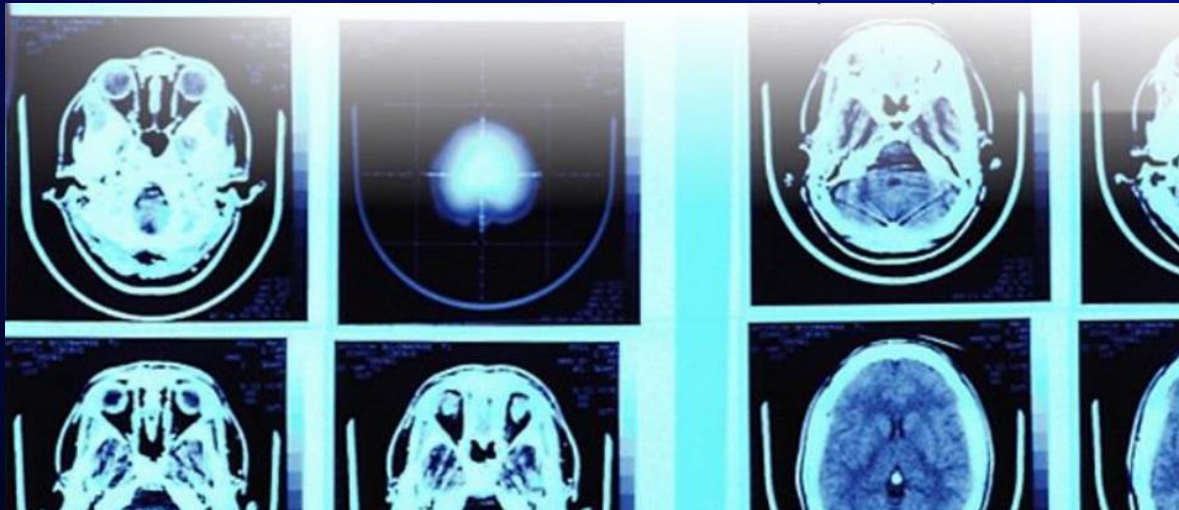


YOU CAN
DO IT!

modified by: Tasnim Alabdulhamed
2021 batch

Introduction to Head CT Imaging



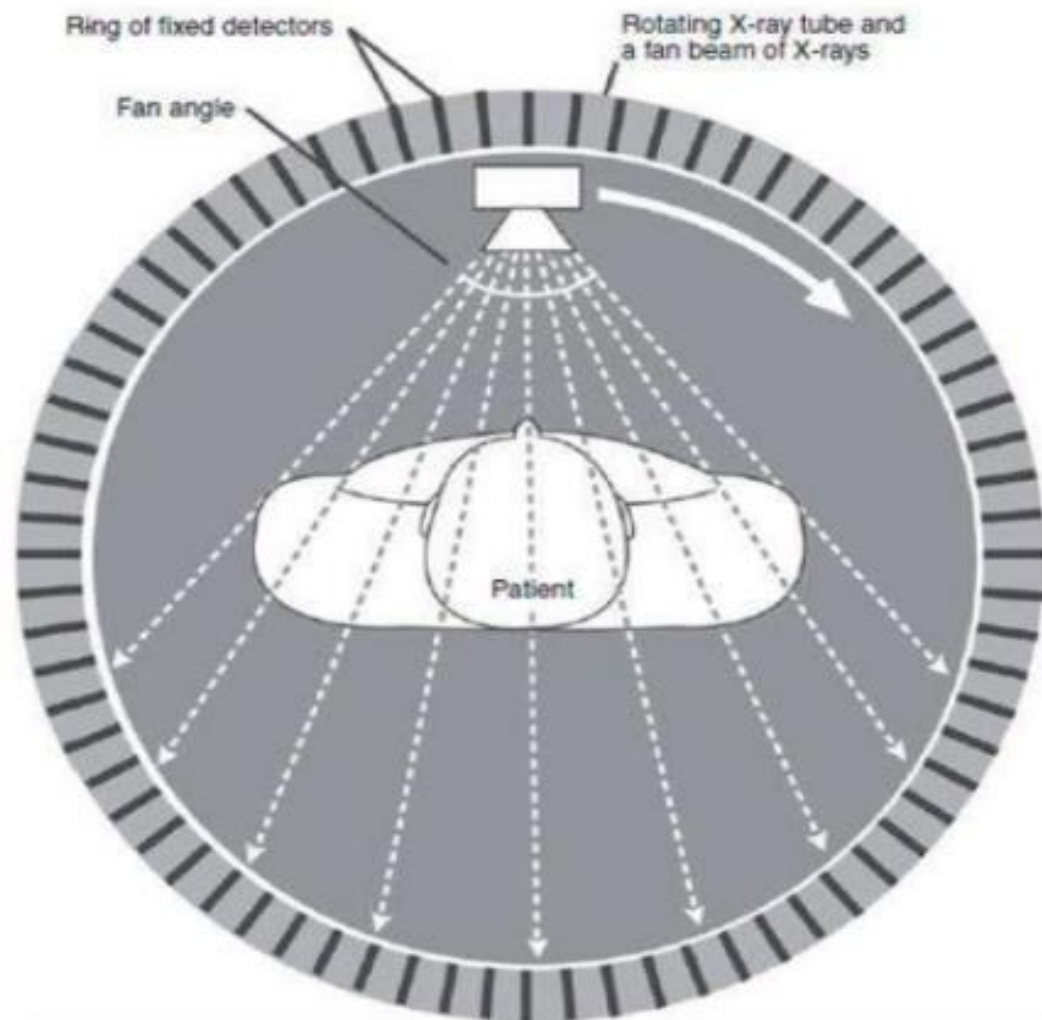
Images in exams will come from the slides

