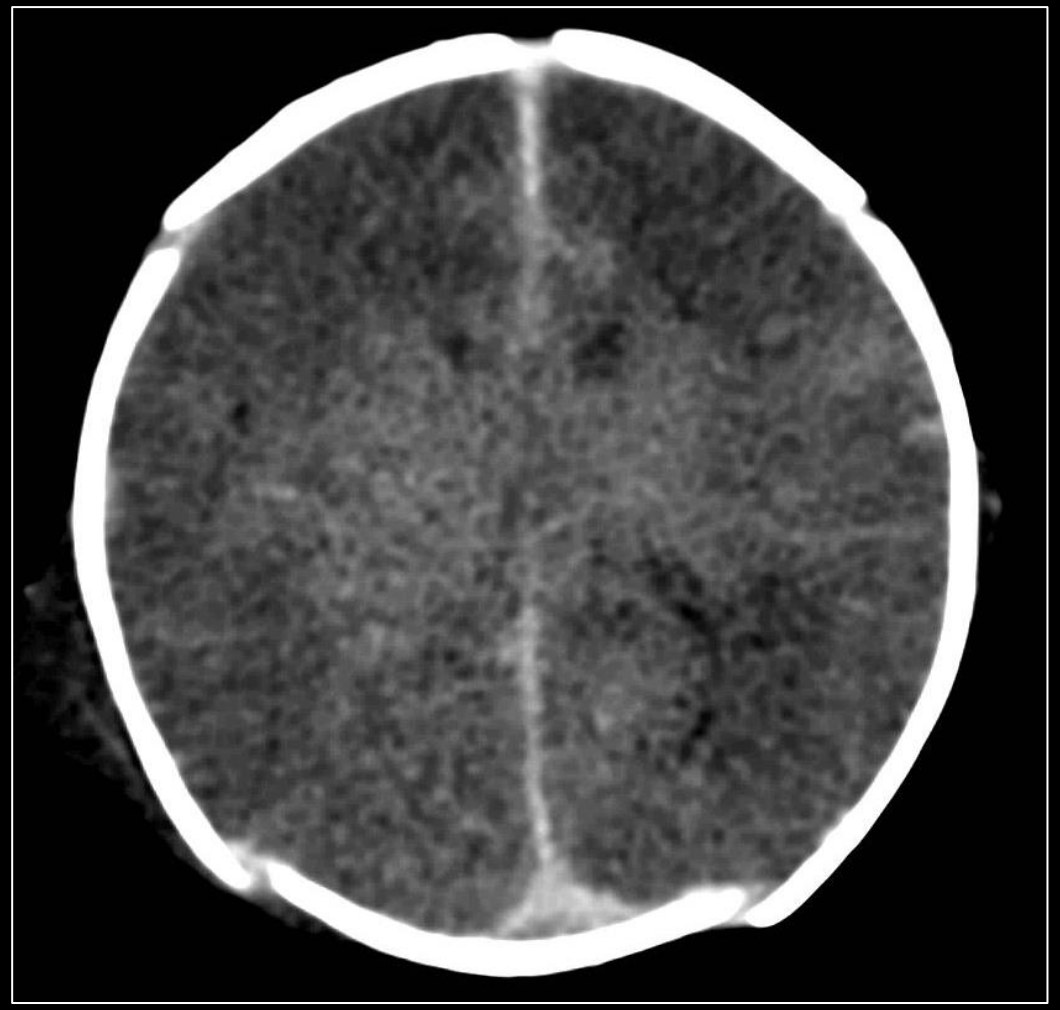




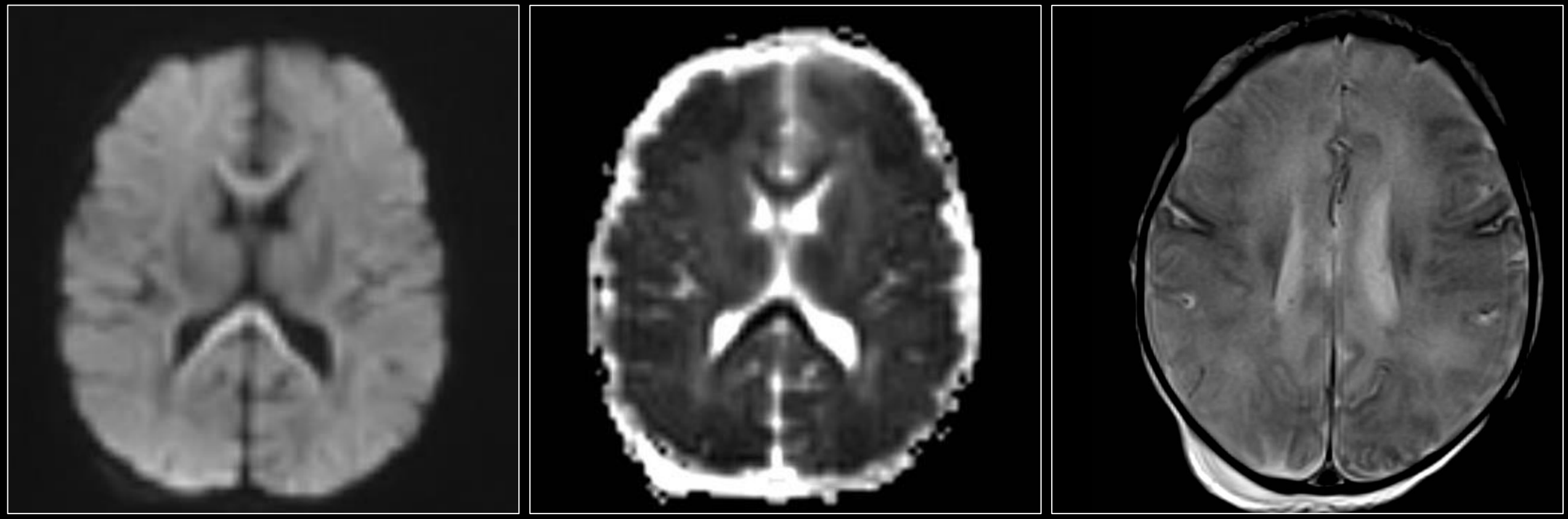


Arterial watershed infarcts



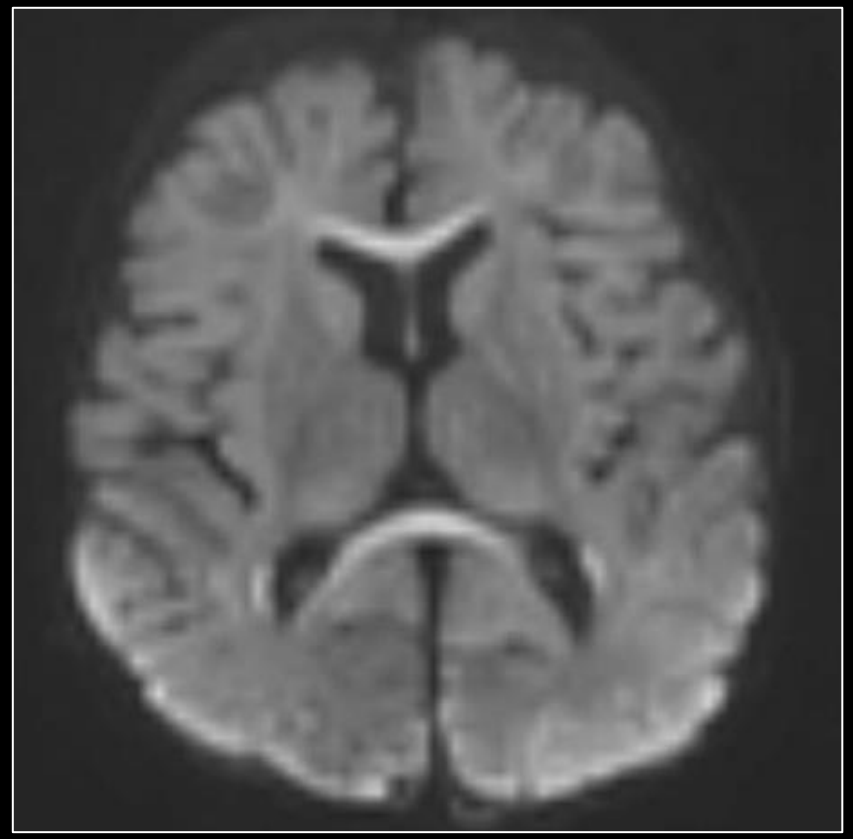
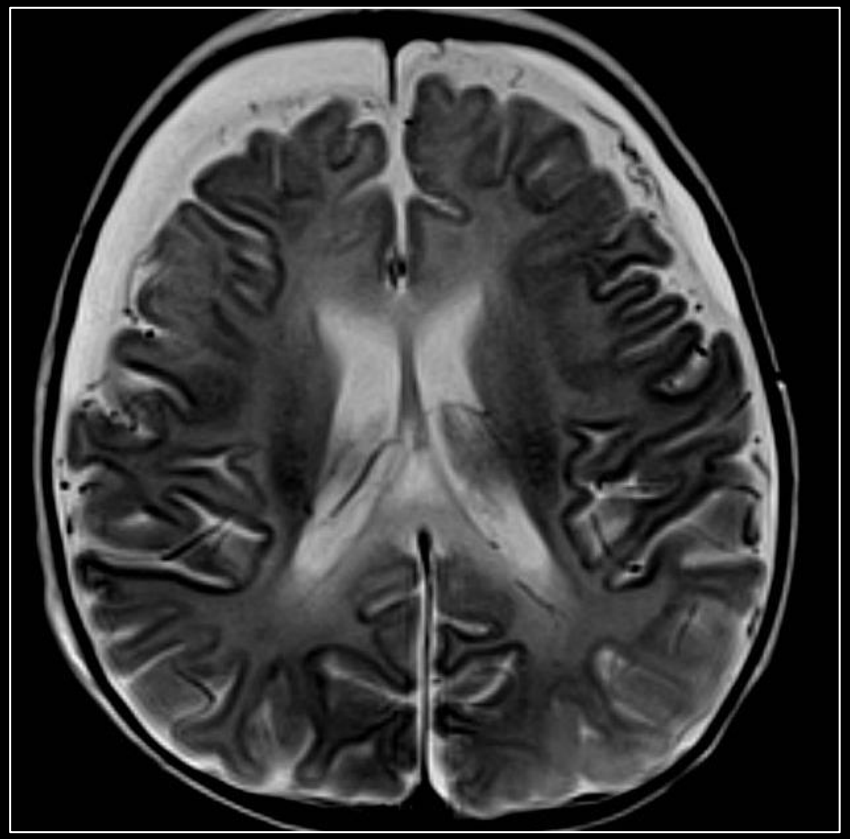


- Newborn status post difficult labor



Diffuse anoxic brain injury

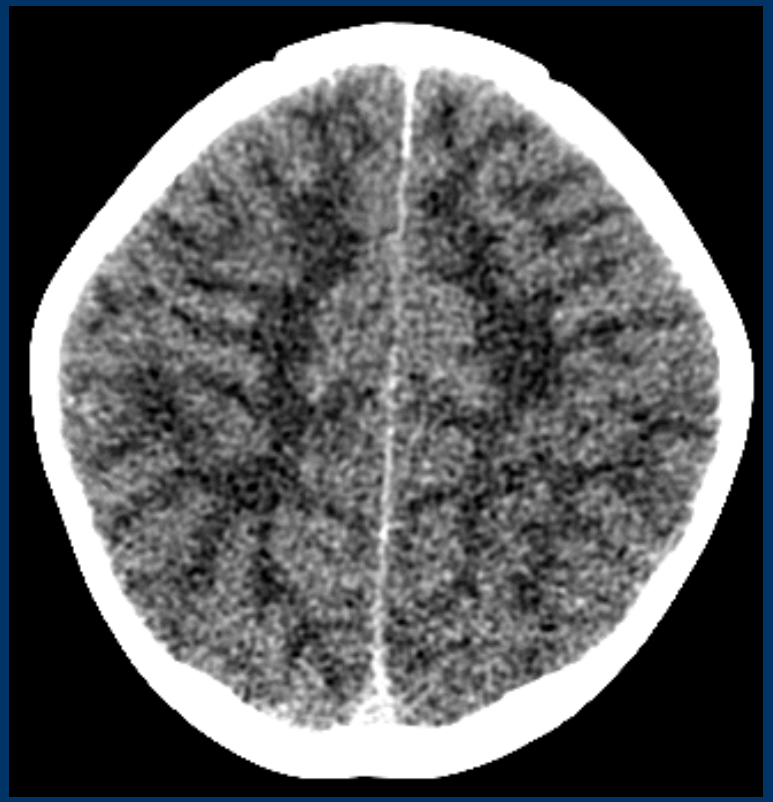
6-month-old with altered mental status

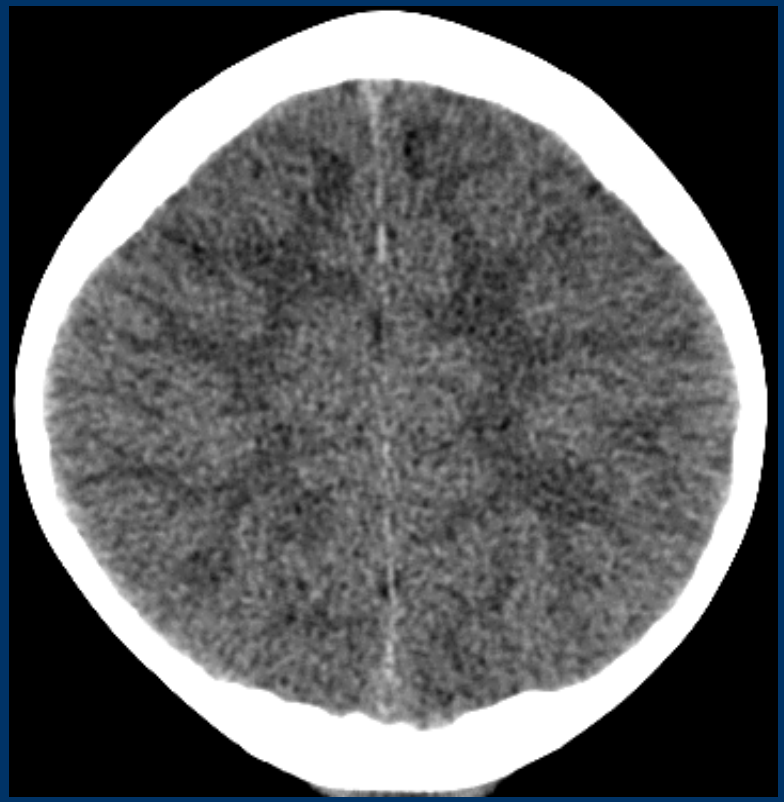

Parenchymal morphology: Older children

Three scenarios of sulci:

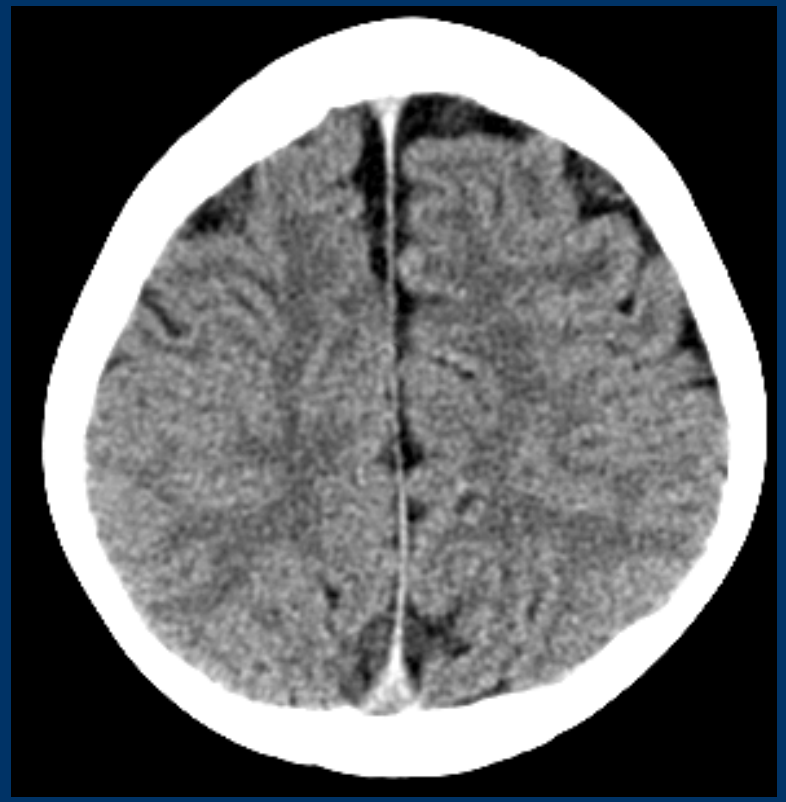
Completely effaced



Partial effacement

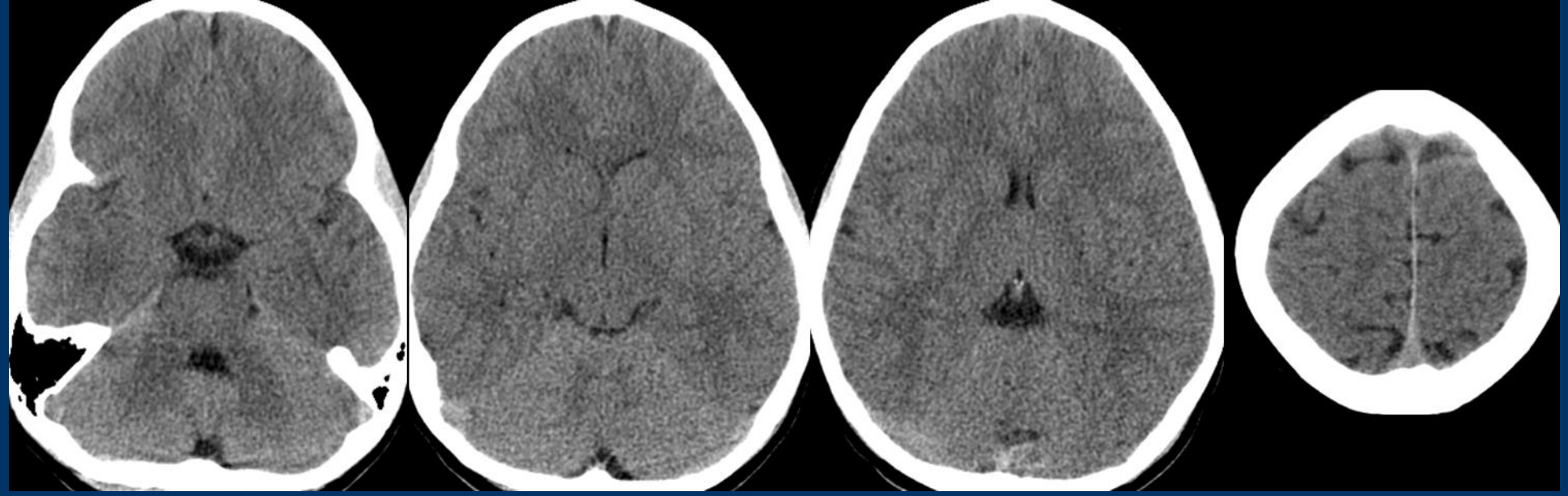


Looks normal

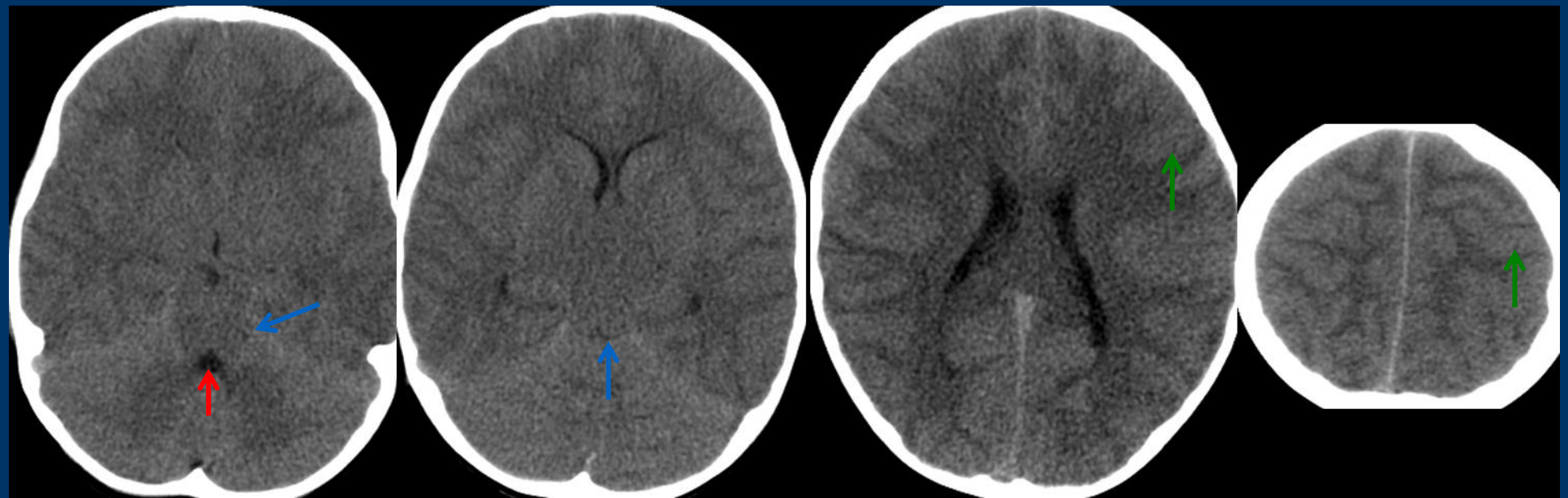


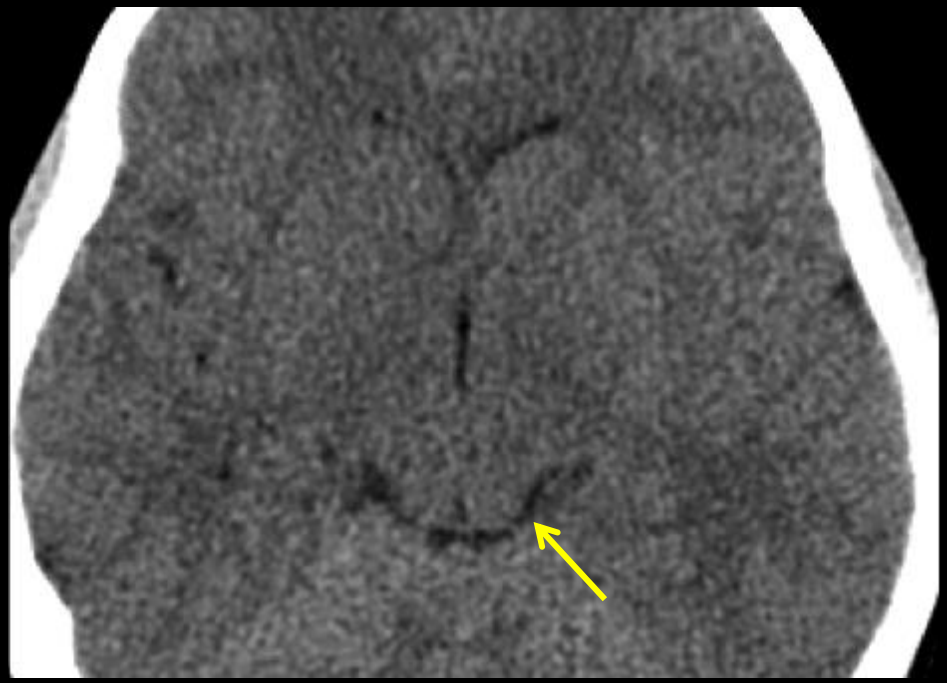
Interpretation summary

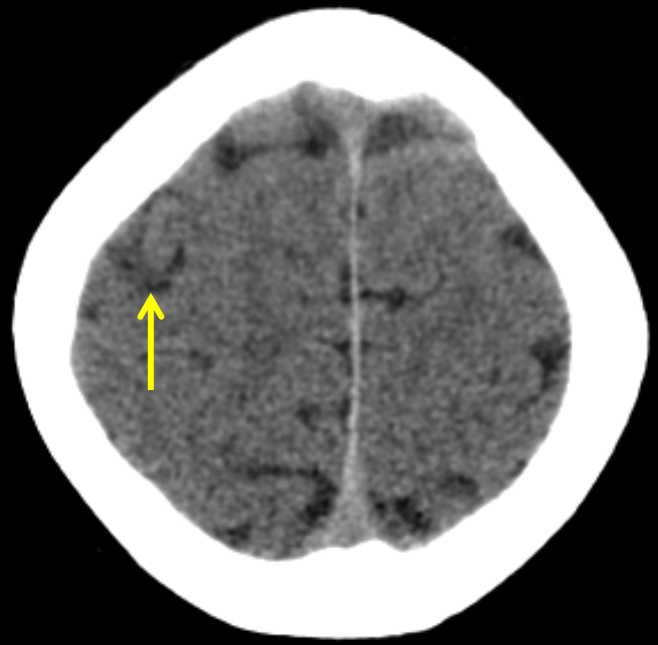
Completely effaced	Abnormal. Look for other signs and/or an explanation of edema and/or mass effect.
Some hints of sulci are seen	Could be normal but cannot definitely exclude global mass effect in the absence of a baseline imaging study.
Looks normal	Likely normal. Probably no global mass effect/brain swelling.



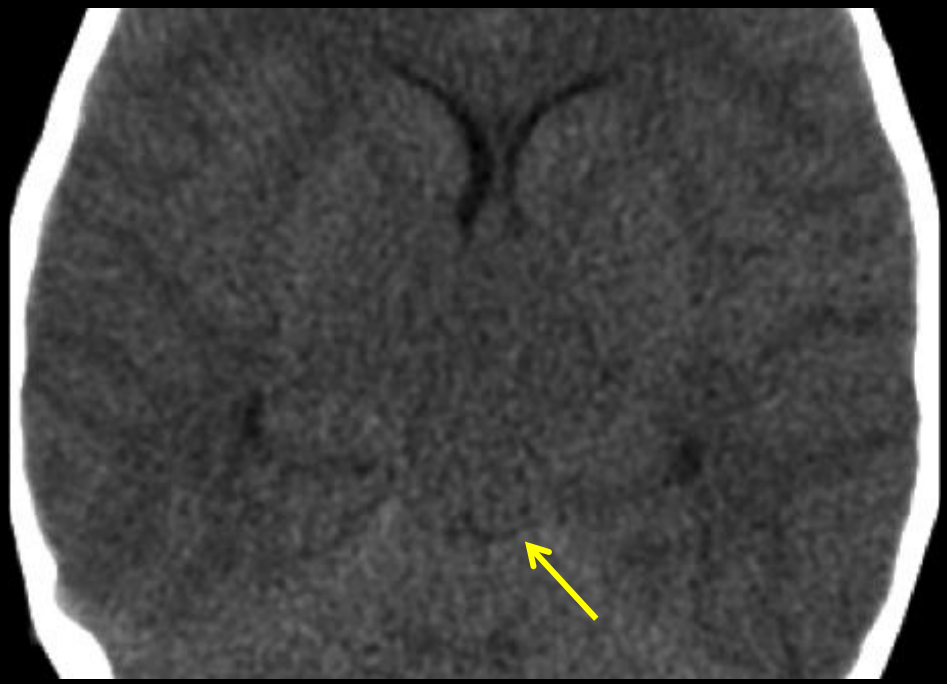
Below: Diffuse cerebral swelling (same patient as above), impending herniation
(arrows: 4th ventricle blunted perimesencephalic cistern effaced, sulci effaced