looks like a long journey but it's simple & 90% of images are repeated



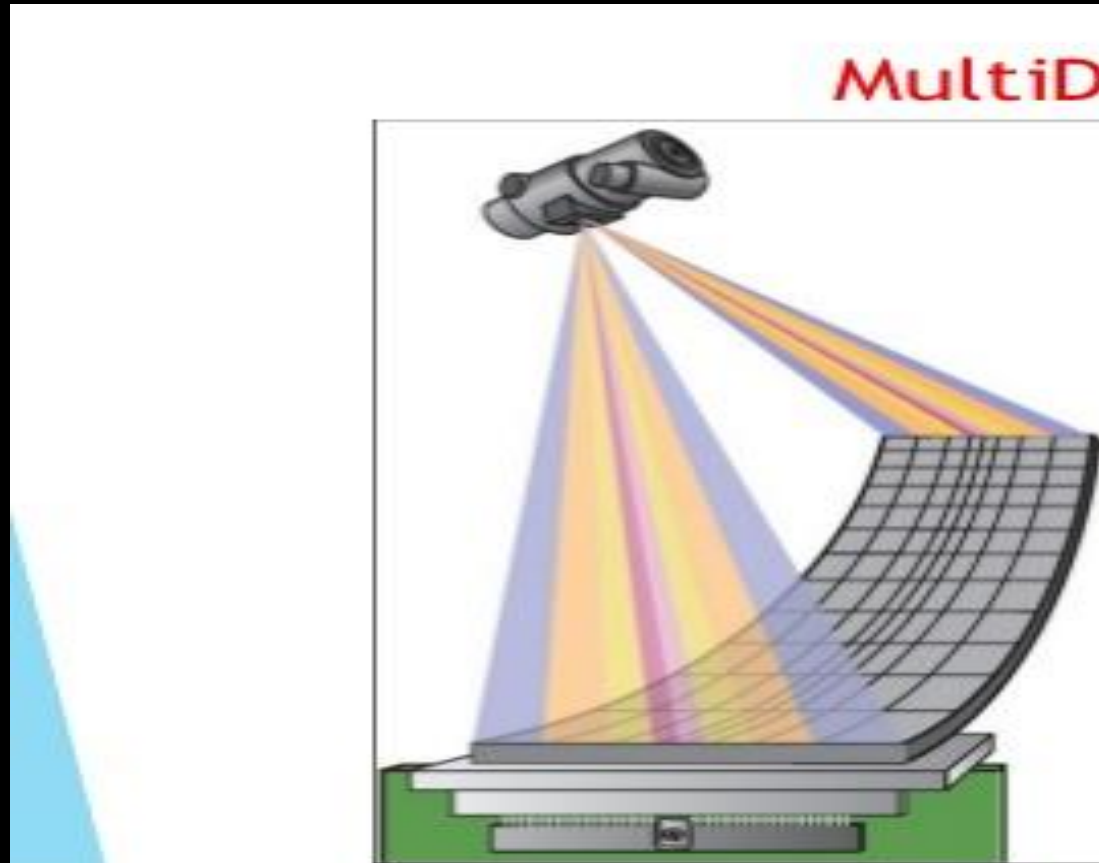
table
movable ←

→ gantry



Multidetector CT scan

more than one detector, the more the better

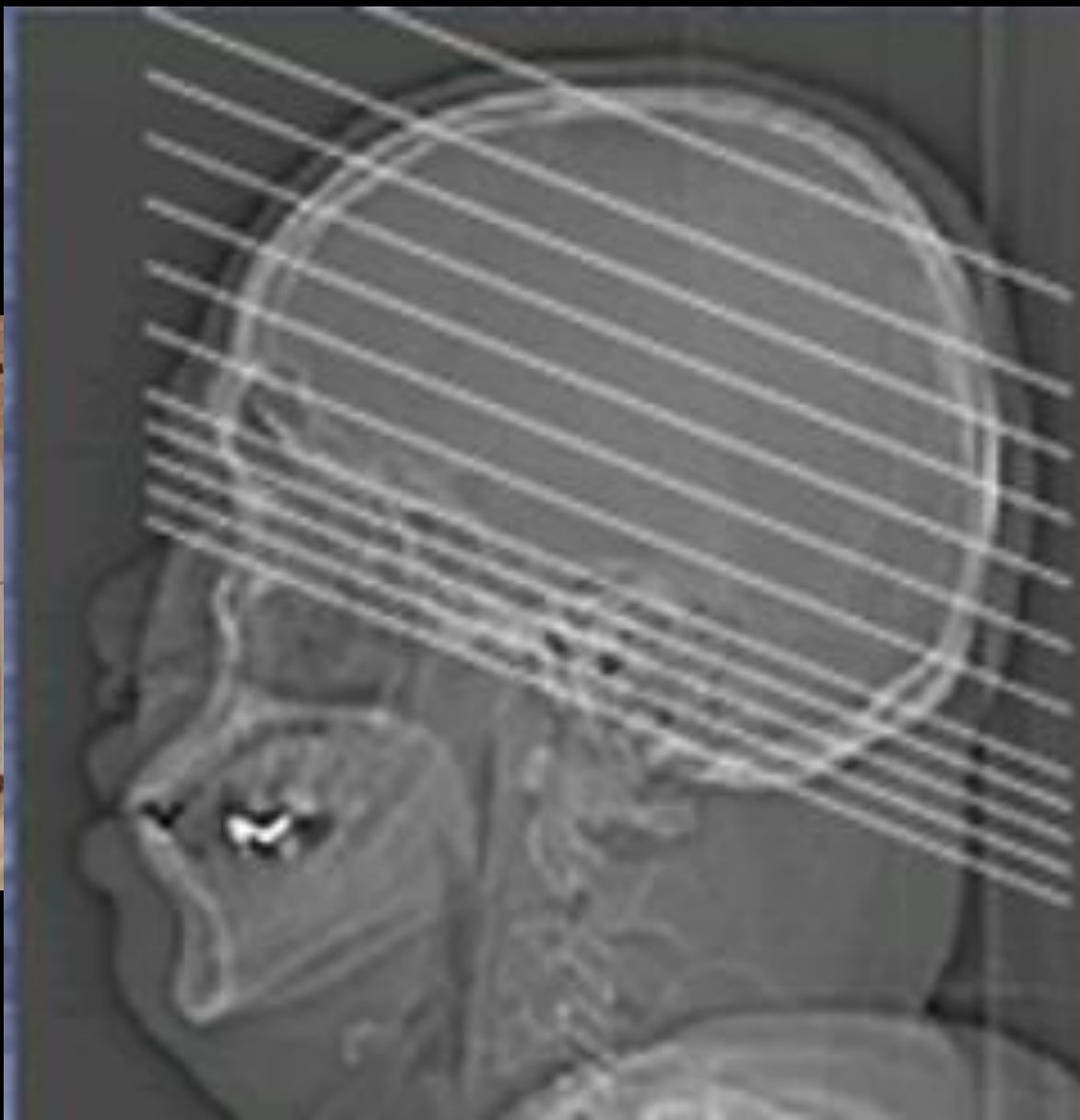




Injector

cannula size must be appropriate with amount of contrast injected or the vein will rupture

↓
compartment Syndrome



GHASSAN AHMAD ADI

559491

*06-Aug-1995, M, 19Y

06-Aug-2014

17:33:53.43

1 IMA 1

TOP 1

SP 373.5

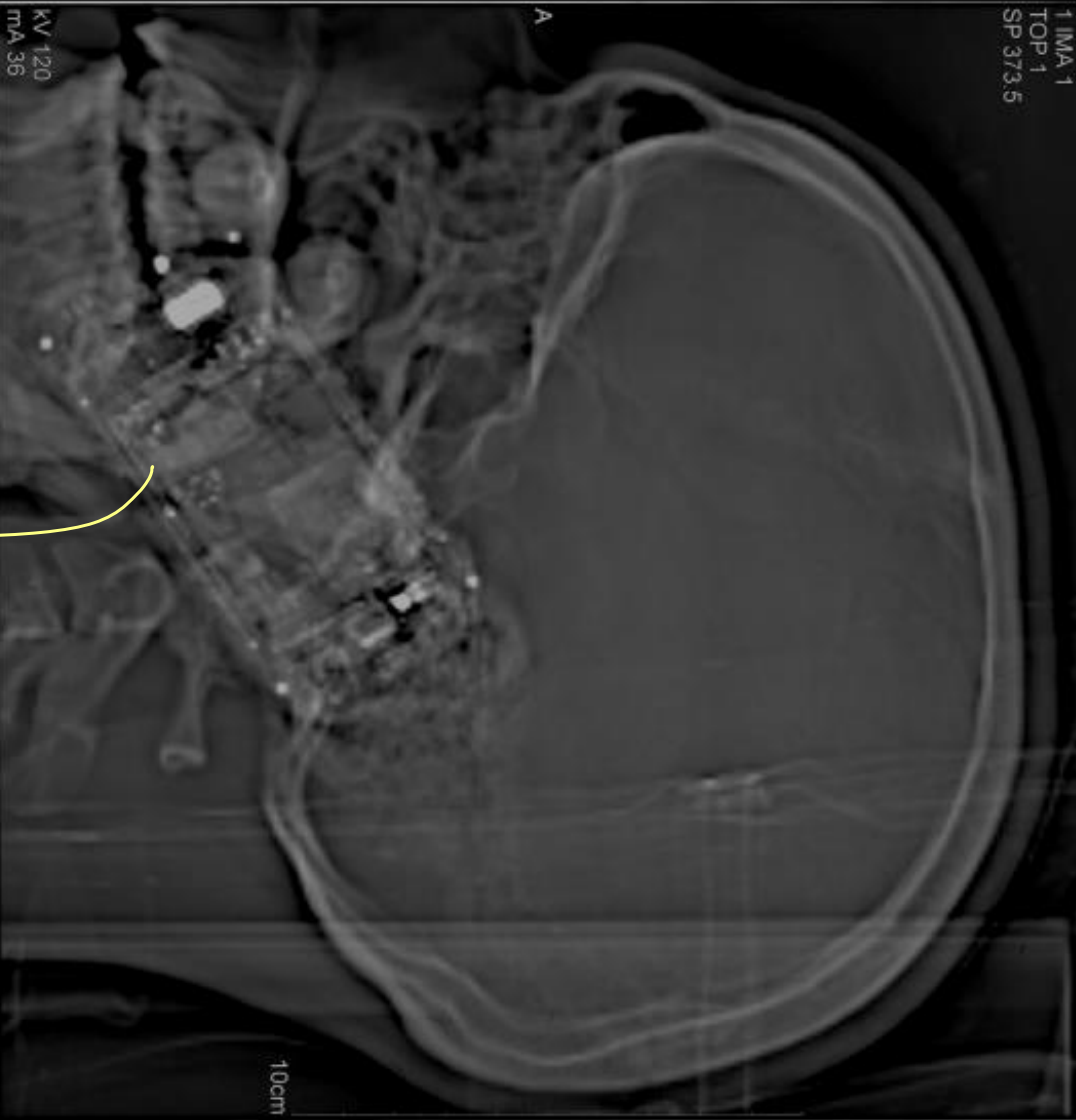
H

JORDAN UNIVERSITY HOSPITAL

Definition

CT 2008G

H-SP



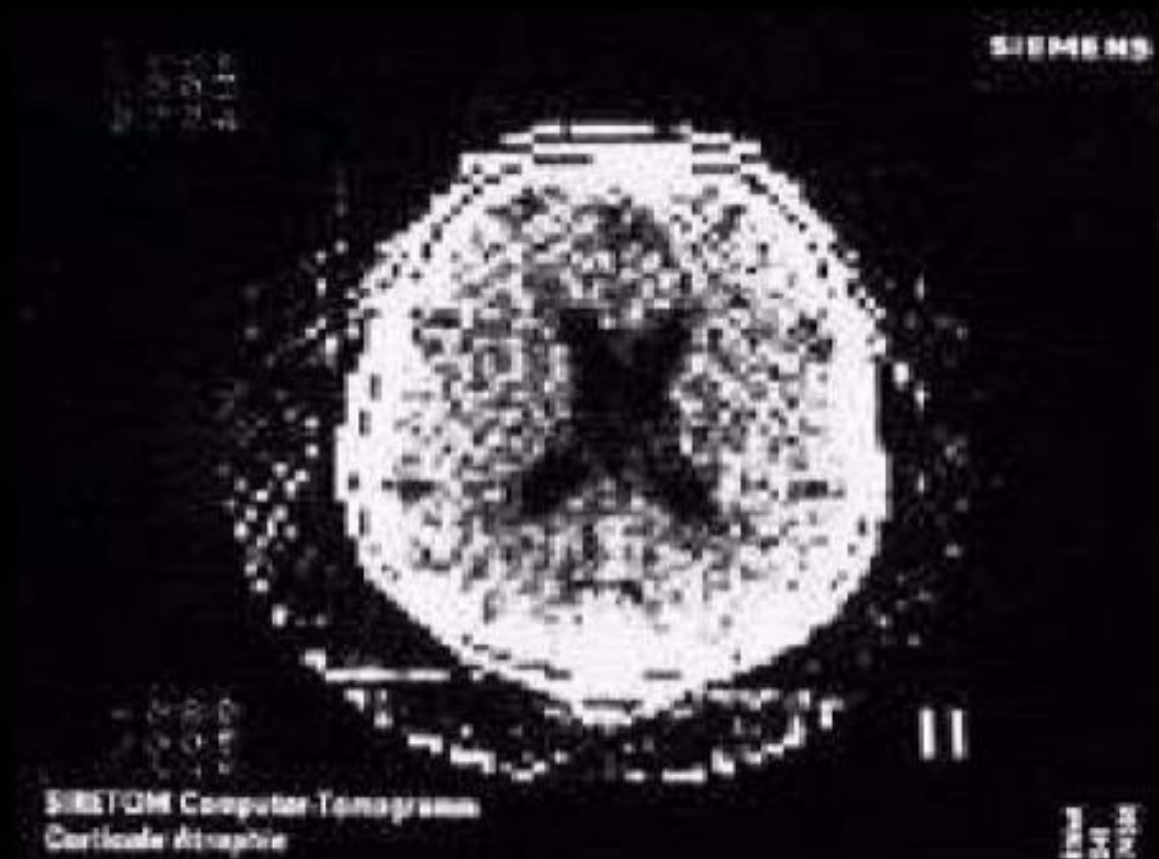
10cm

kV 120
mAs 36
TI 2.7
GT 0.0
SL 0.6
512 0/0
T20s S32P0 1a a

W 392
C 69

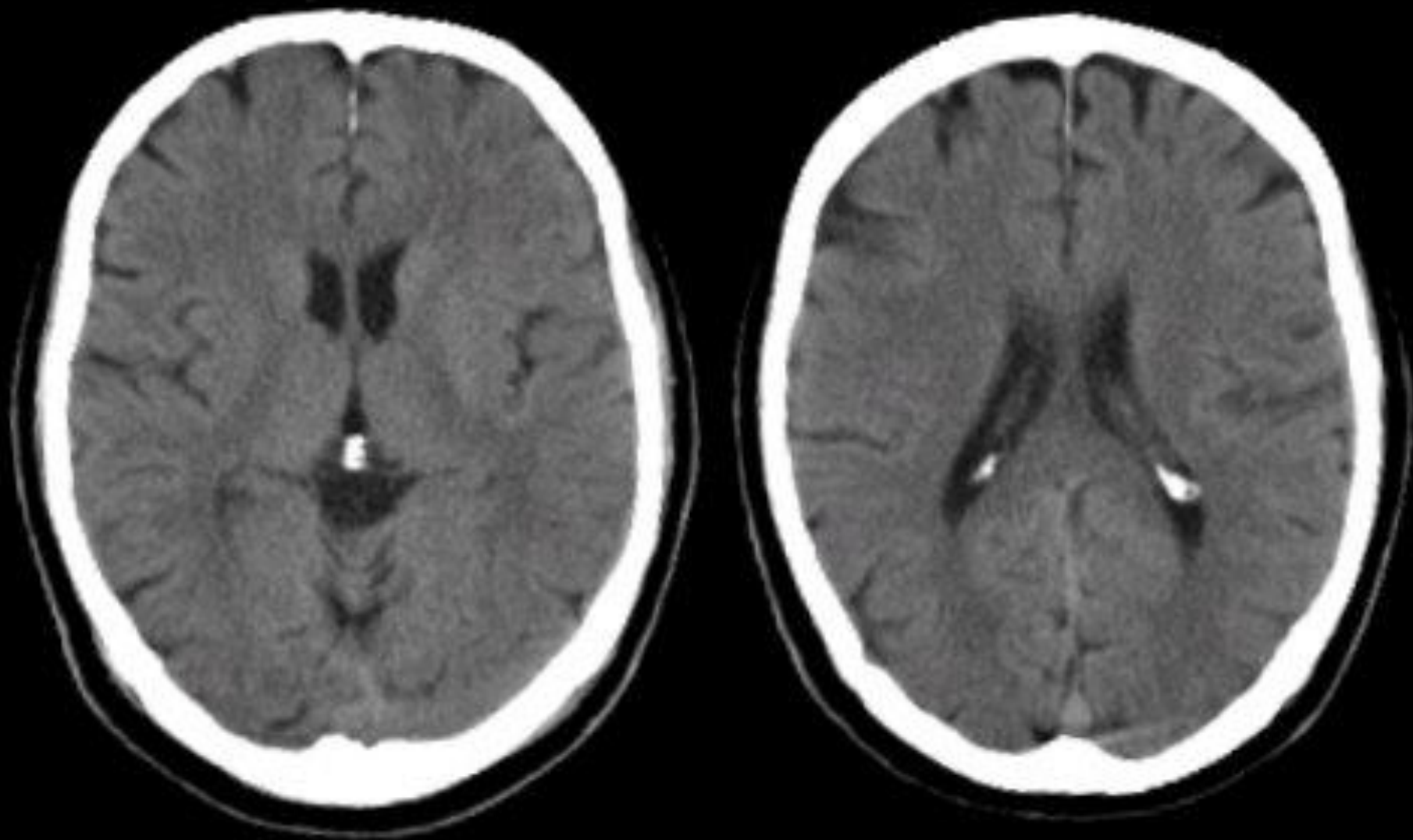
phone ←

1st CT image
in life



Original axial CT image from the dedicated Siretom CT scanner circa 1975. This image is a coarse 128 x 128 matrix

High resolution brain CT



CT vs. MRI

	CT	MRI
Obtained	X-ray beam	Magnetic fld
Bone	Bright	Dark
Cost	\$330	\$900
Plane	Axial	3-D
Technique	Adjust window	T1, T2, Pd
Length	10-20 minutes	30-60 min
Opening	Wide doughnut hazardous on health → using x-ray better in trauma pts	Long, narrow

Advantages to CT

- Costs less than MRI
- Better access
- Shows up acute bleed
- A good quick screen
- Good visualization of bony structures and calcified lesions

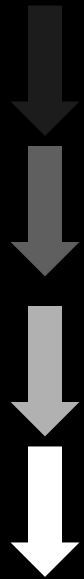
Disadvantages to CT

- Resolution
- ★ • Beam-hardening artifact
- Limited views of the posterior fossa and poor visualization of white-matter disease