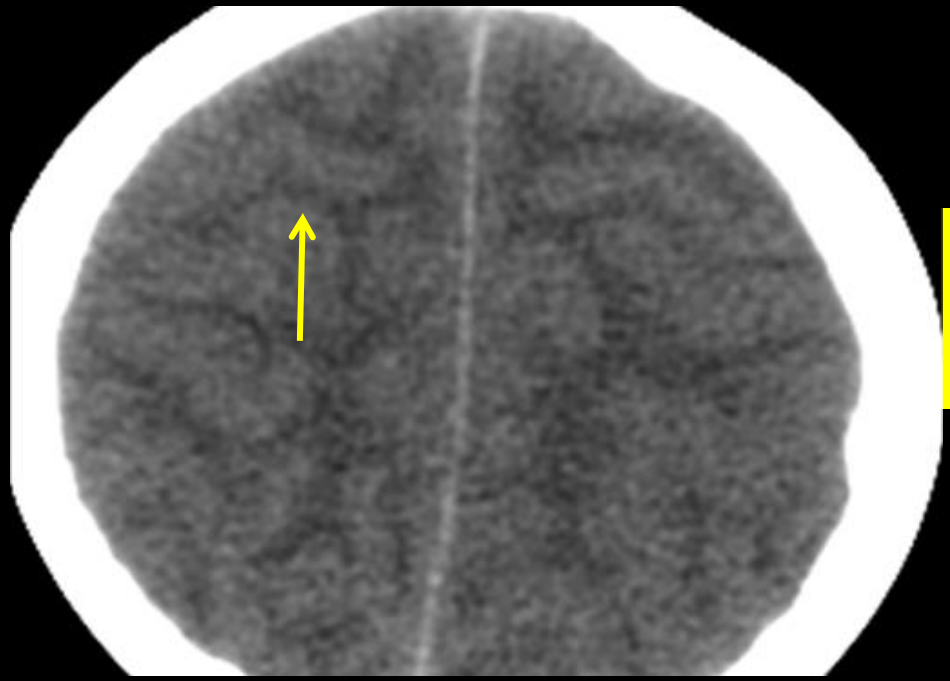




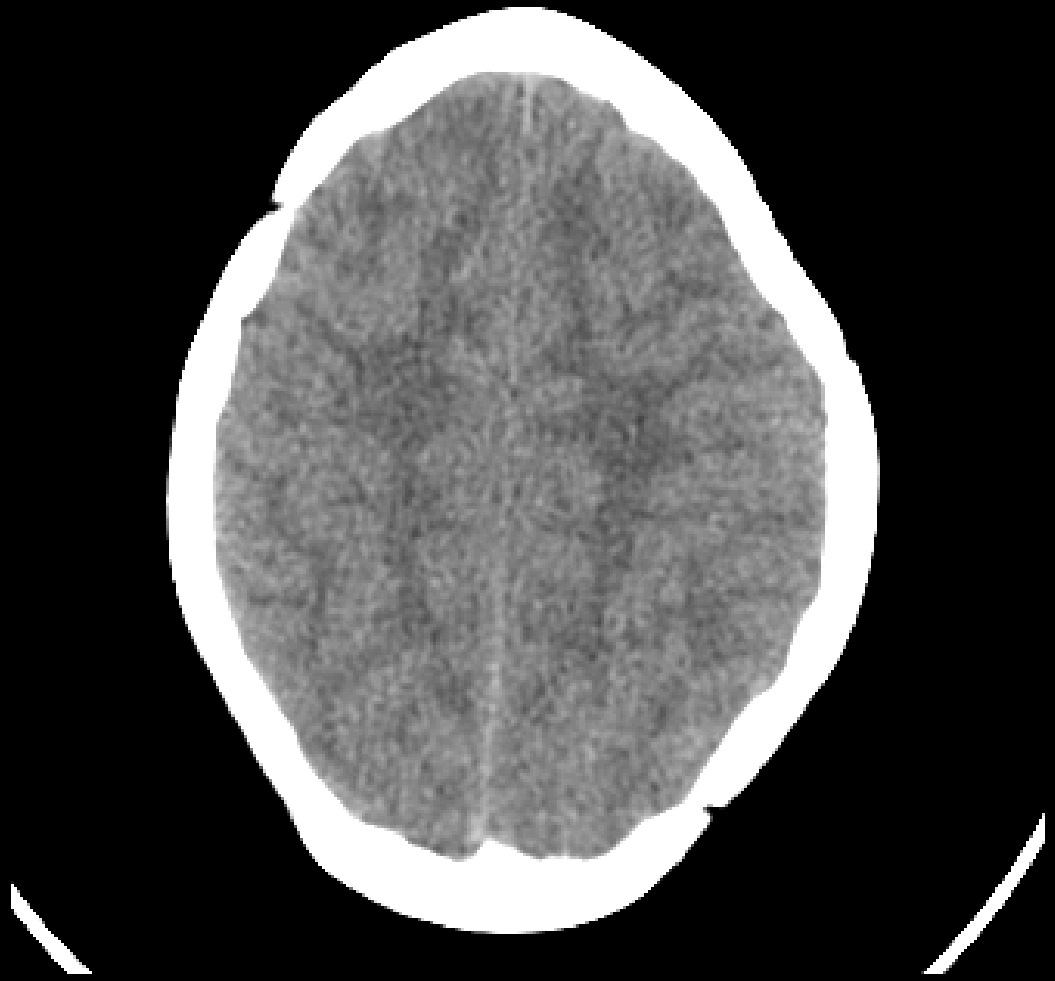


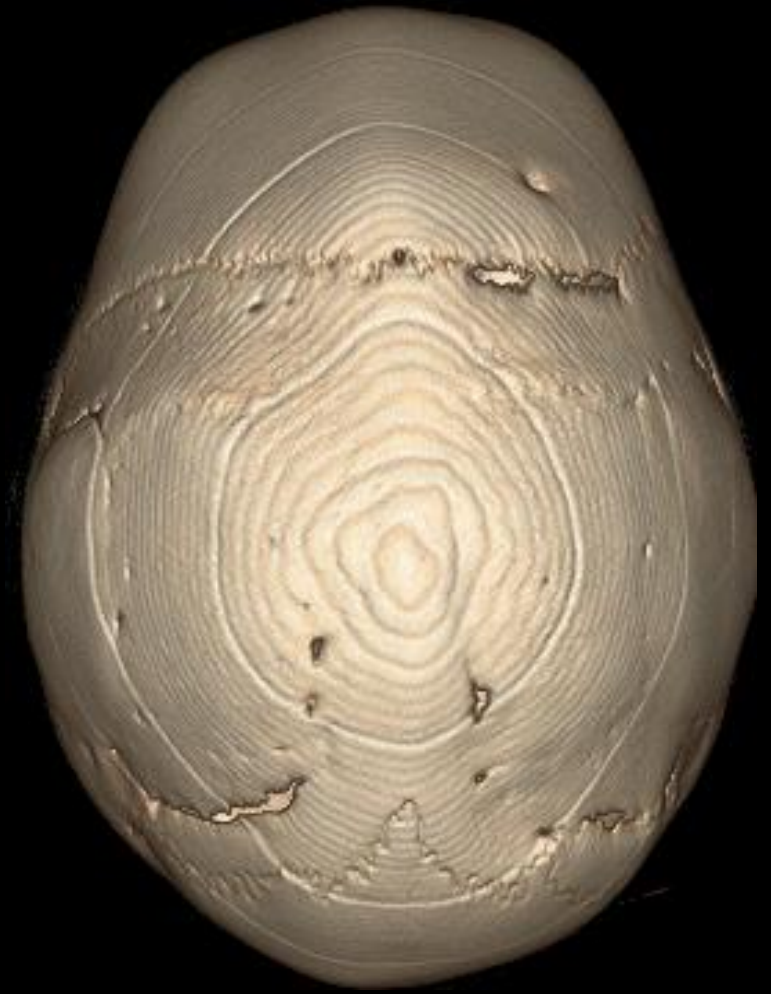
Normal





Diffuse swelling, impending herniation

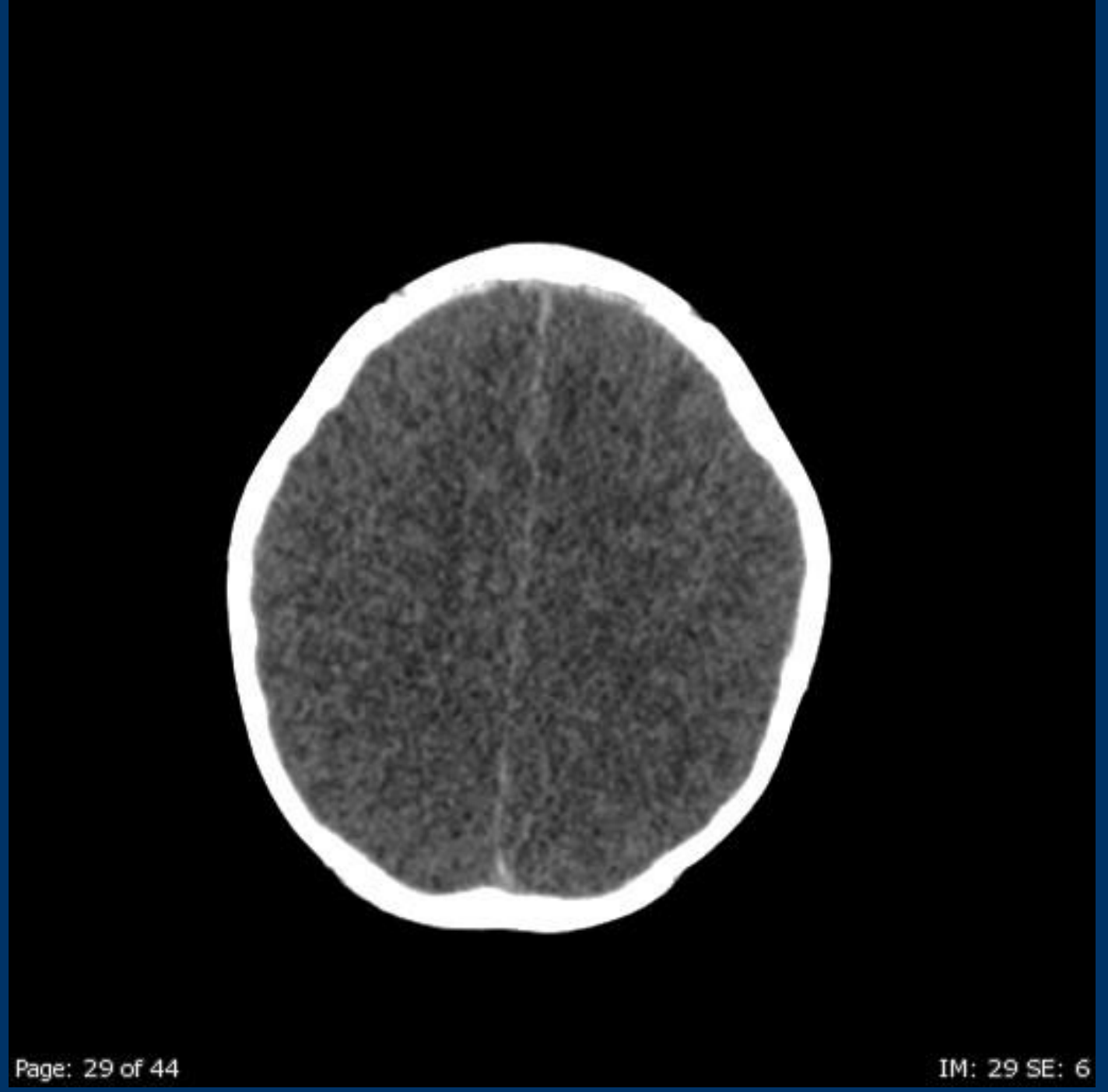


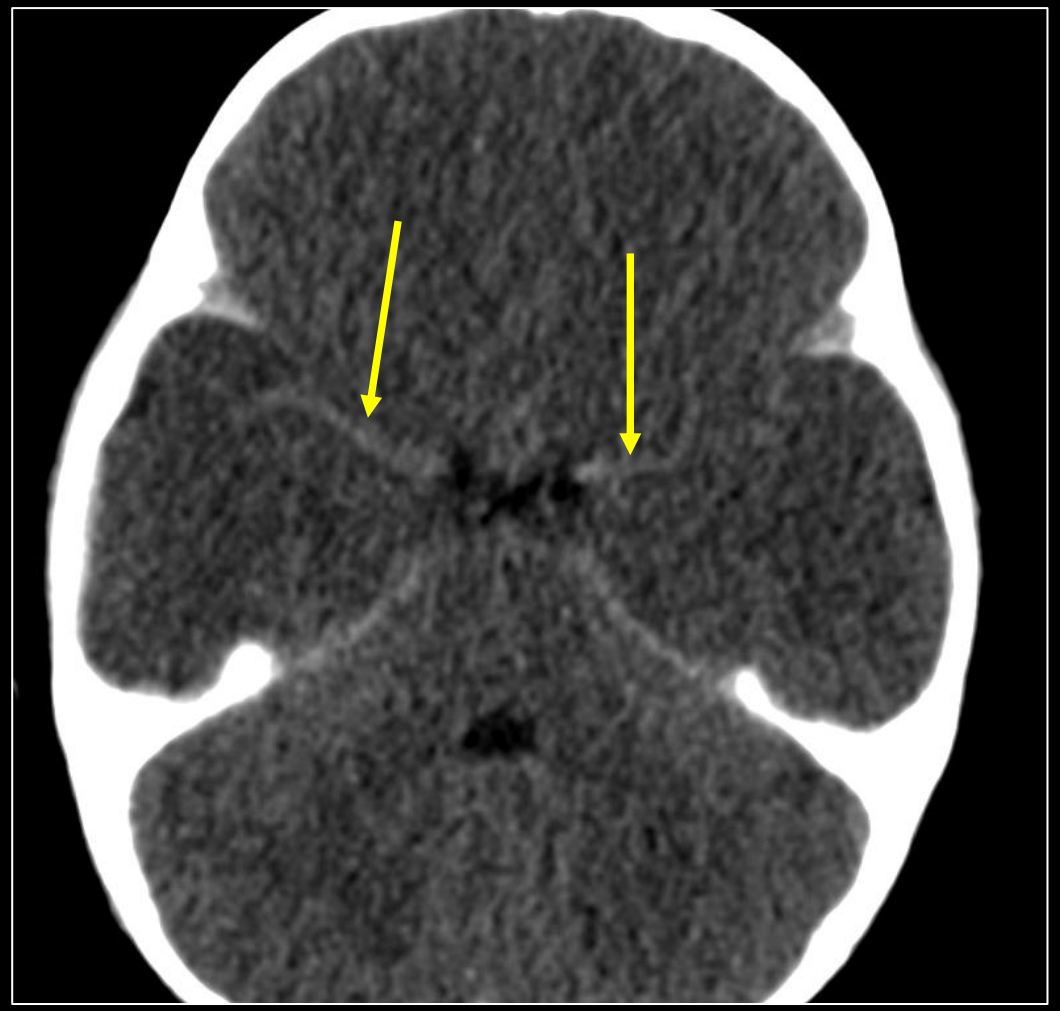


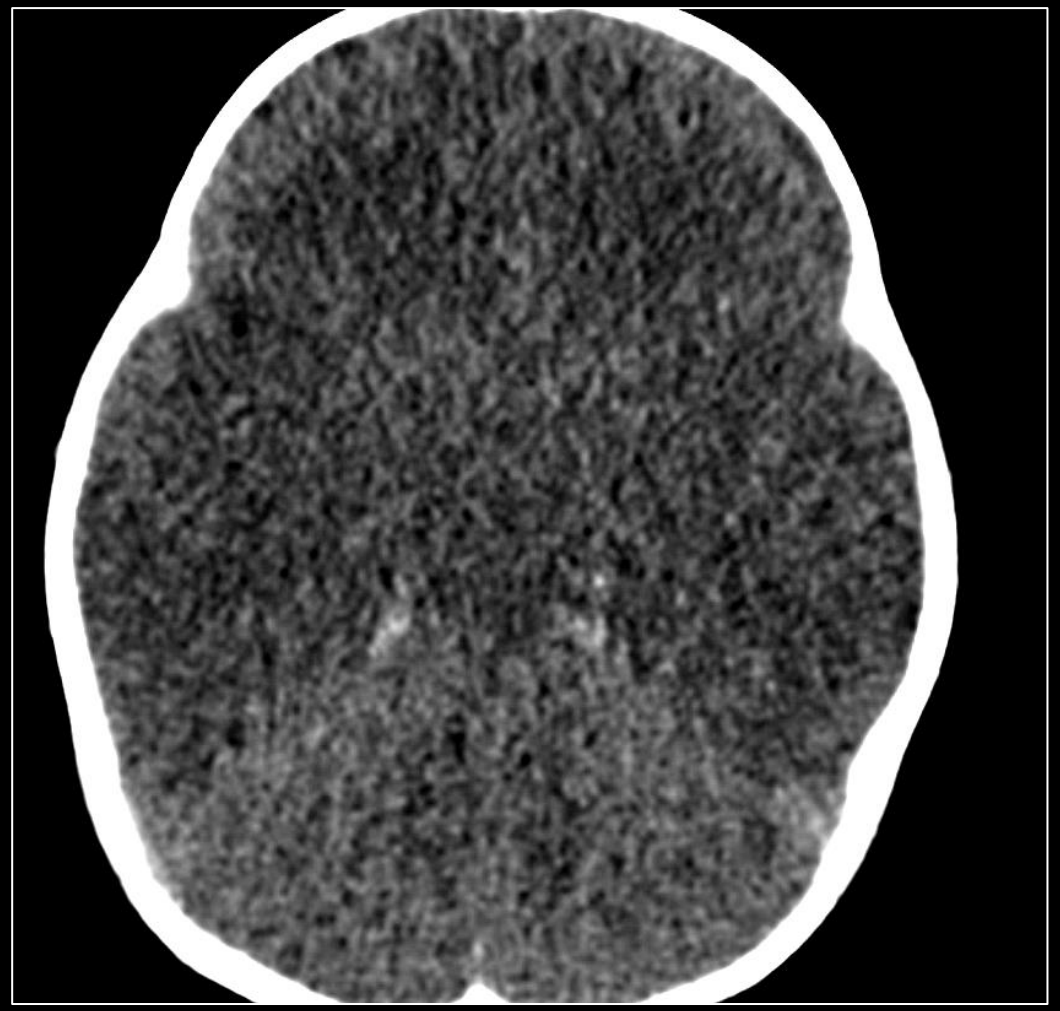
Craniosynostosis

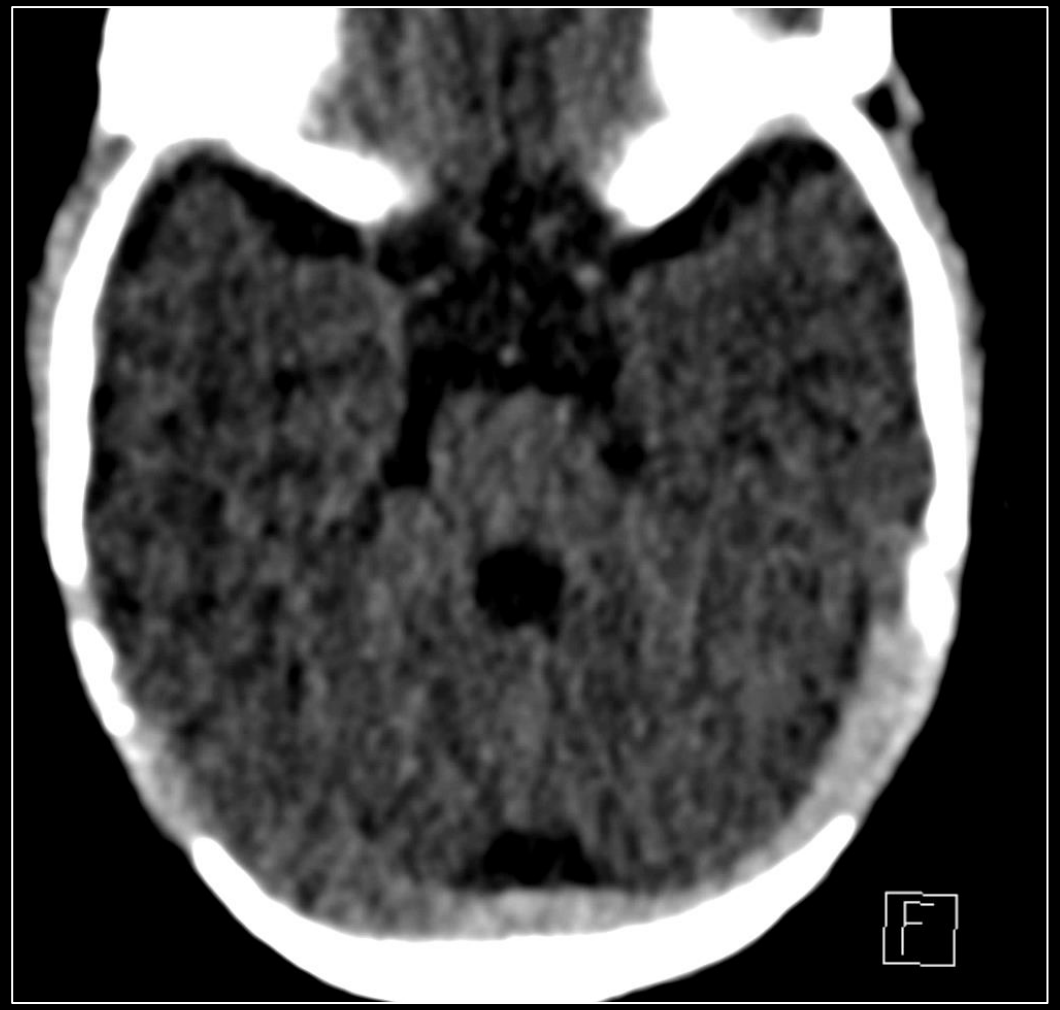
Questionable subarachnoid hemorrhage

9 month old boy



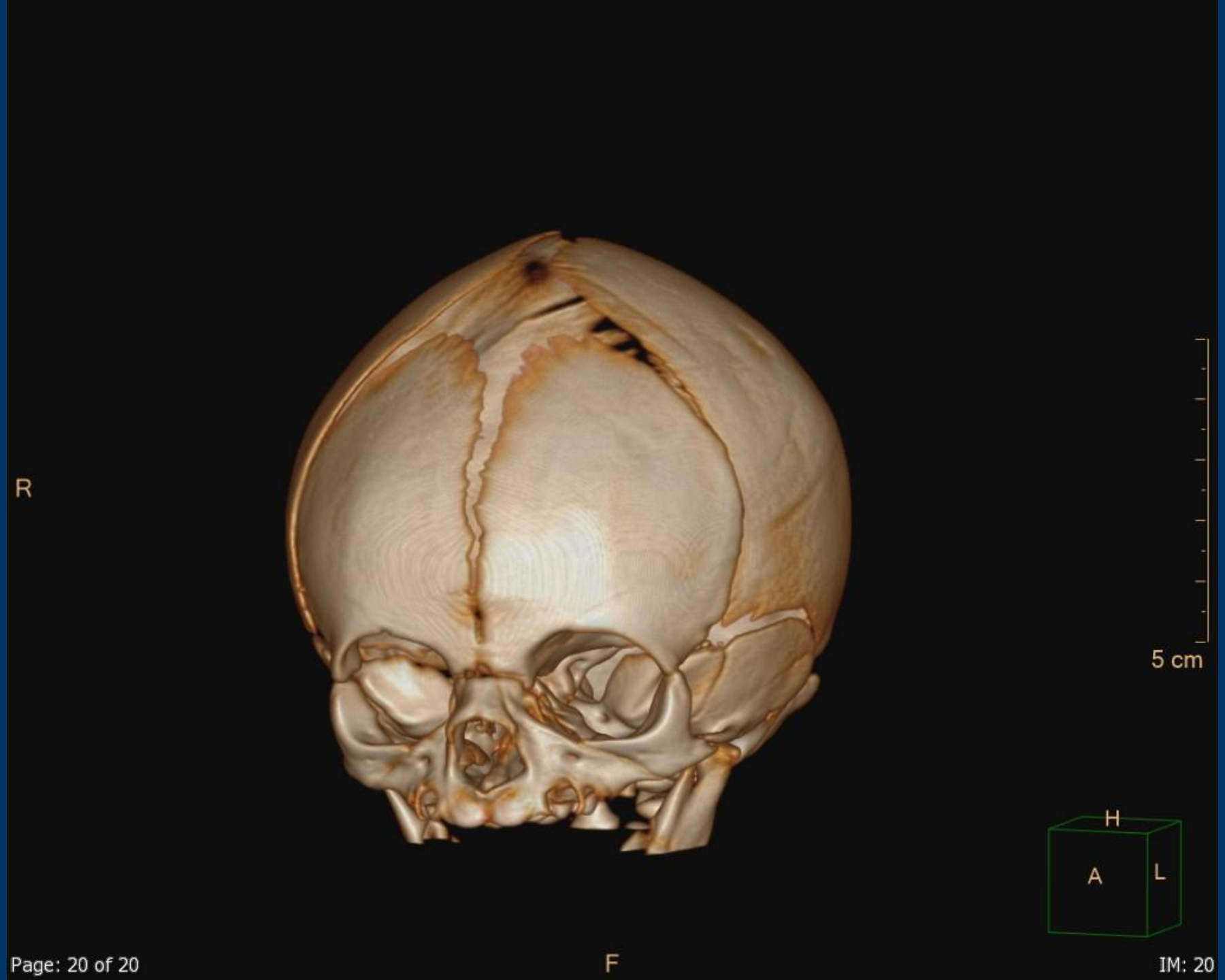






- Does this newborn have subdural hemorrhages?


F
Page: 33 of 34
IM: 34 SE: 4

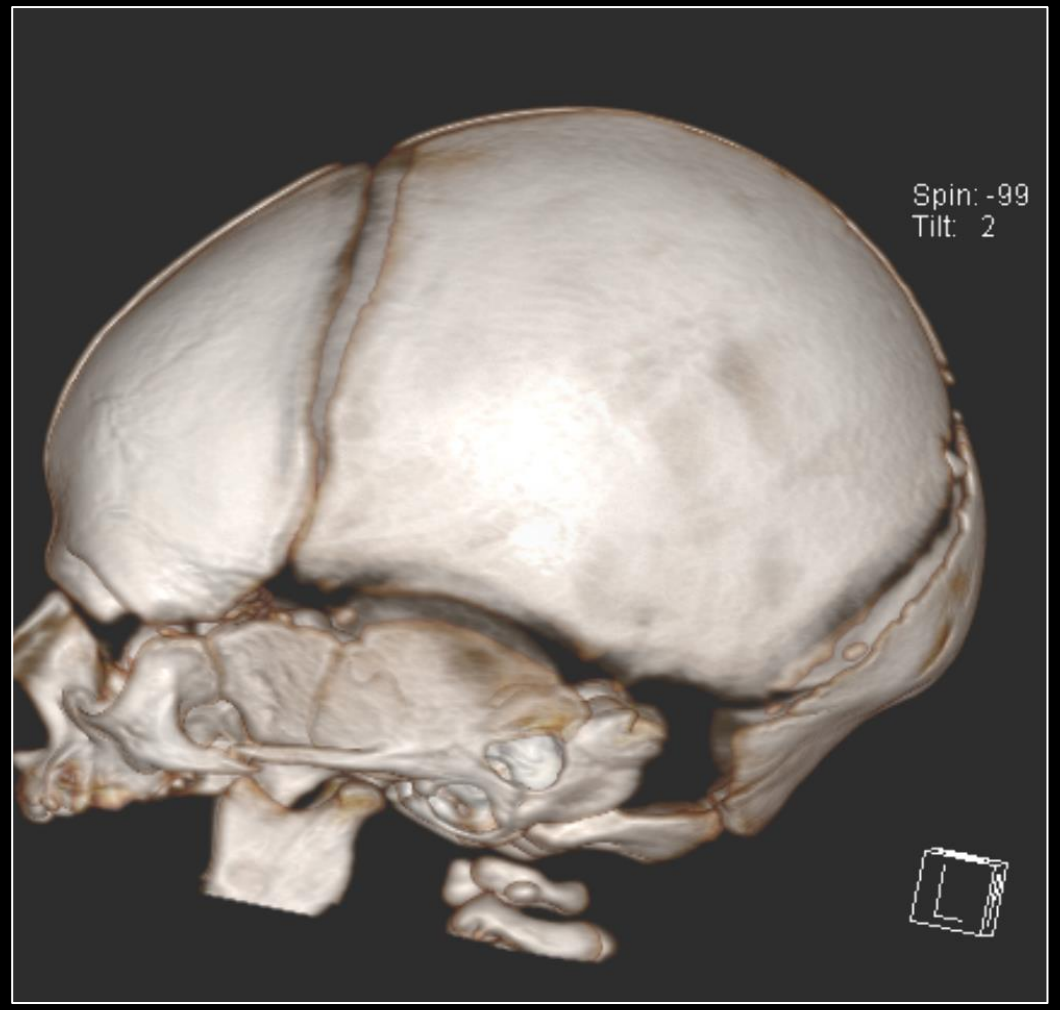

R
5 cm
H
A
L
F

Sutures:

- Coronal
- Sagittal
- Lambdoid
- Squamosal
- Remaining sutures are named after the adjacent bones
- Metopic and mendosal (metopic=frontal; Mendosal =posterior intraoccipital)