Poor visualization < $\begin{matrix} \text{post. fossa} \\ \text{white matter disease} \end{matrix}$

CT density

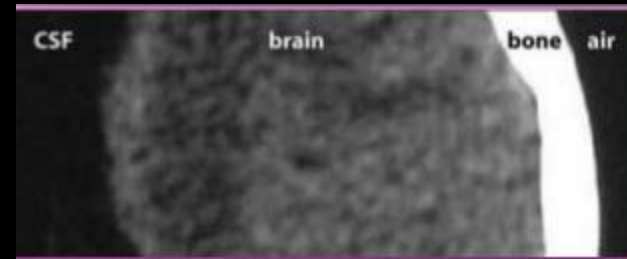
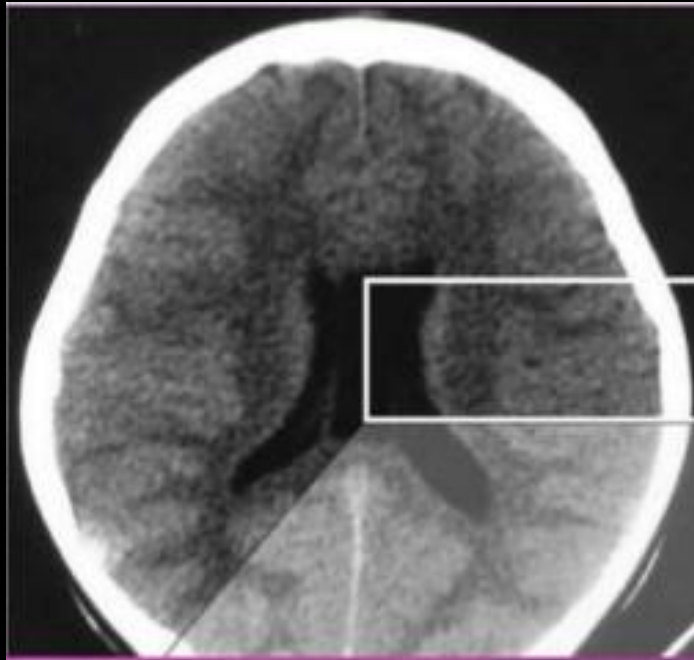
Black



White

Structure/ Tissue	Hounsfield units
Air	-1000 to -600
Fat	-100 to -60
Water	0
CSF	+8 to 18
White matter	+30 to 41
Gray matter	+37 to 41
Acute blood	+50 to 100
Calcification	+140 to 200
Bone	+600 to 2000
metal	+1000-+10000

grey scale



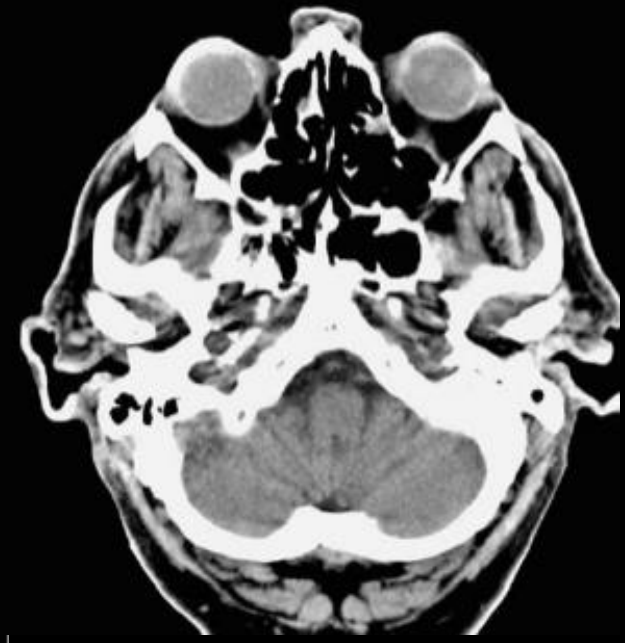
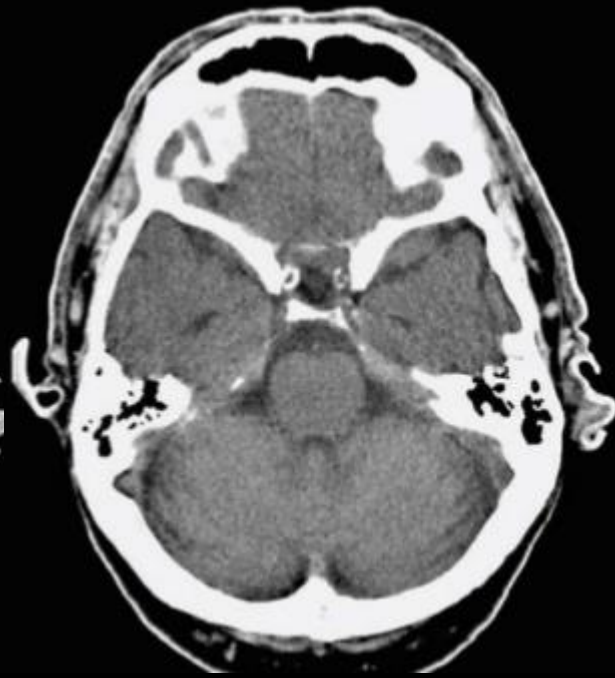
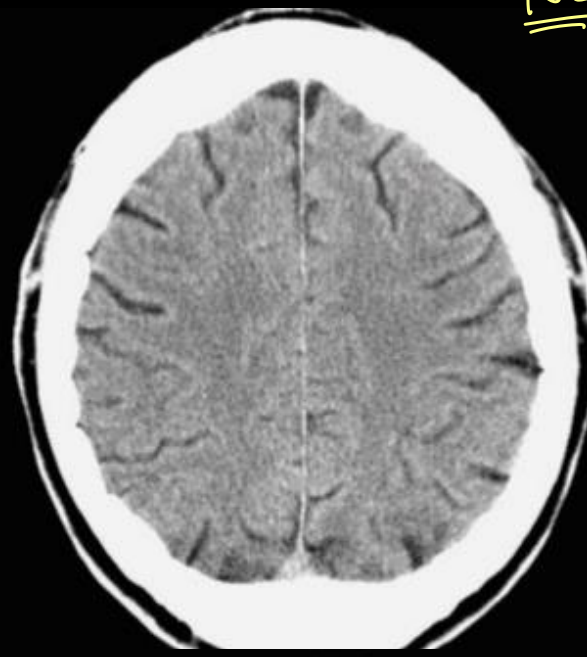
ventricle white matter grey matter

white matter appears darker
grey matter appears brighter

Normal brain CT scan report :

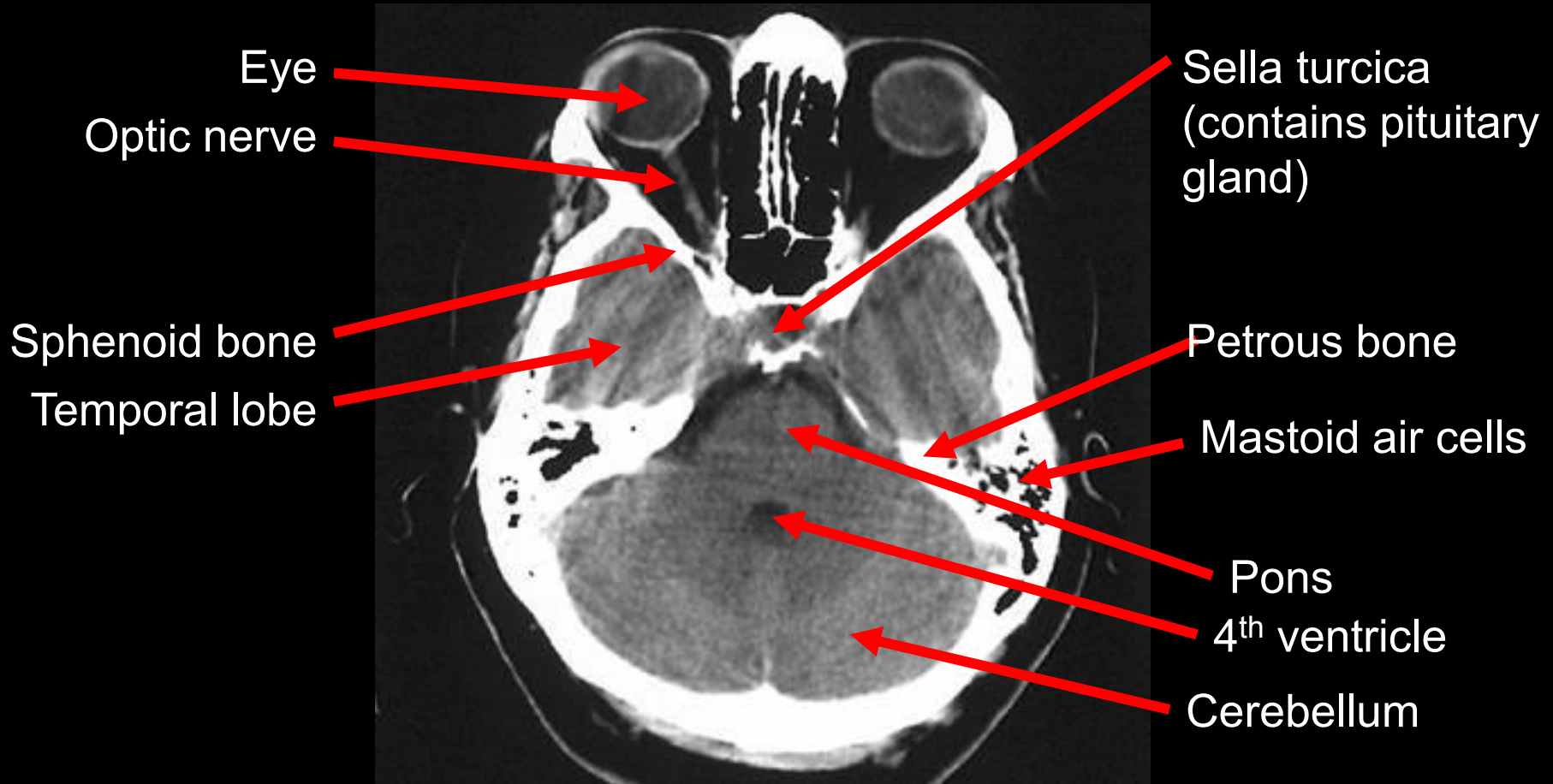
- 1 No brain focal lesion
- 2 No midline shift
- 3 No hydrocephalus