3D Volume Rendered Images

- 3D volume rendered images can increase detection of fracture and diastatsis and are routinely done at our institution.
- These images require minimal post-processing, and do not increase radiation dose.
- Good practice to include 3D rendered images in your practice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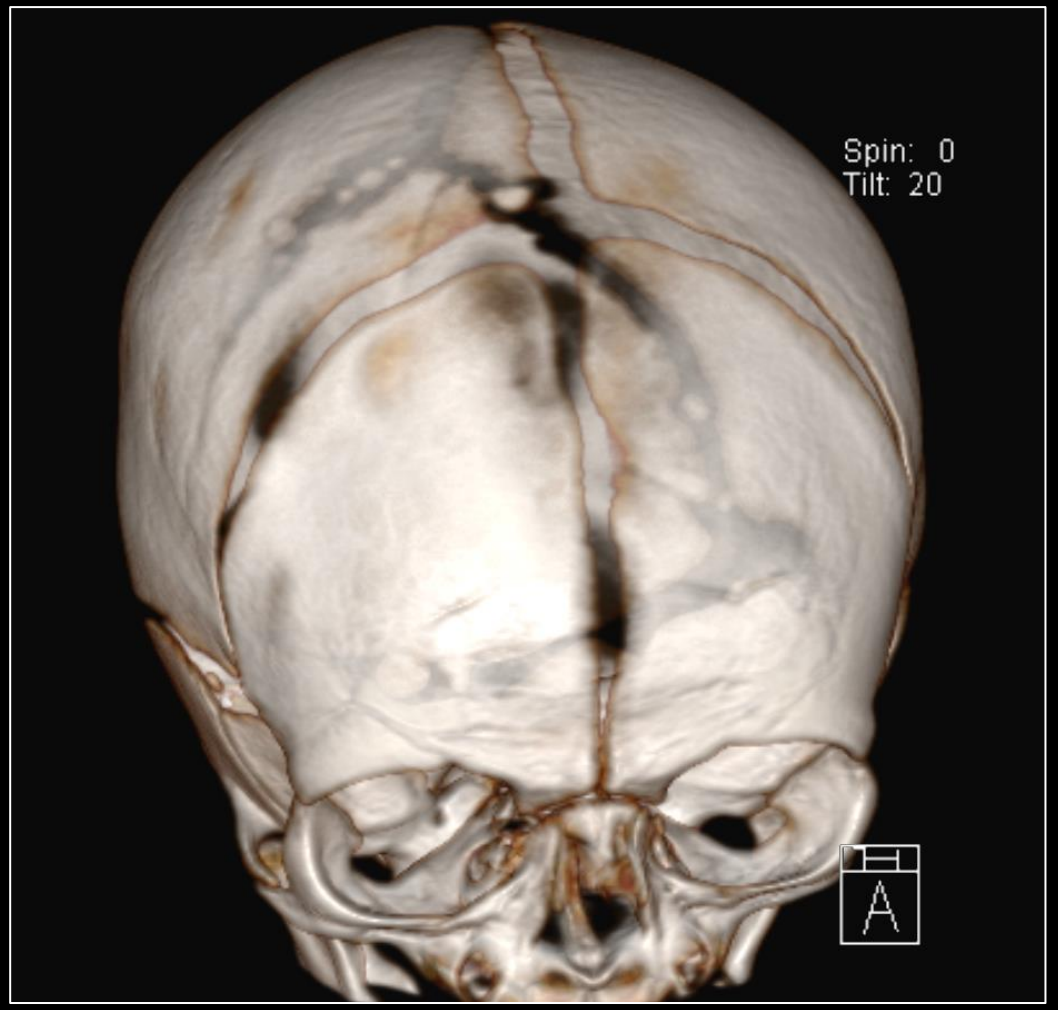
Tilt: 2
L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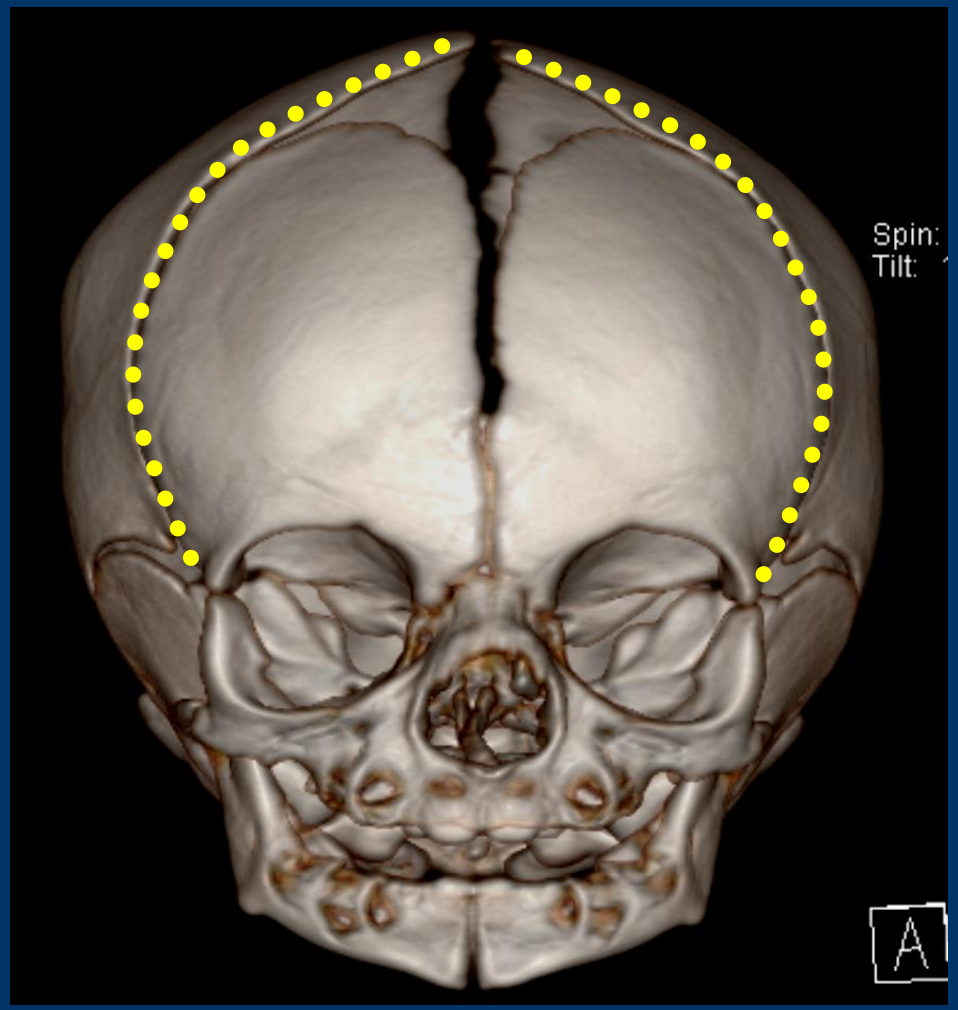
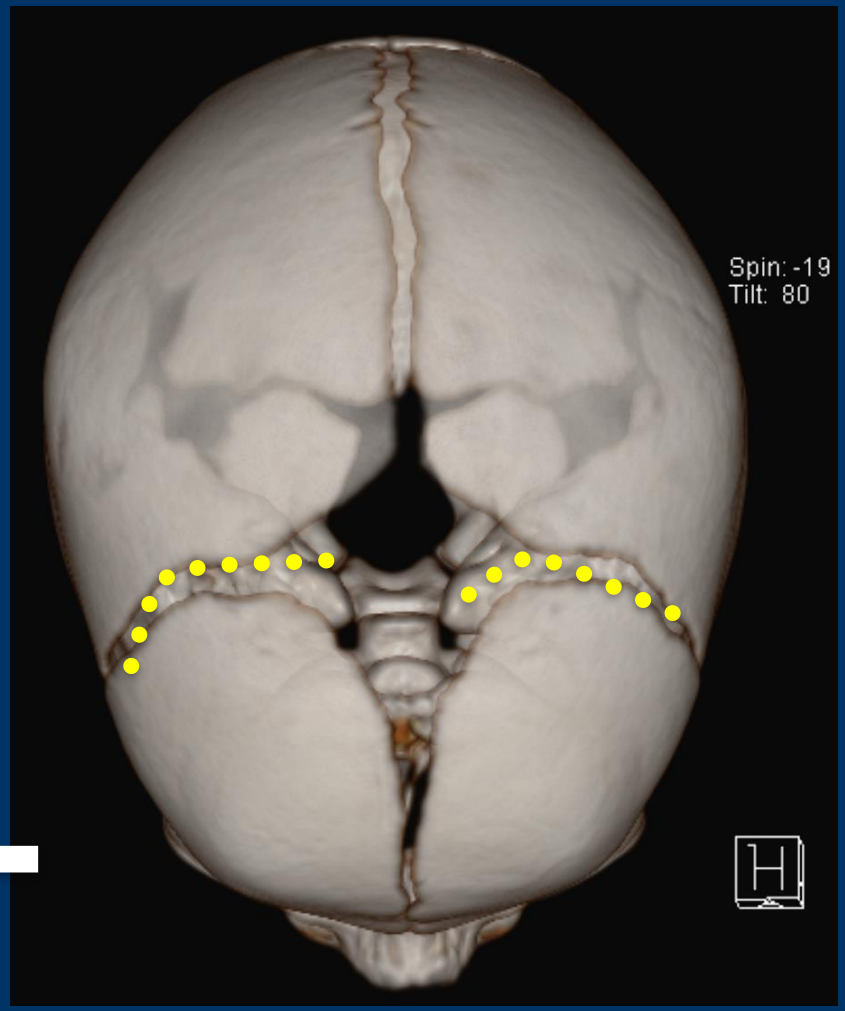
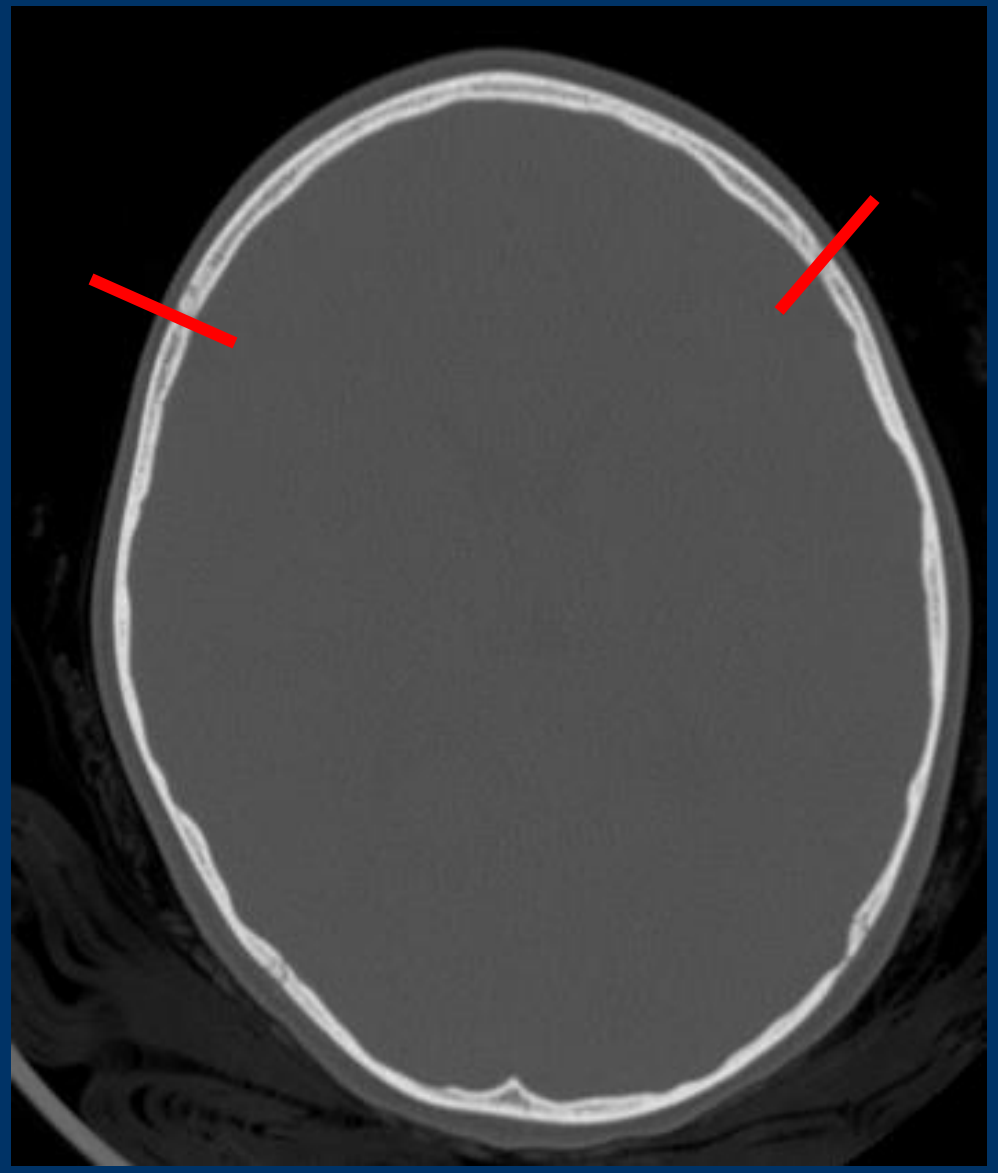
Coronal Suture