211



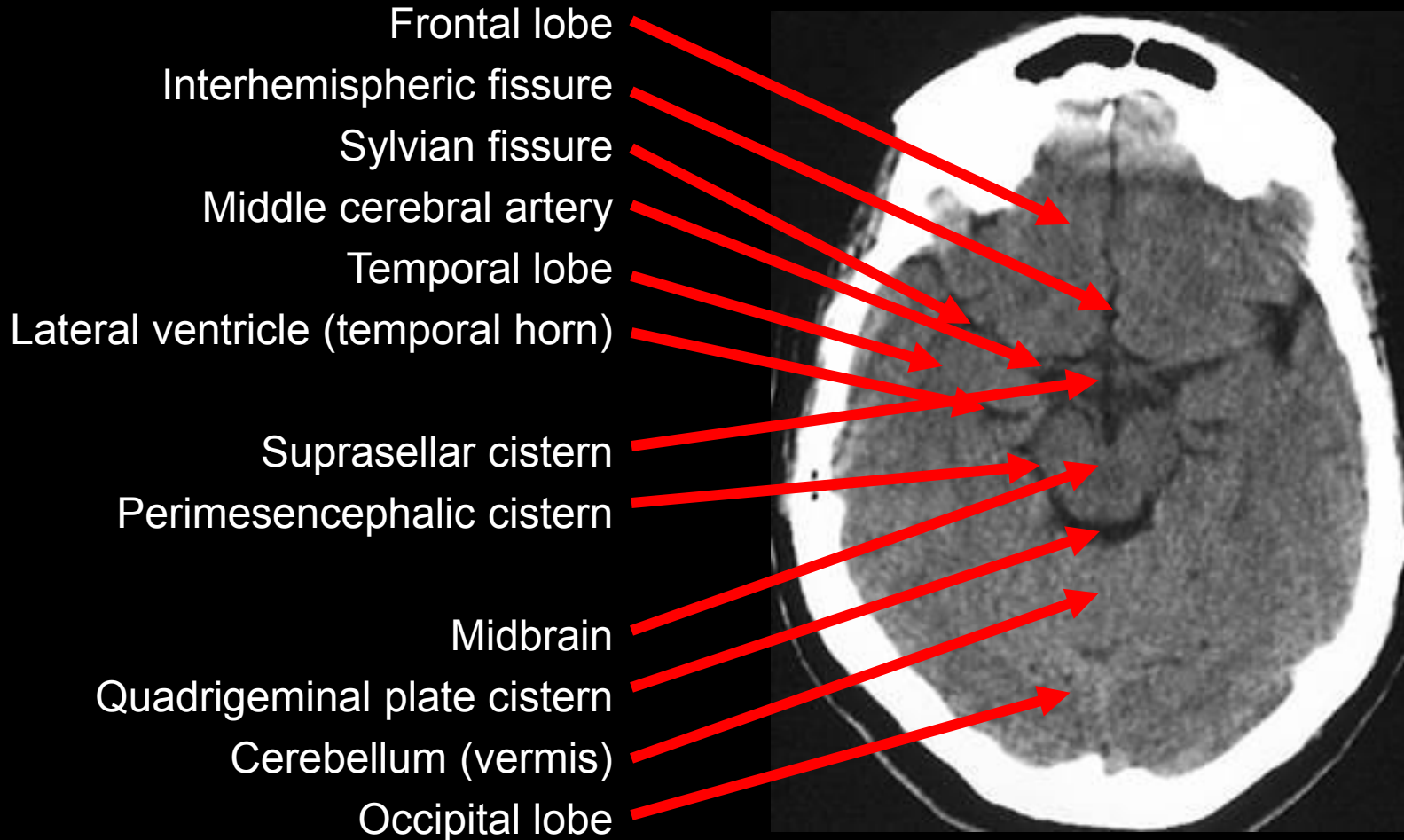
Normal Brain anatomy

not required



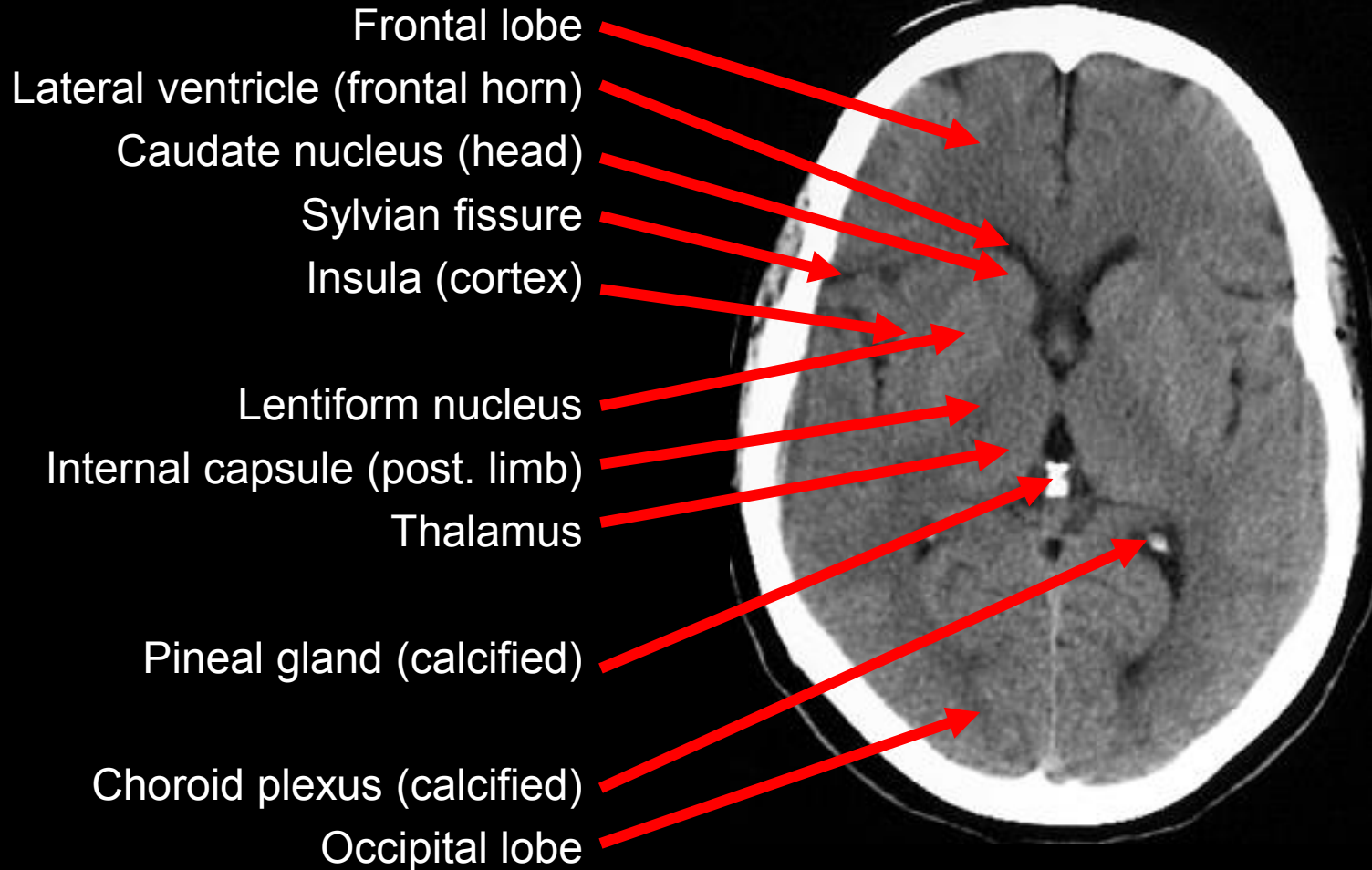
Normal Brain Anatomy

not required