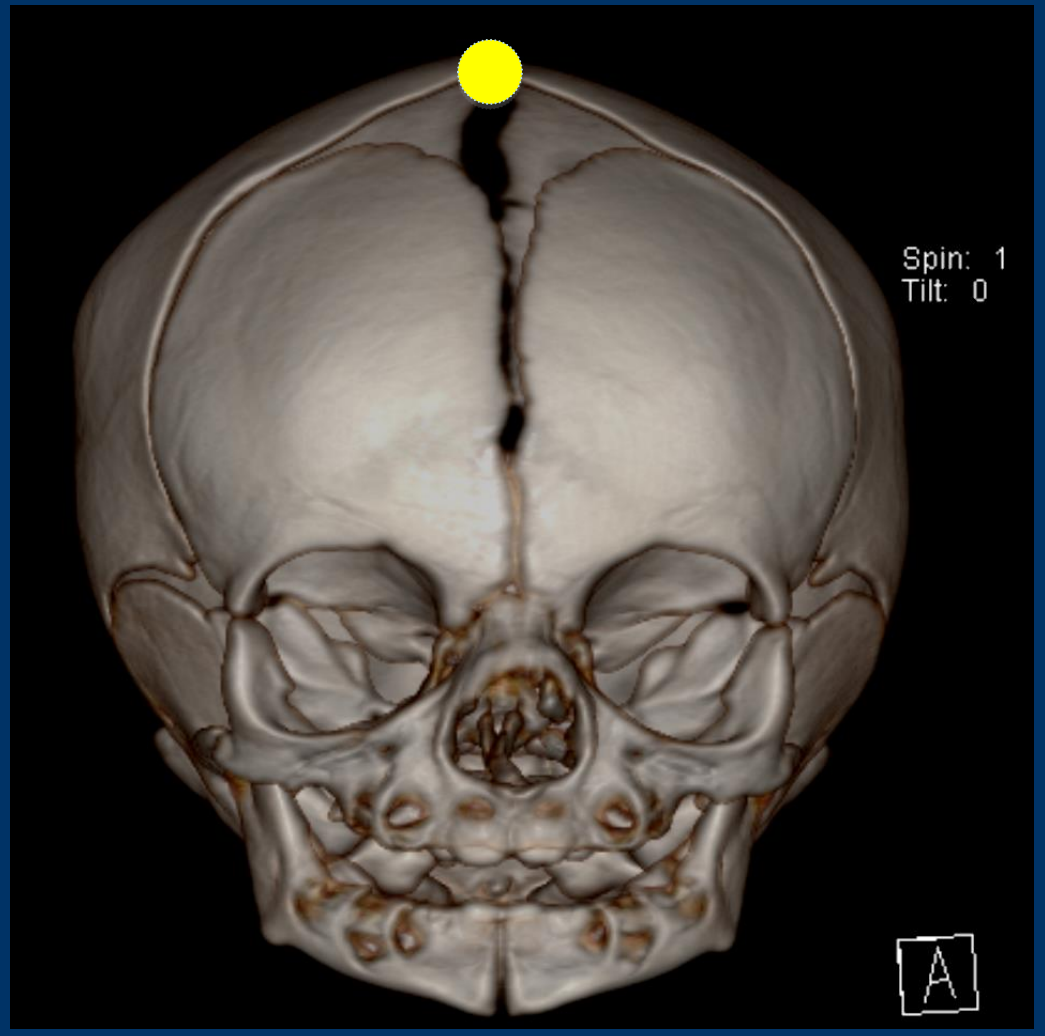


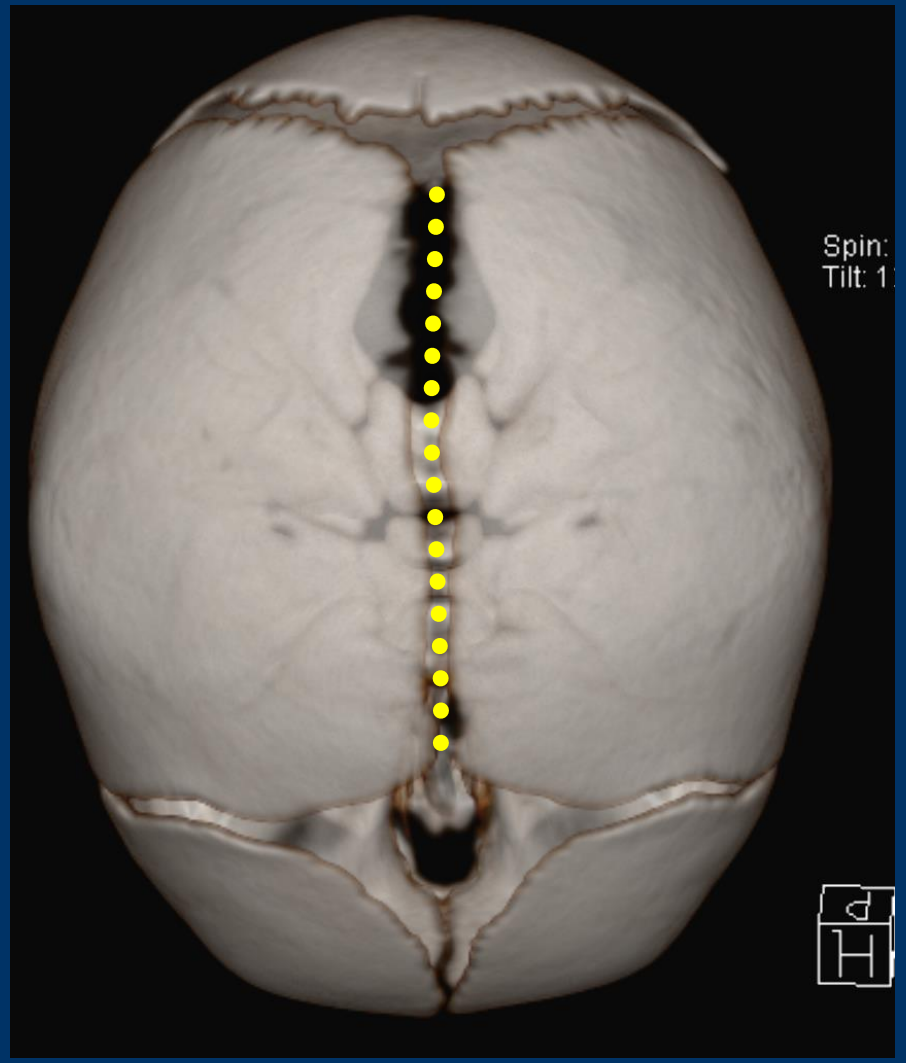


Coronal suture

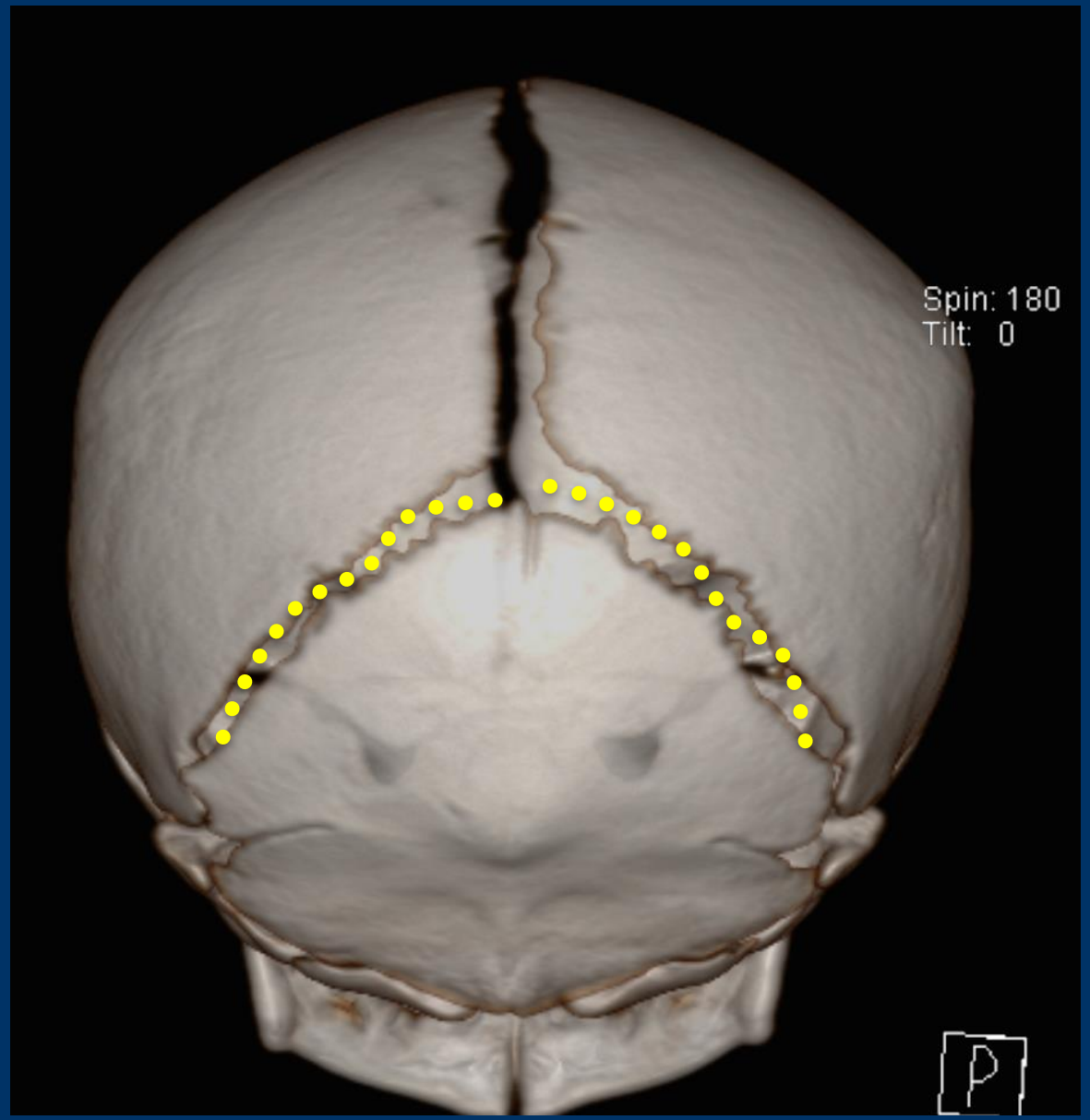


Sagittal suture

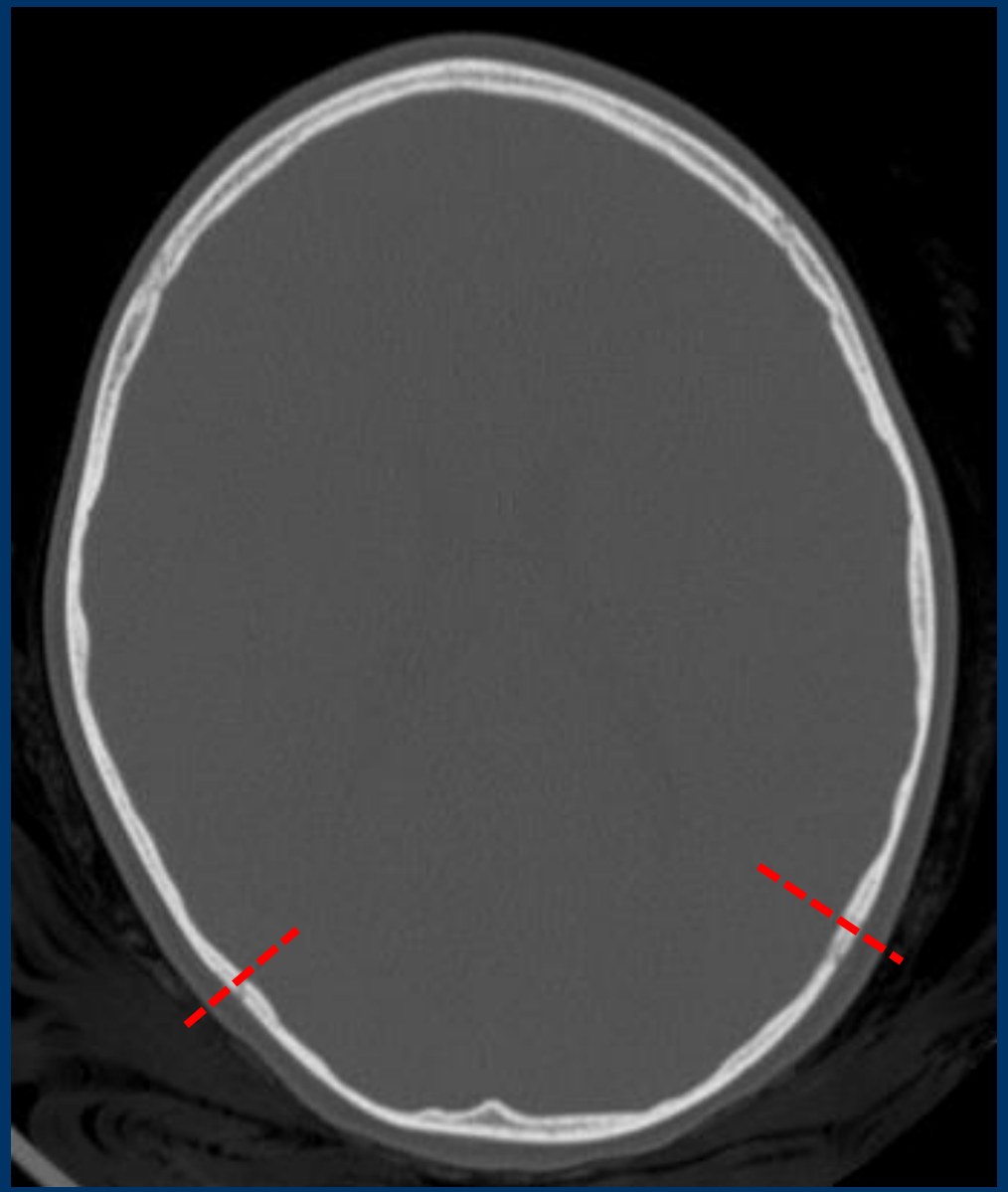




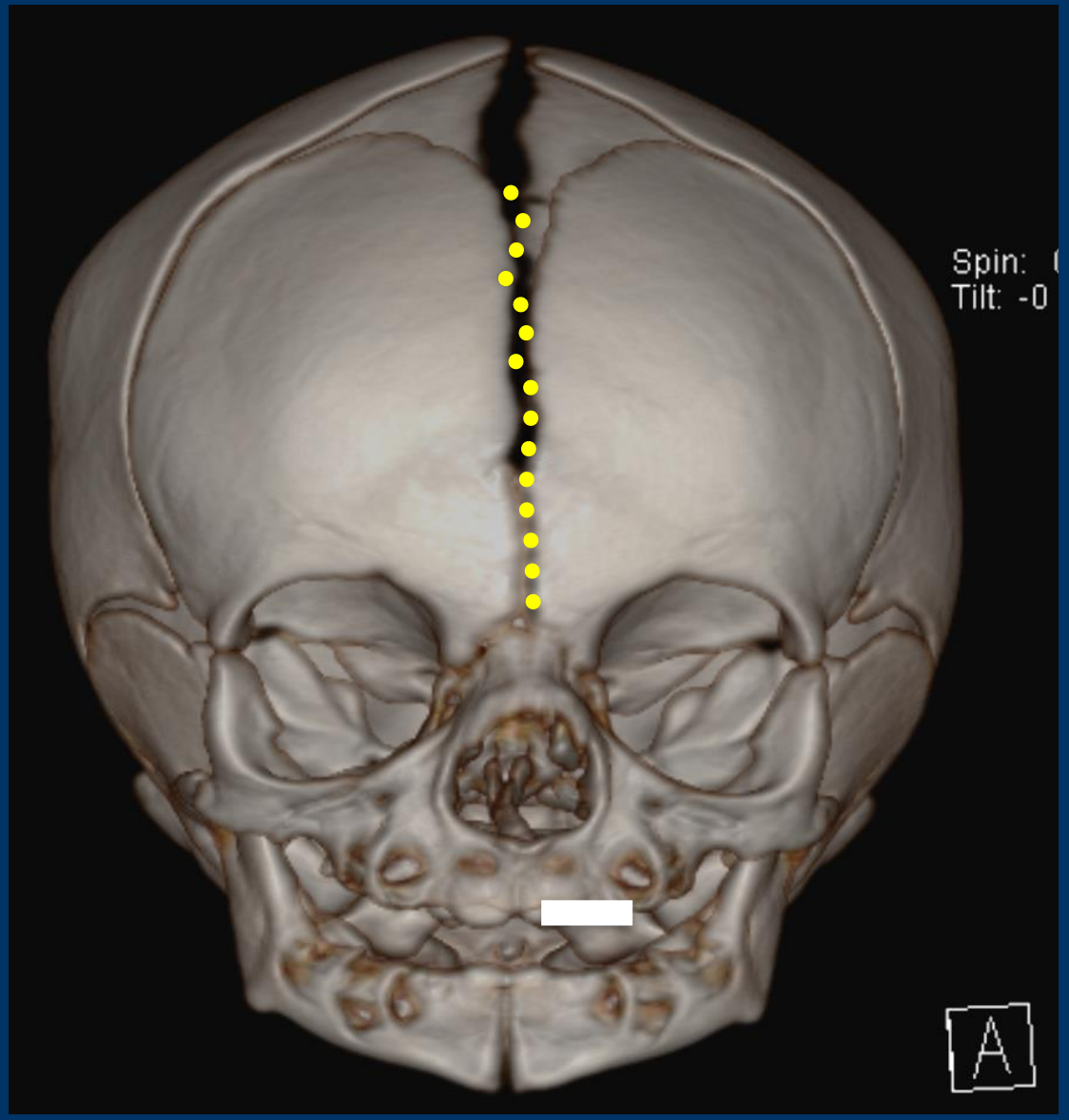
Lambdoid suture



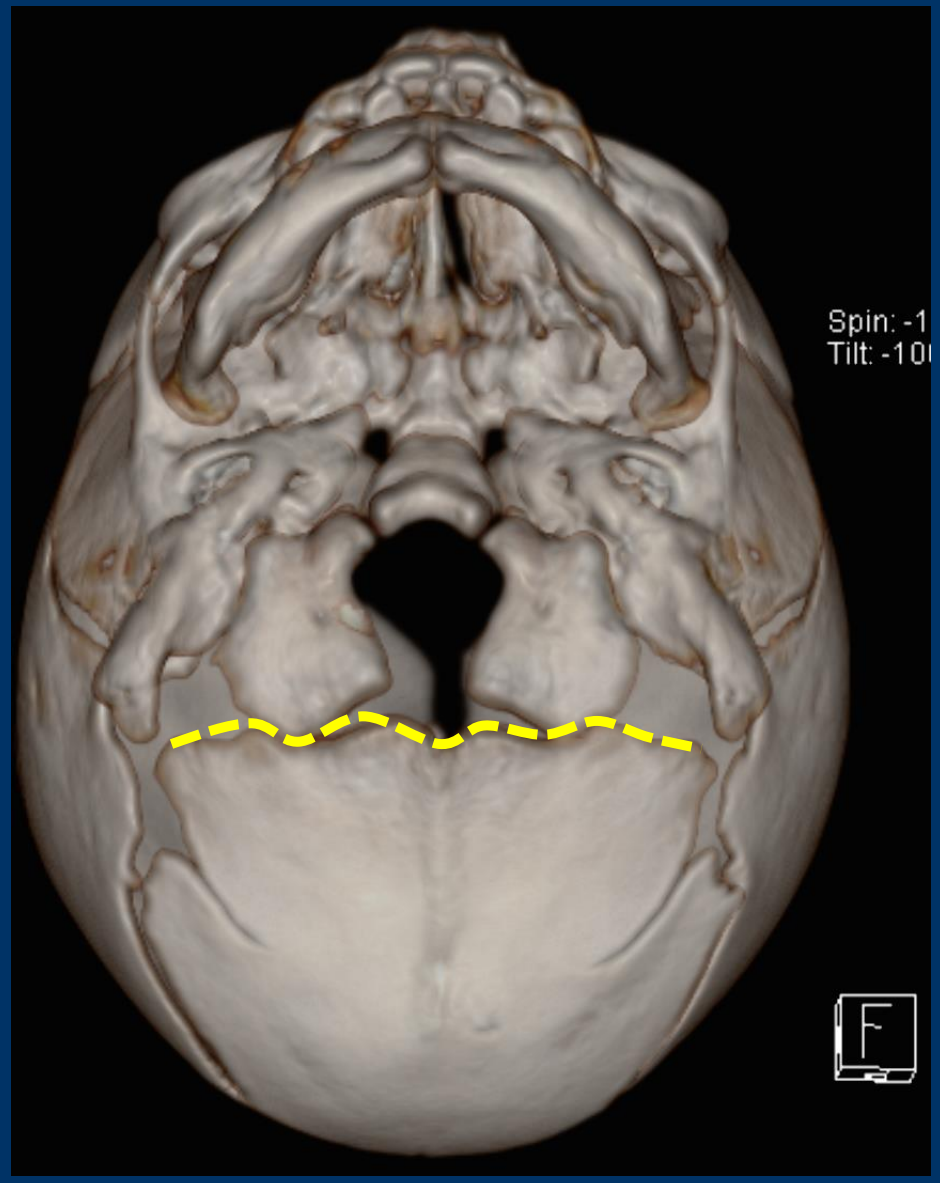
lambdoid suture.



Metopic or frontal suture



Posterior intraoccipital suture

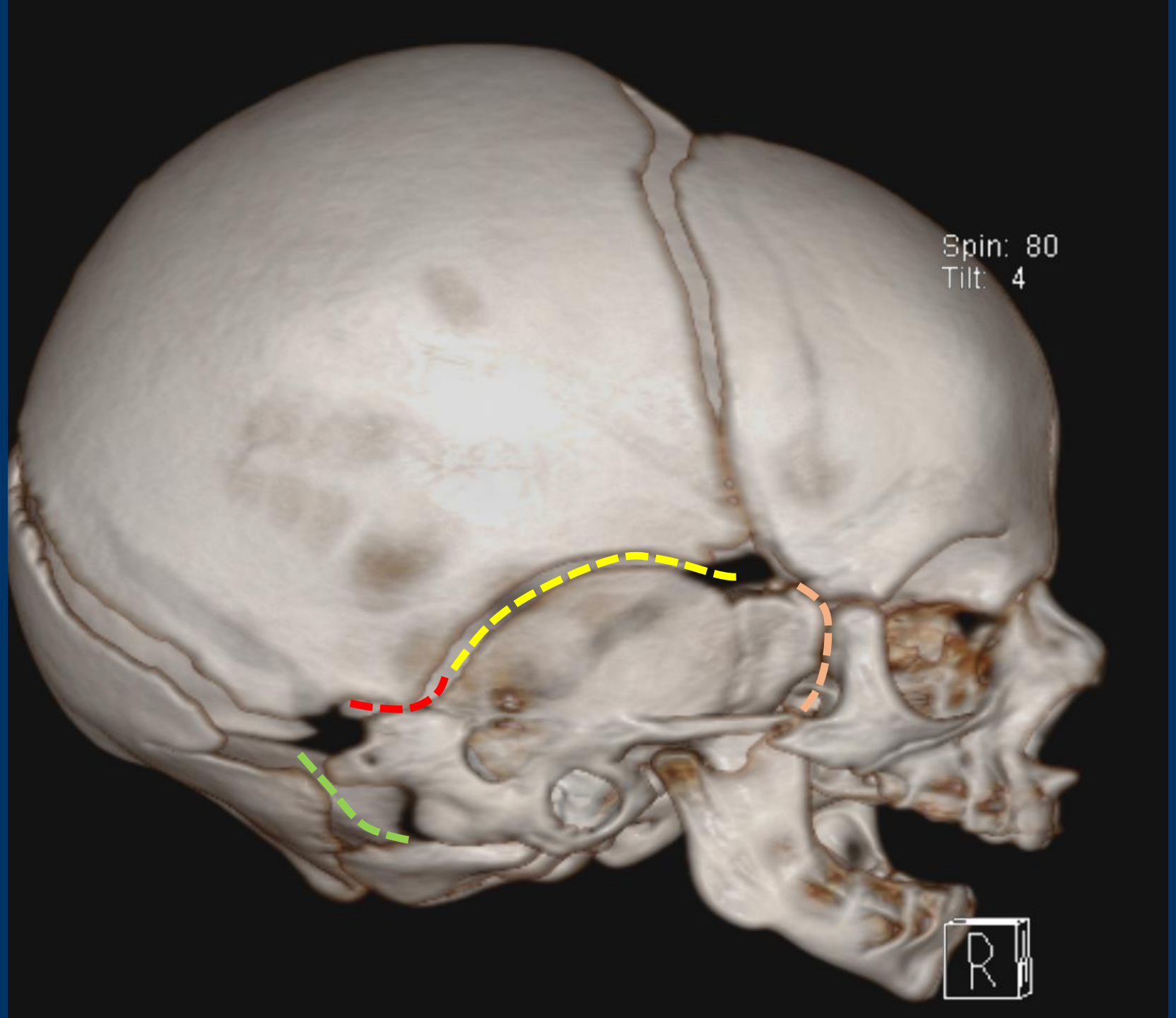


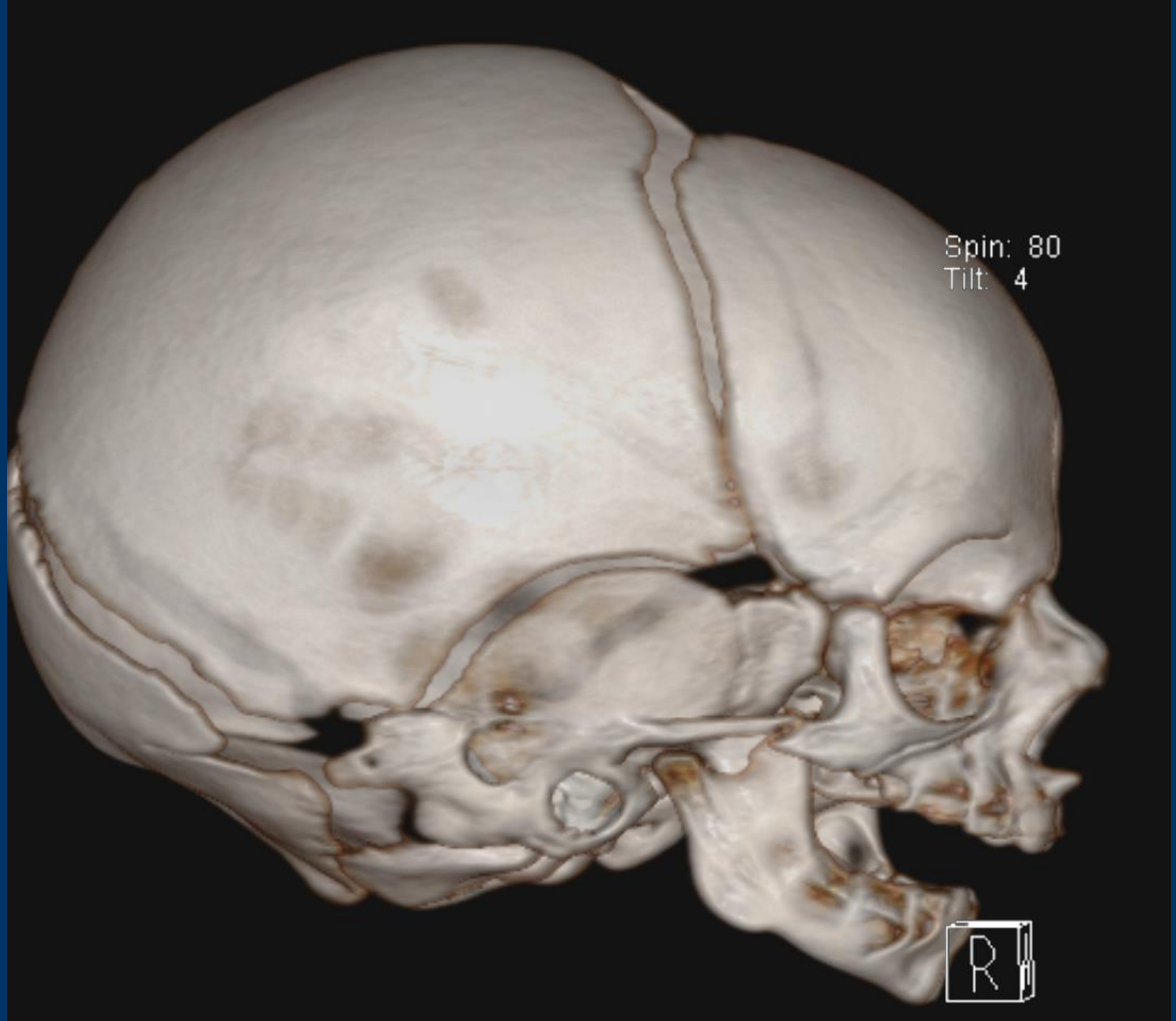
Squamosal suture

Parietomastoid

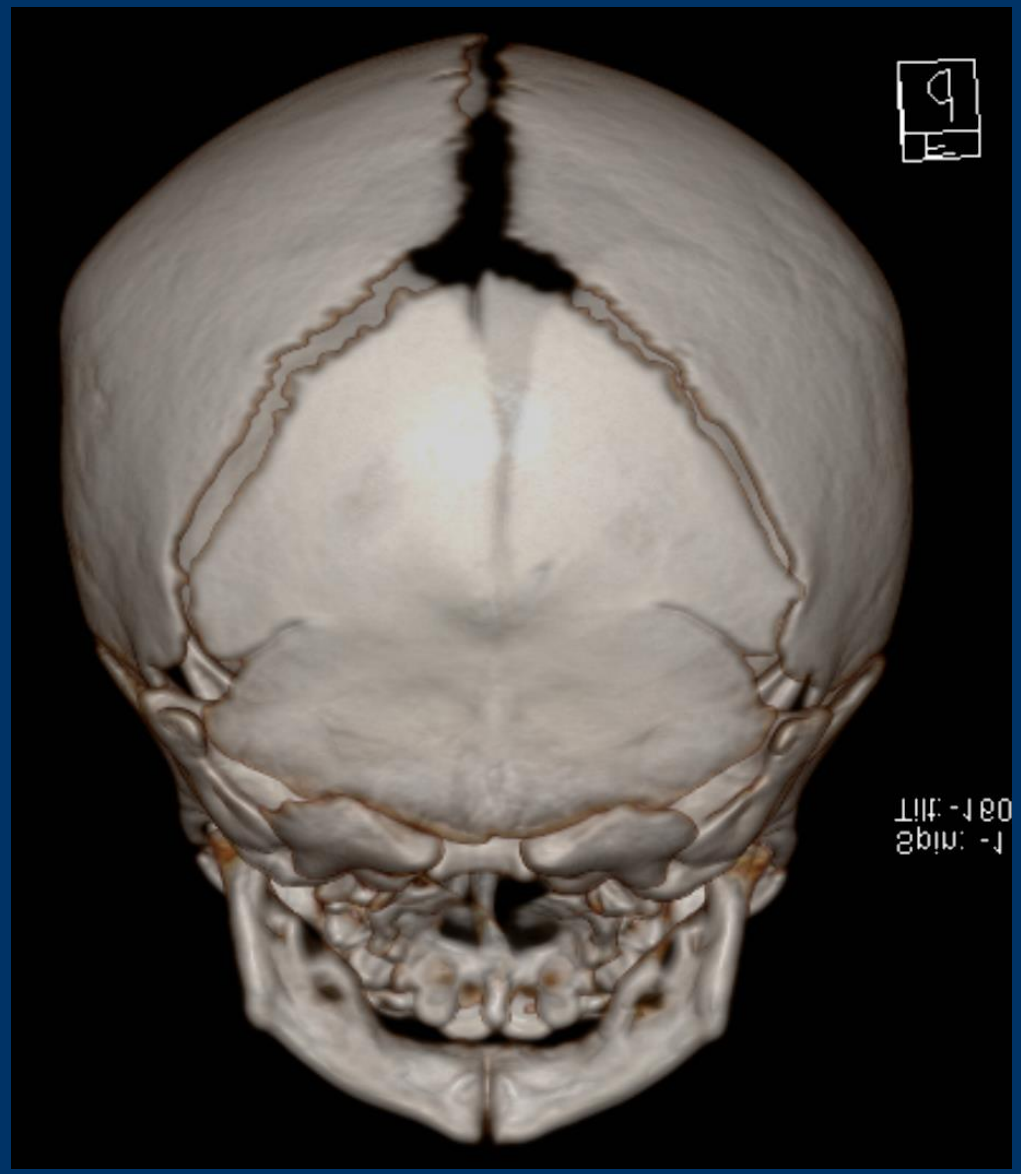
Occipitomastoid

Sphenotemporal



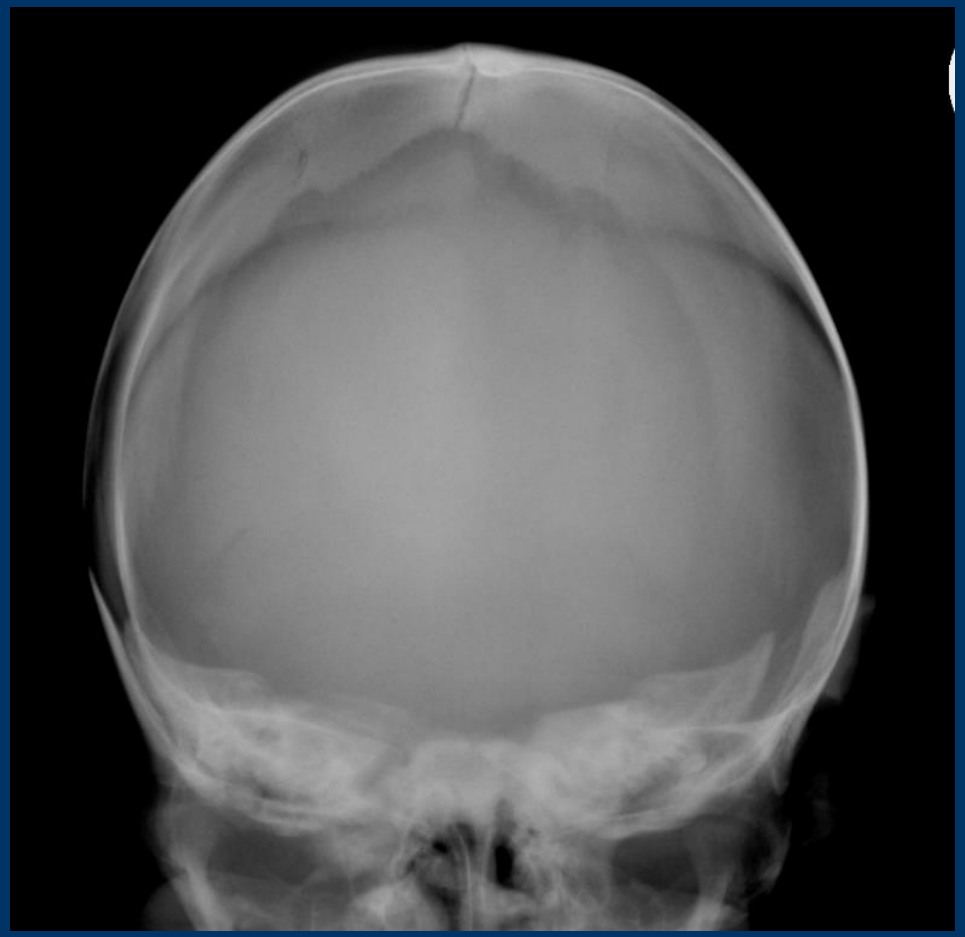

Spin: 80
Tilt: 4
R

Accessory Sutures



The interparietal suture is an accessory suture of the upper part of the occipital bone that wedges between the parietal bones

Frequently confused with a fracture, especially when asymmetrical! 3D bone renderings (left) and MIP (maximum intensity projections, right) can help in visualizing sutures and fractures.



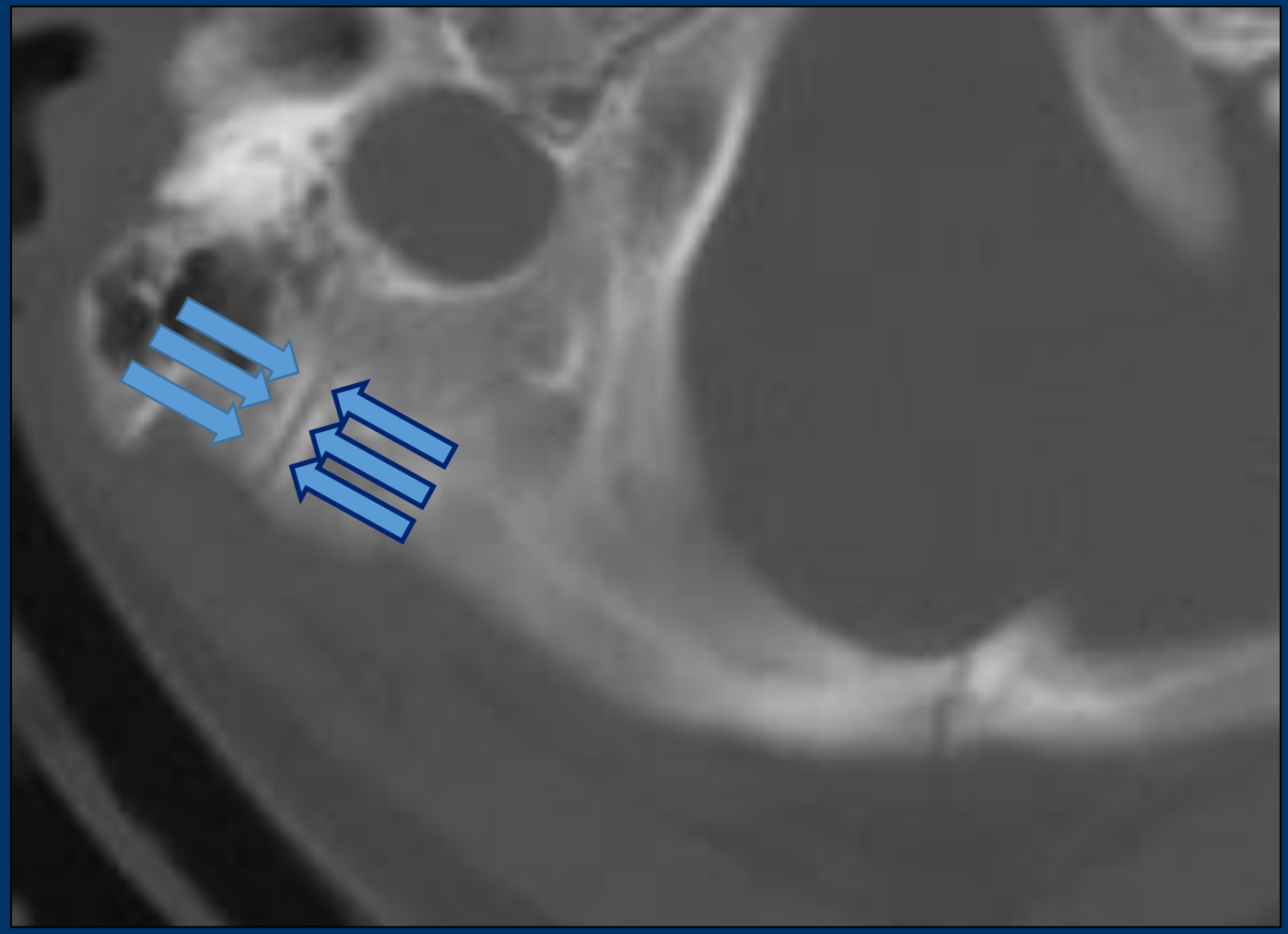
Accessory parietal suture

Suture Closures

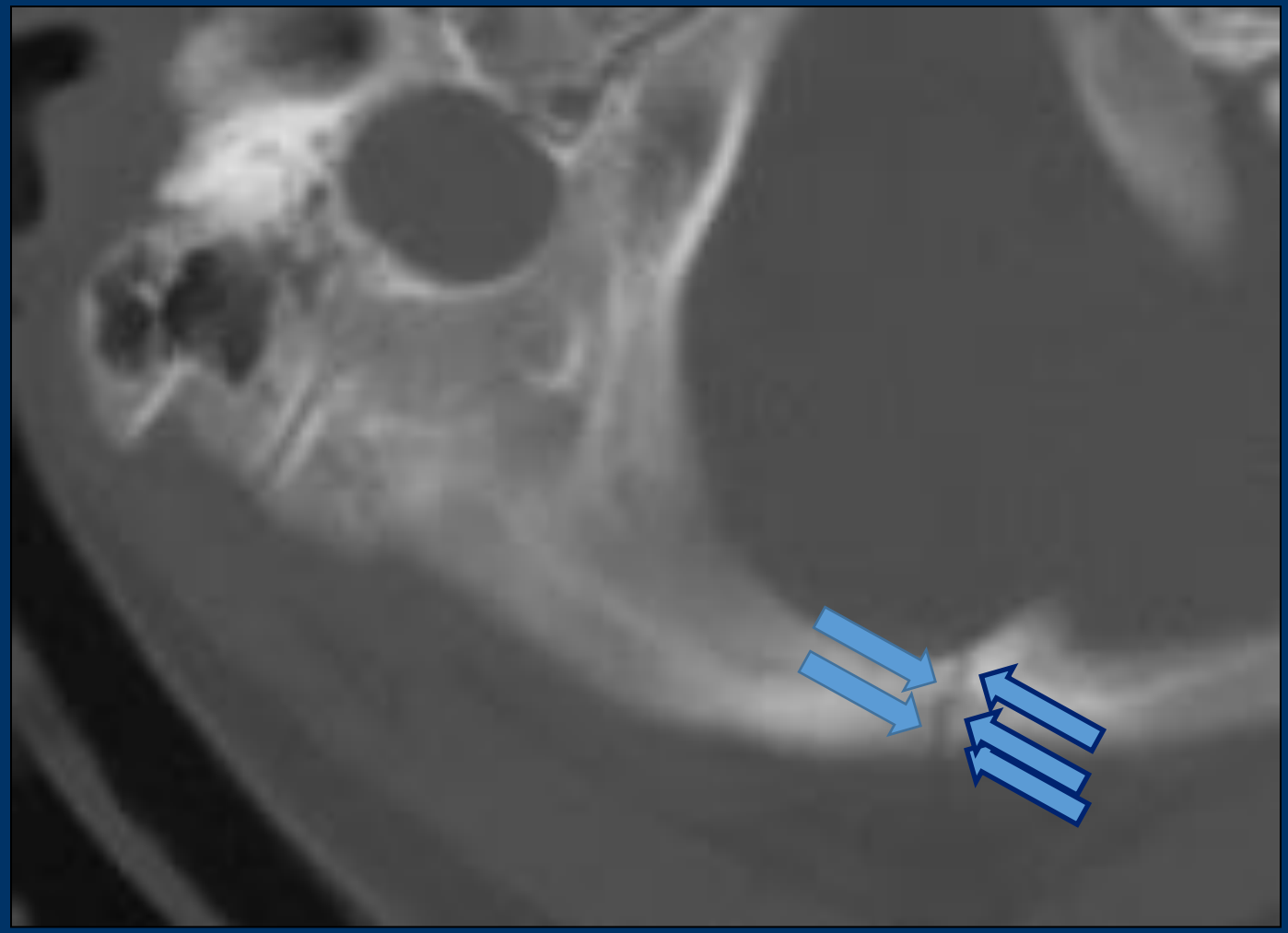
Structure	Closure
Posterior fontanelle	by 3 mo
Sphenoidal fontanelle	by 6 mo
Metopic suture	by 3-9 mo
Mastoid fontanelle	by 6-18 mo
Anterior fontanelle	by 1-3 yrs
Posterior intraoccipital suture	by 1-3 yrs
Coronal, lambdoid and sagittal sutures	by teenage years

Skull Fractures

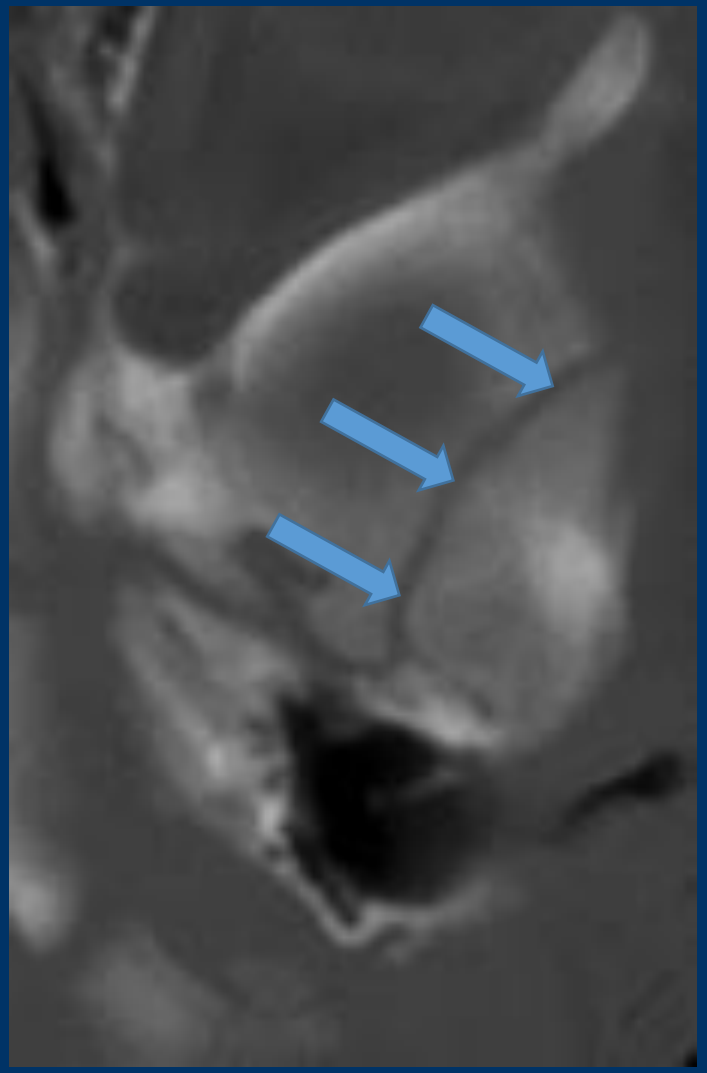
Corticated right mastoid-occipital suture



Non-corticated right occiptal fracture



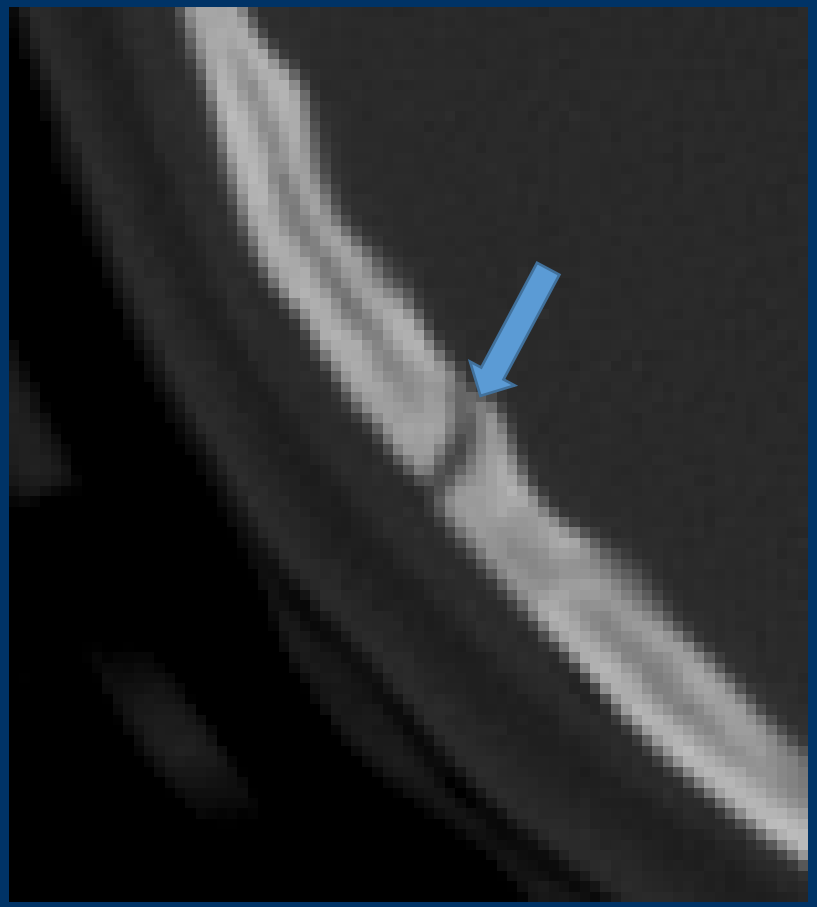
Immature suture, not corticated



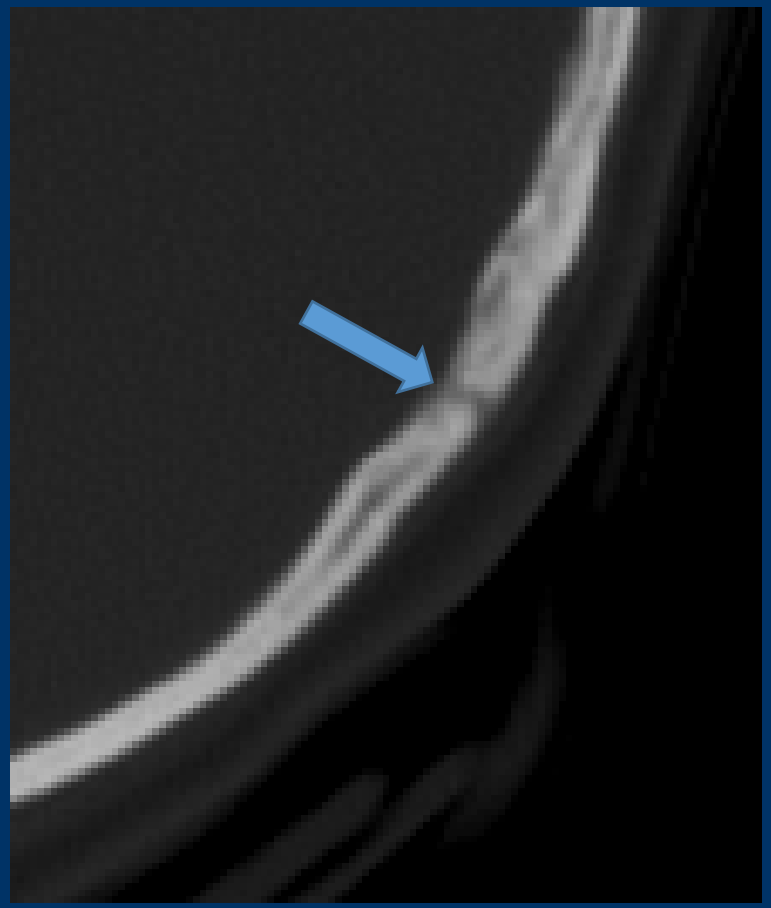
17 day old girl
Left sphenotemporal suture

Suture dehiscence

12 year old boy, lambdoid sutures

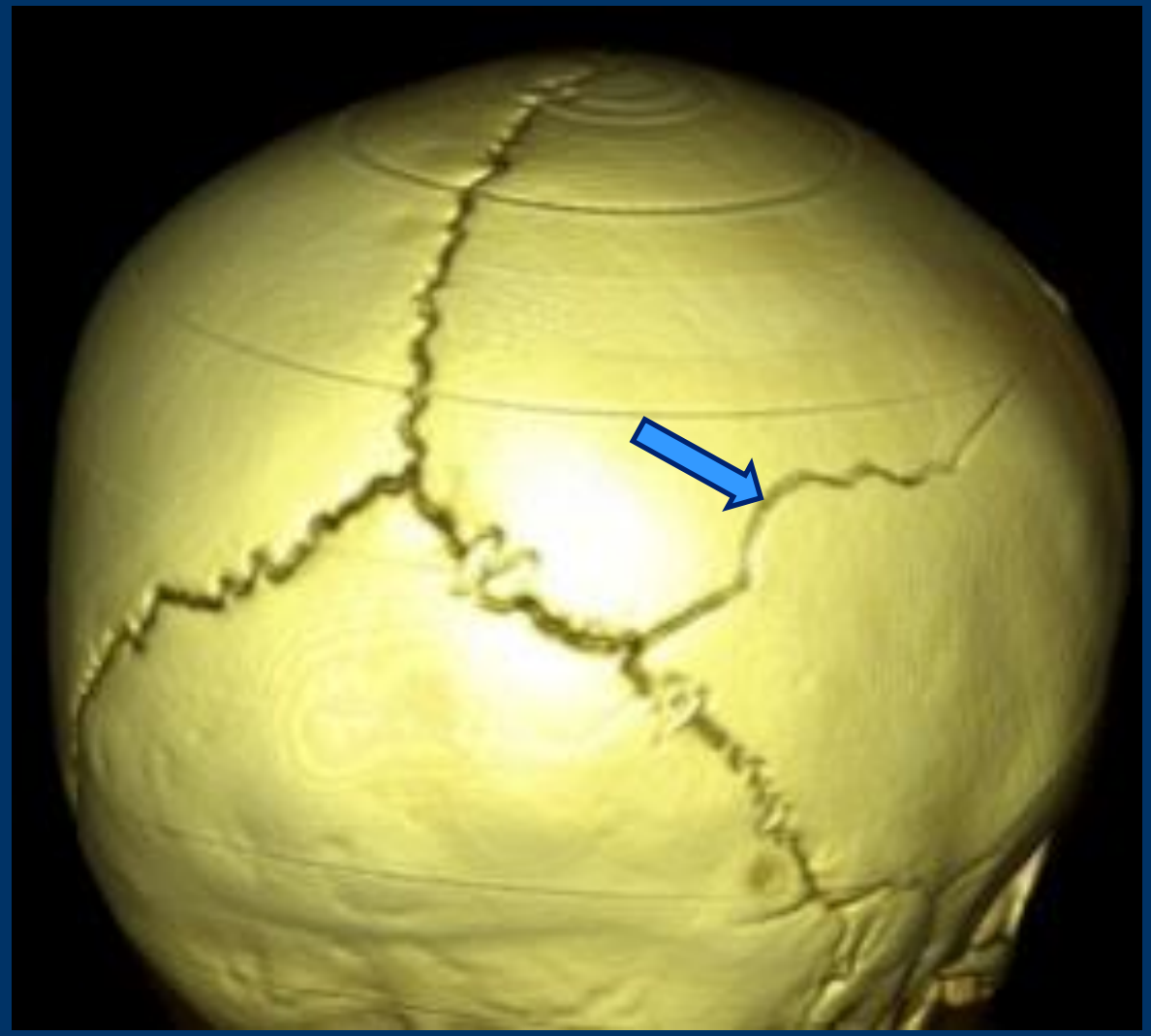


Traumatic dehiscence right



Normal left

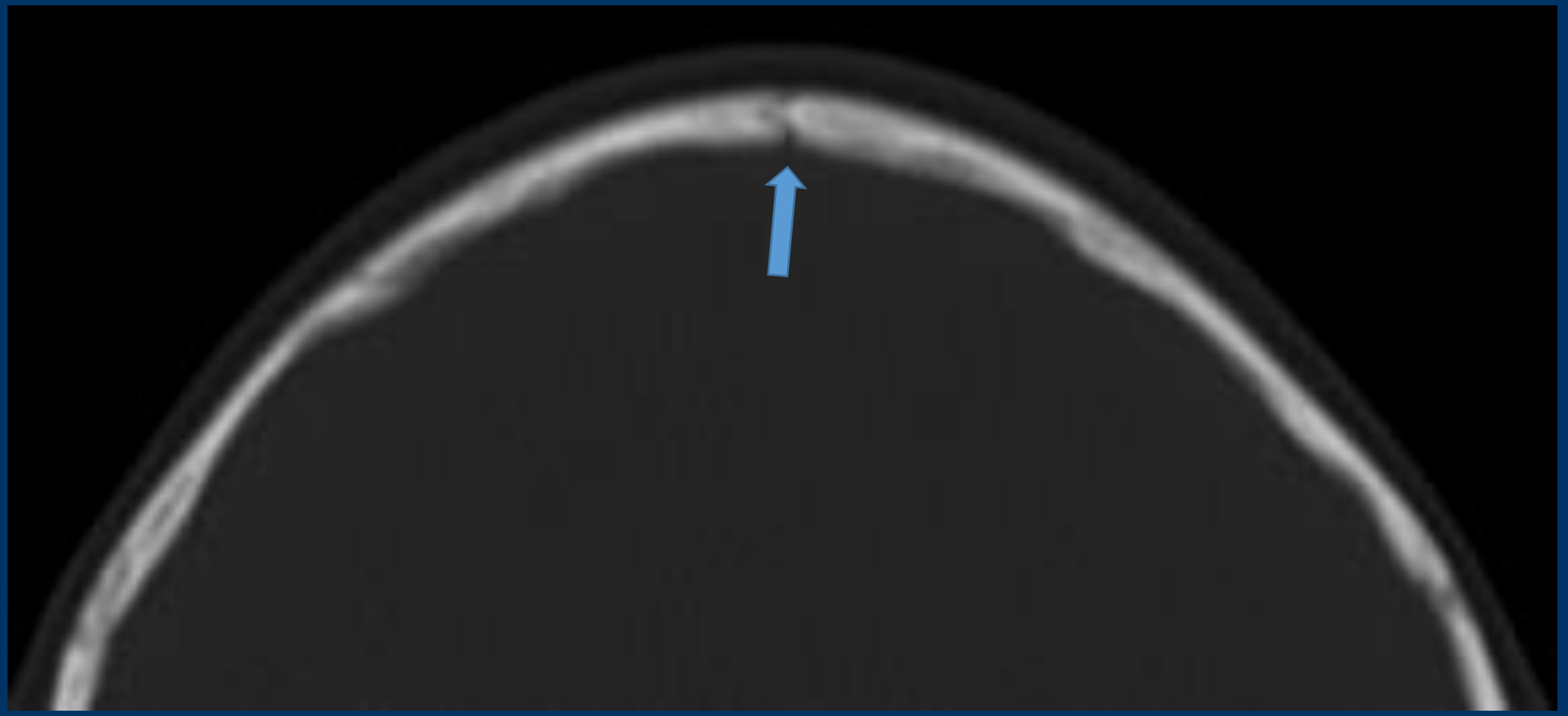
Right parietal skull fracture



Skull fracture (blue arrow) more linear (but curved course) than sagittal and lambdoid sutures.

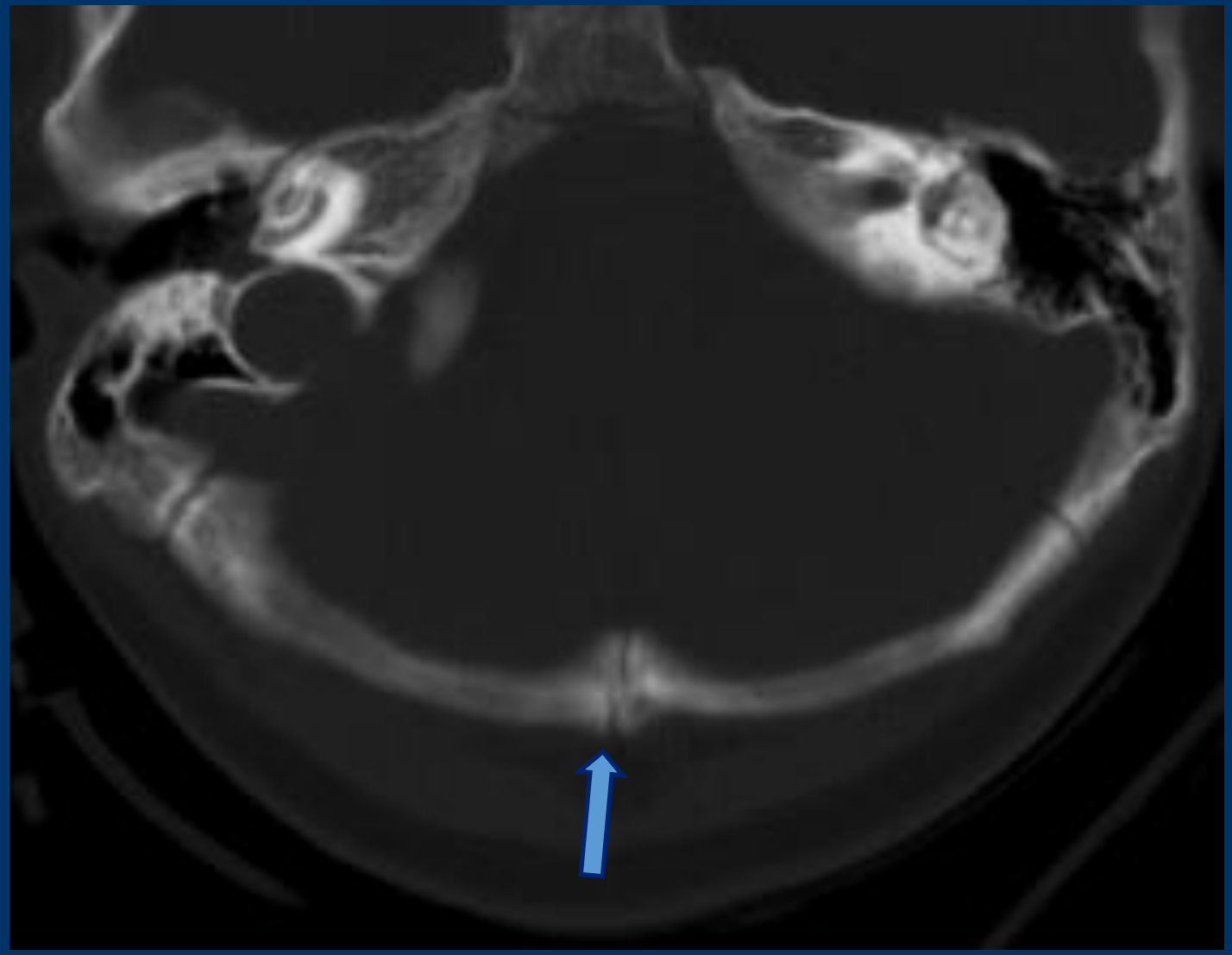
10 month old girl, right parietal fracture

Metopic suture



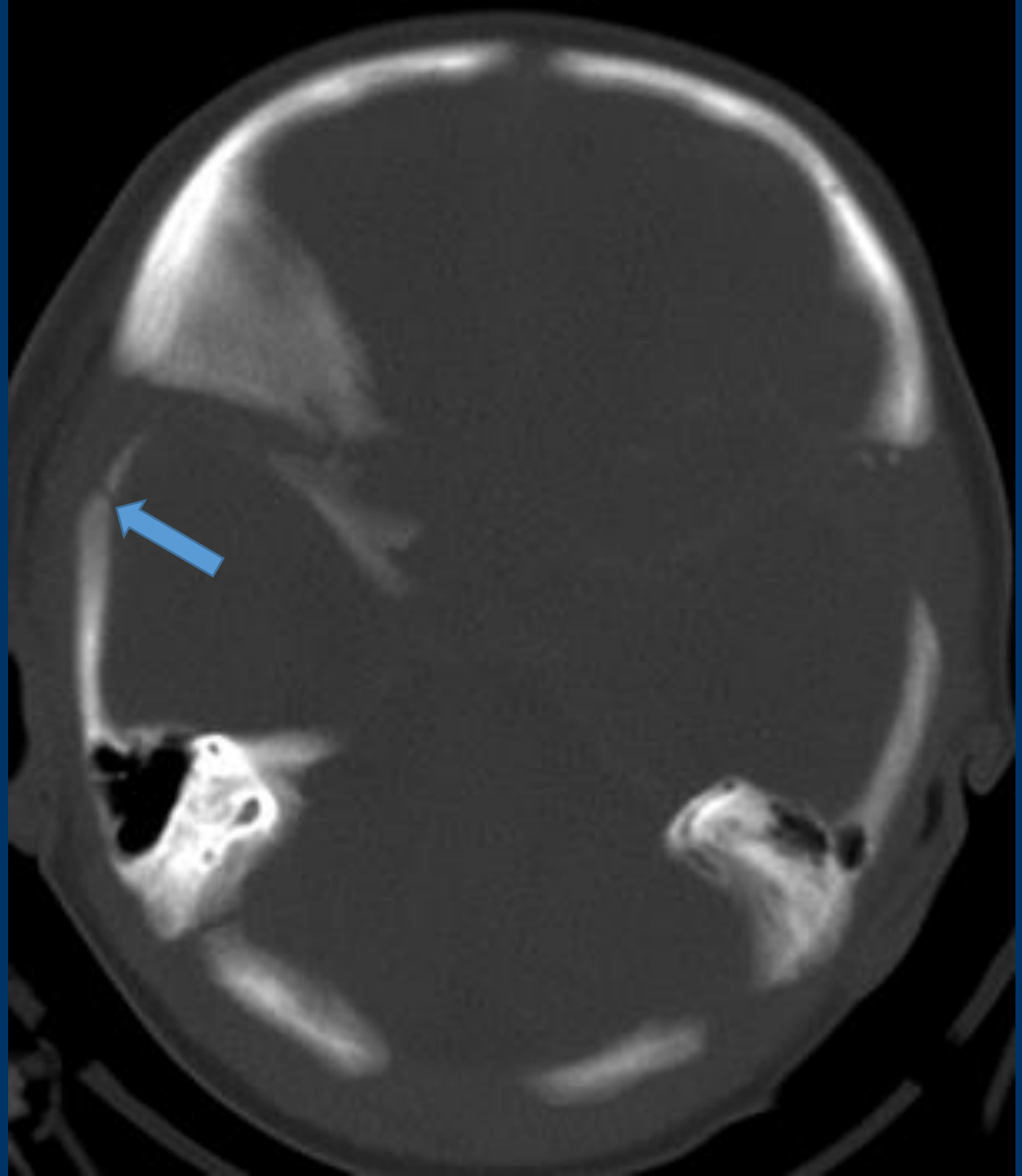
8 year old boy

Midline occipital fracture

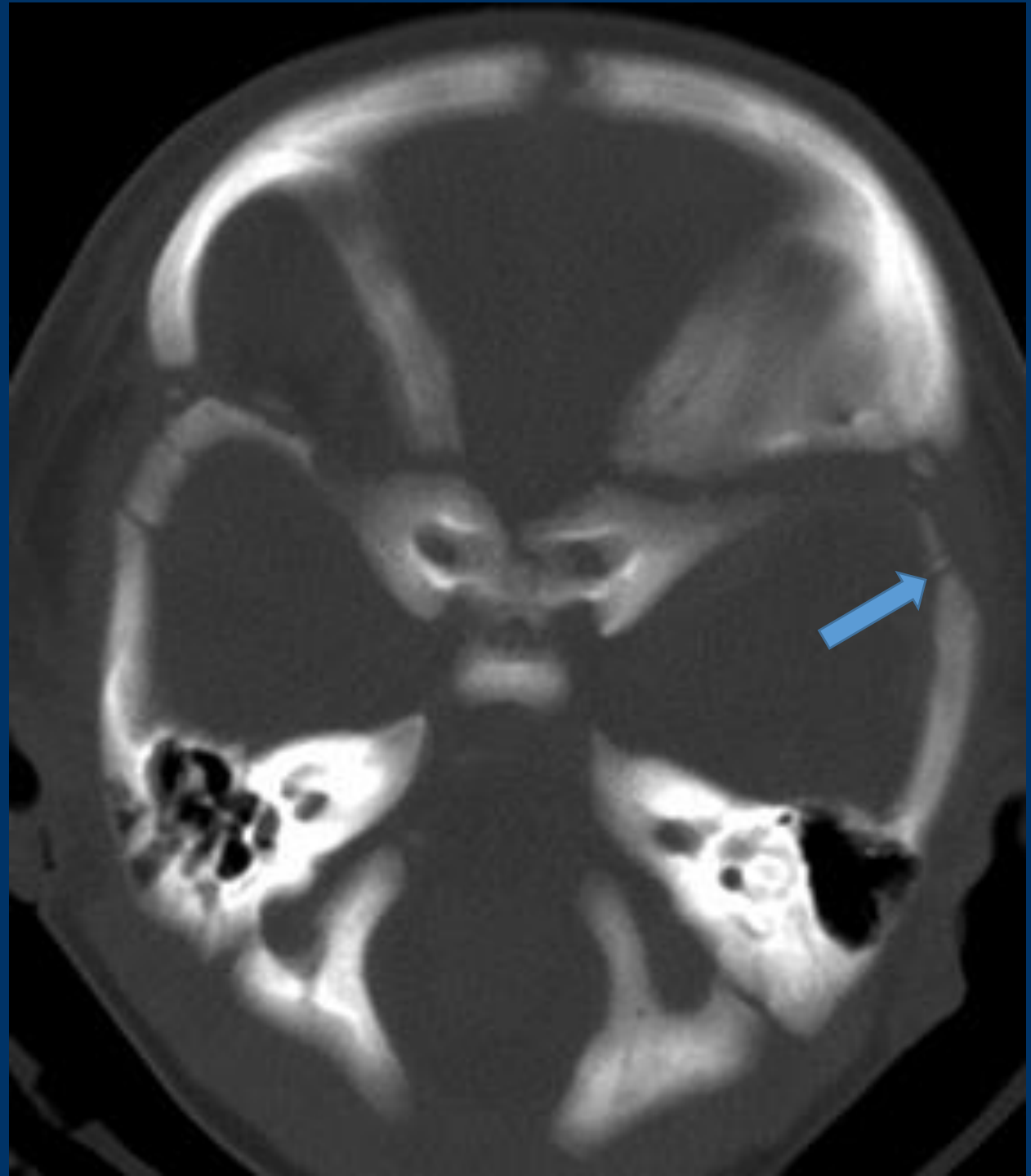


Head tilt

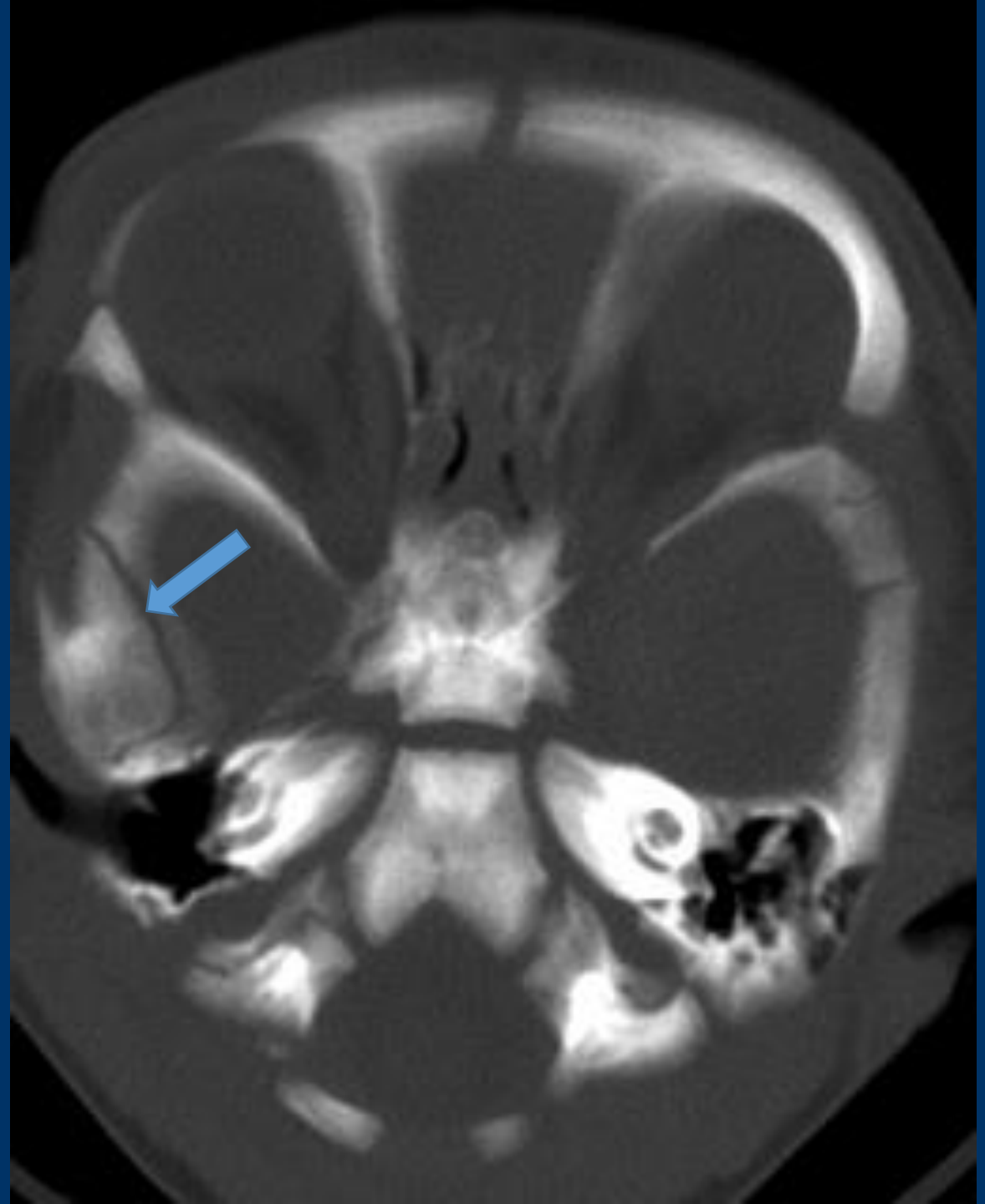
Right temporal fracture?



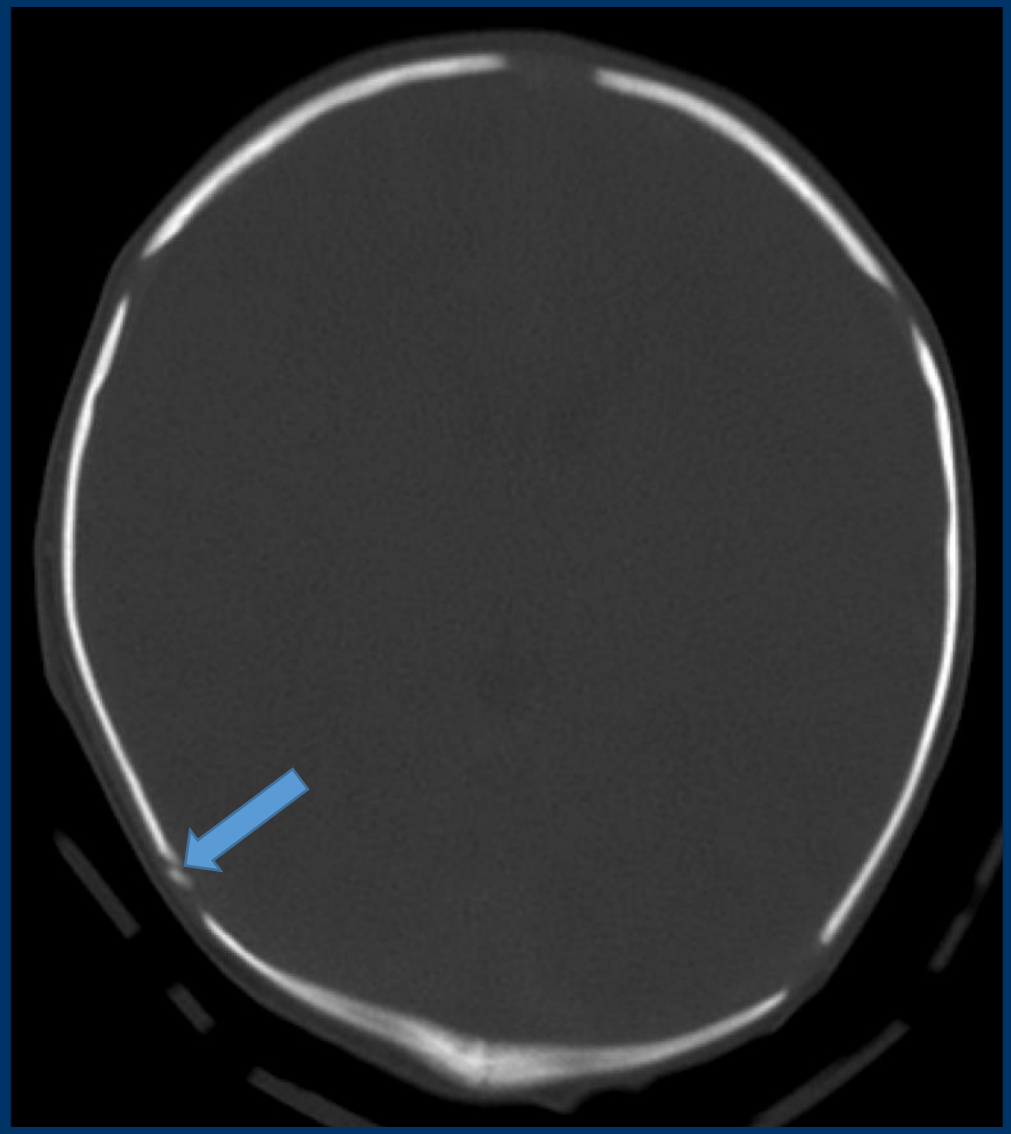
Linear bone lucency is symmetrical considering tilted head.



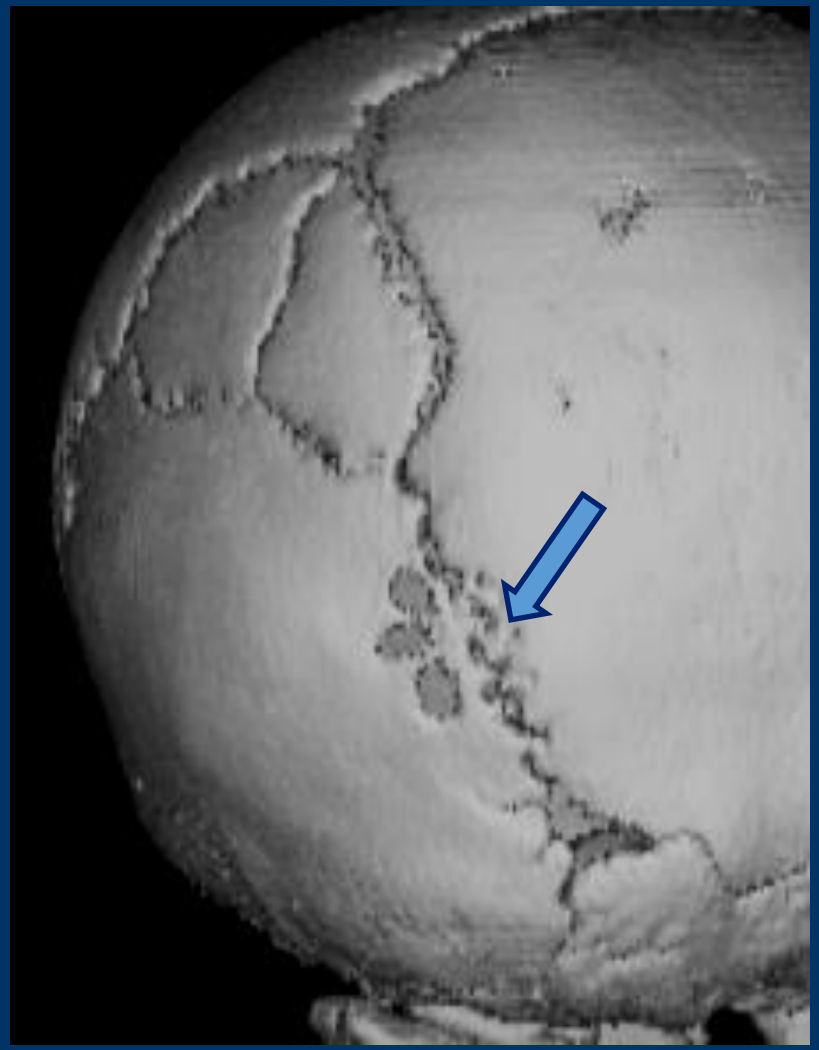
The lucency is part of the sphenotemporal suture.

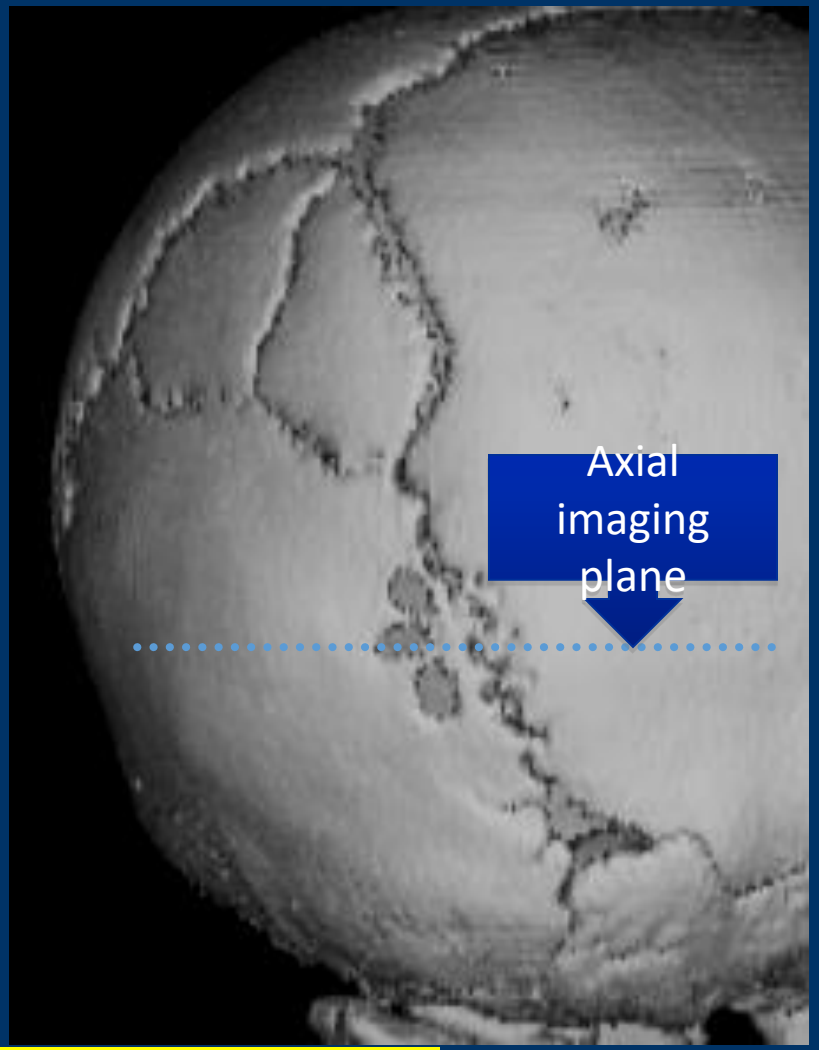


Fracture?

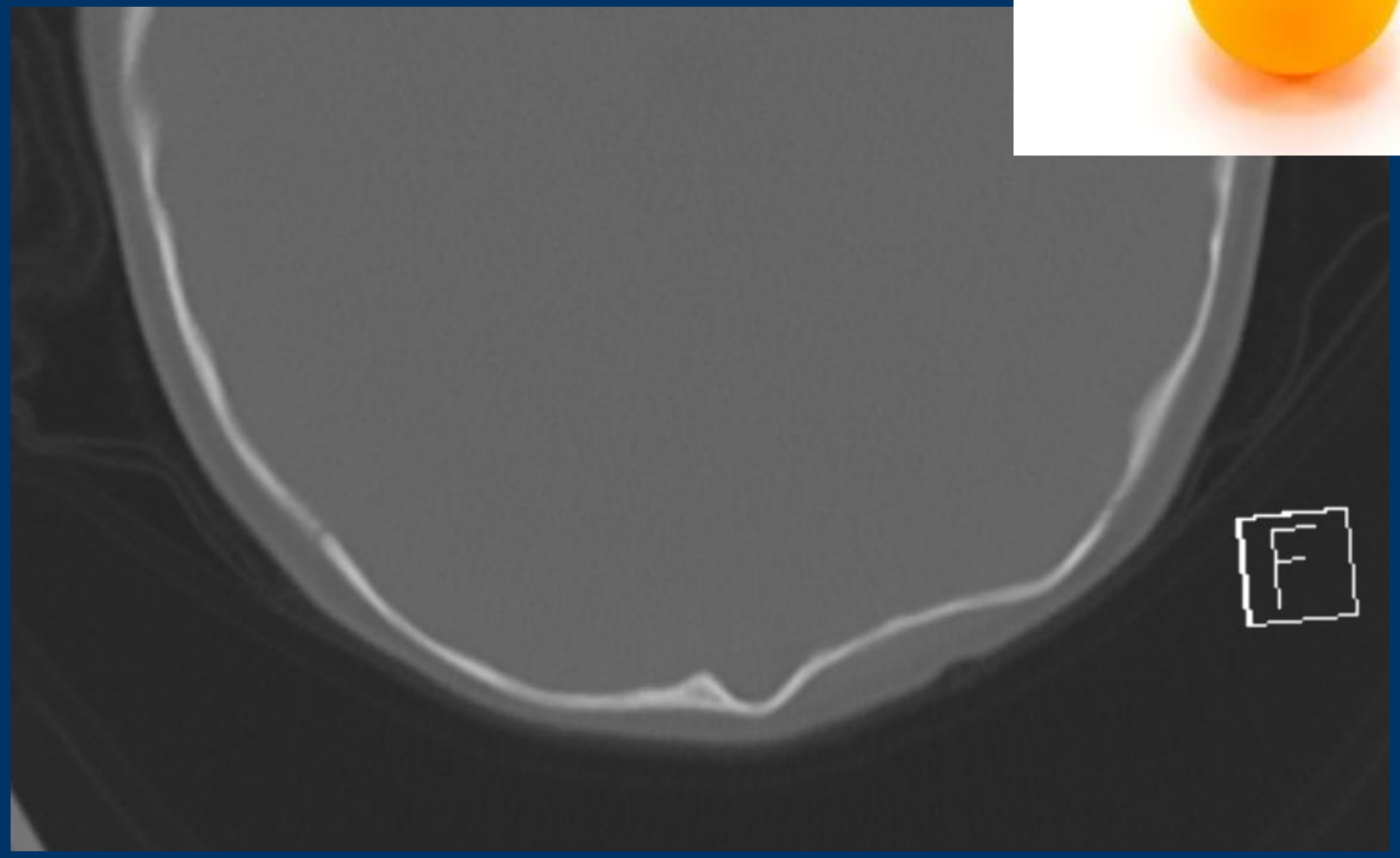


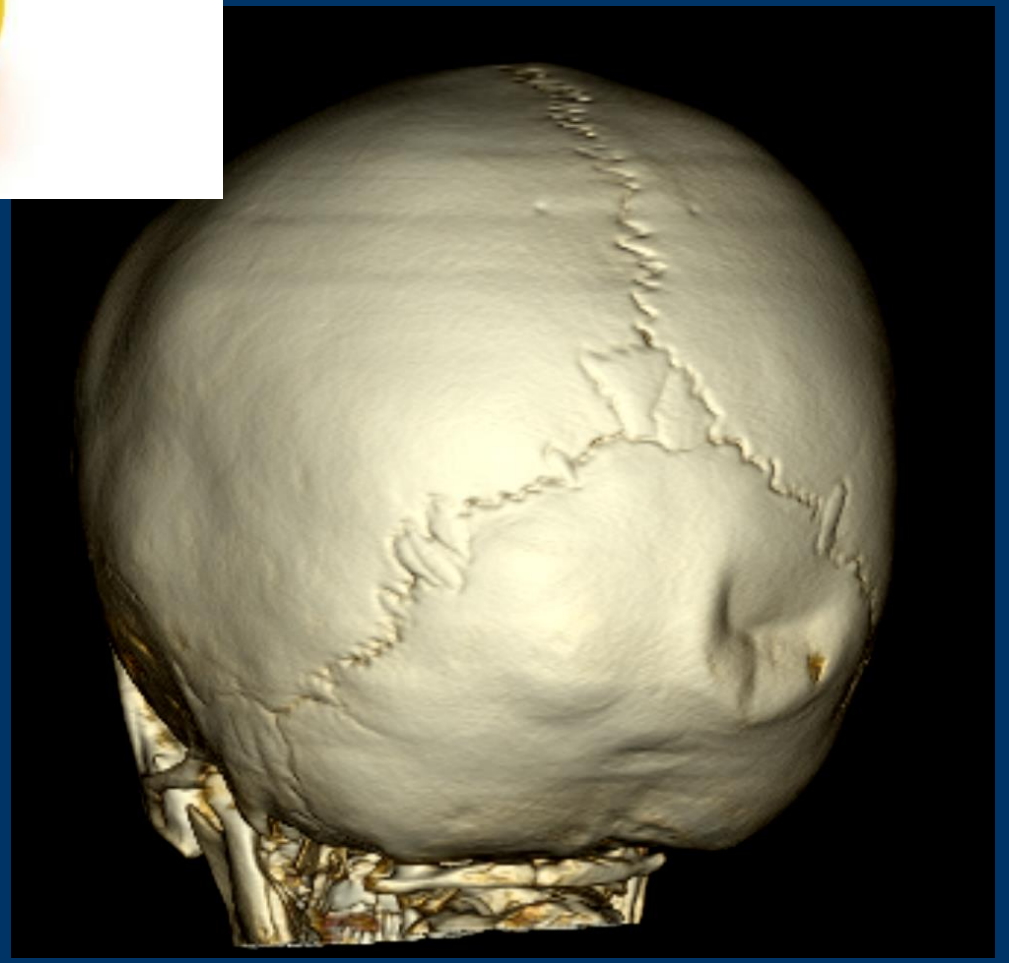
Ongoing sutural maturation





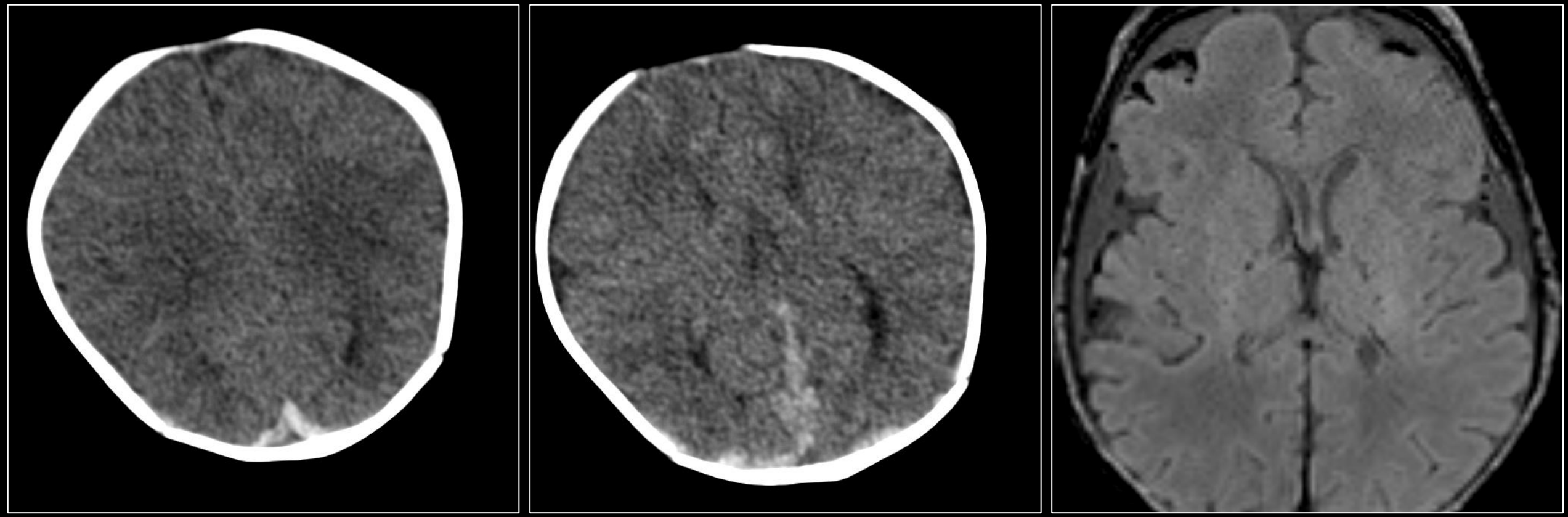
A small bone “finger” (blue arrow)-
can mimic a fracture is axial plane (dotted line)





Birth Trauma

- Small birth-related subdural hematomas are observed in 8–46% of asymptomatic newborn infants
- Resolve in the overwhelming majority of infants within the first 4–6 postnatal weeks
- No evidence to support rebleeding



Subgaleal hematoma vs Cephalhematoma


Thank
you!