not required

Normal Brain Anatomy

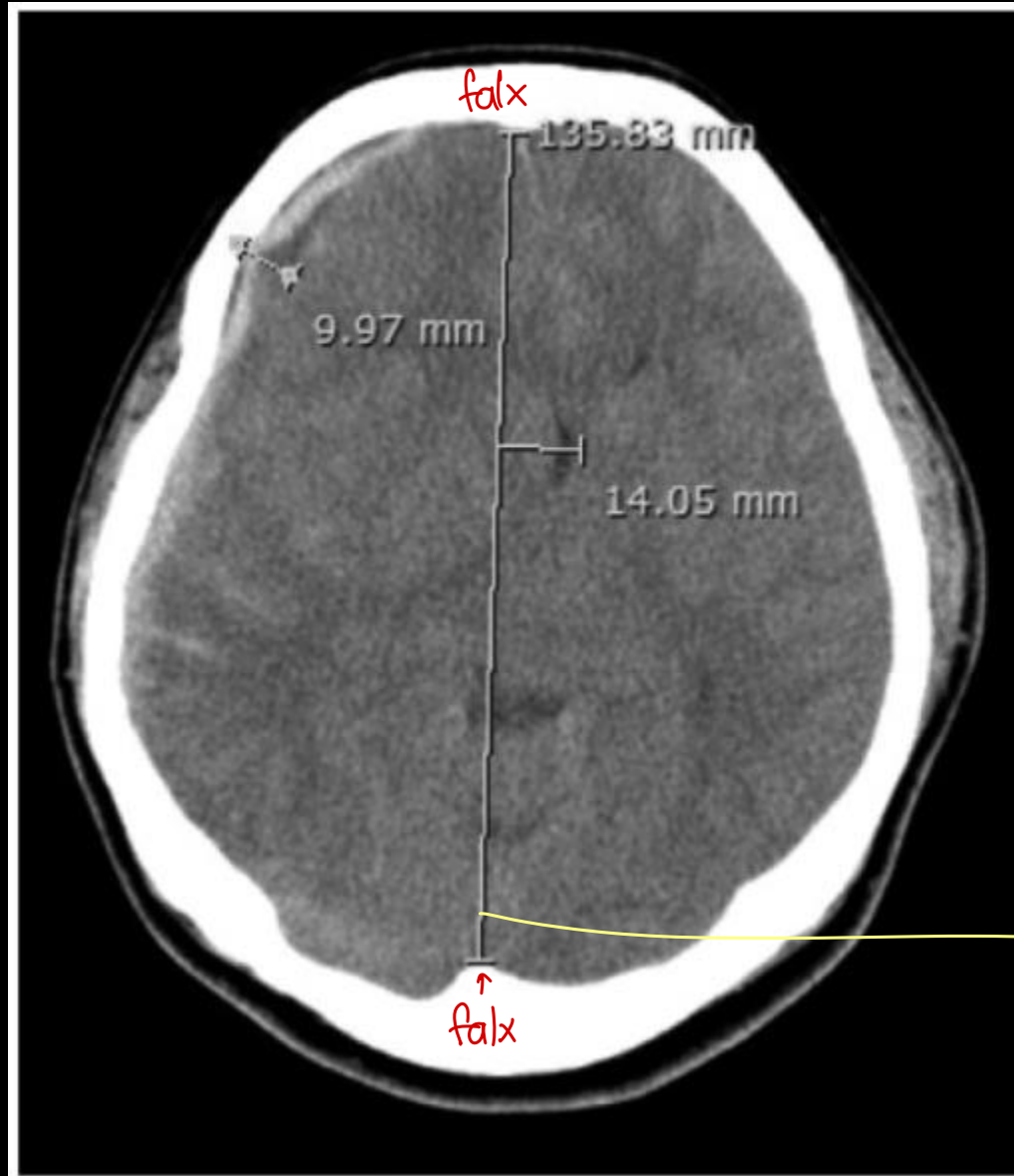


Brain Radiology Report

Look for:

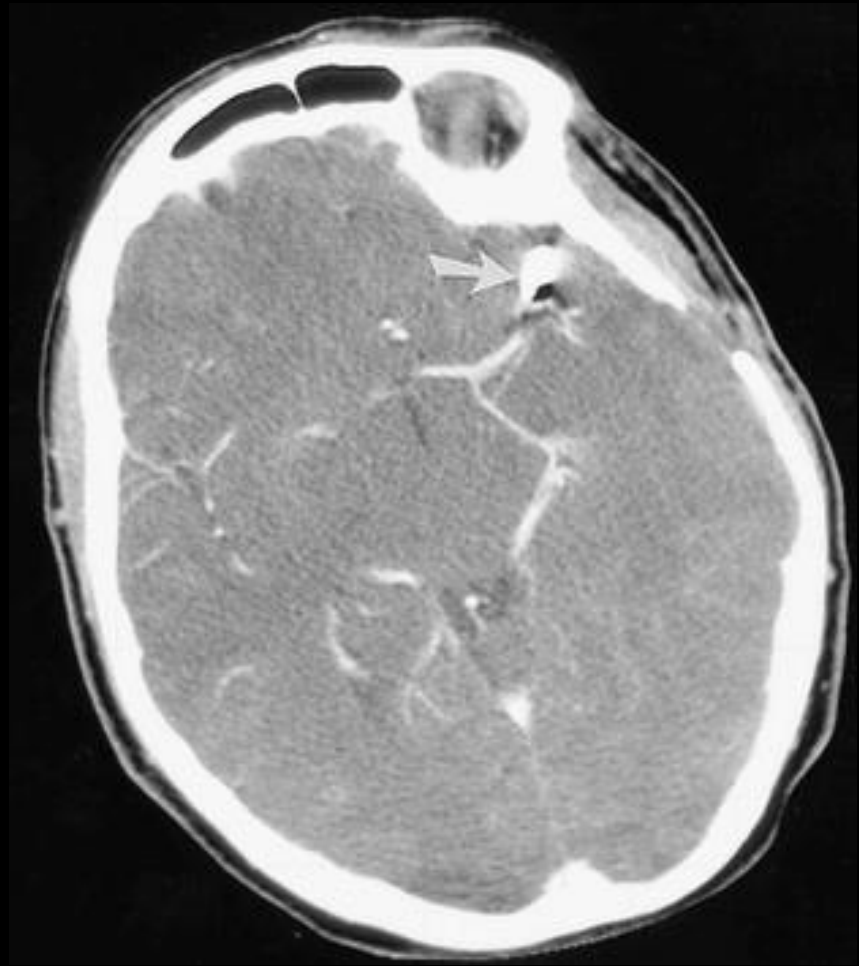
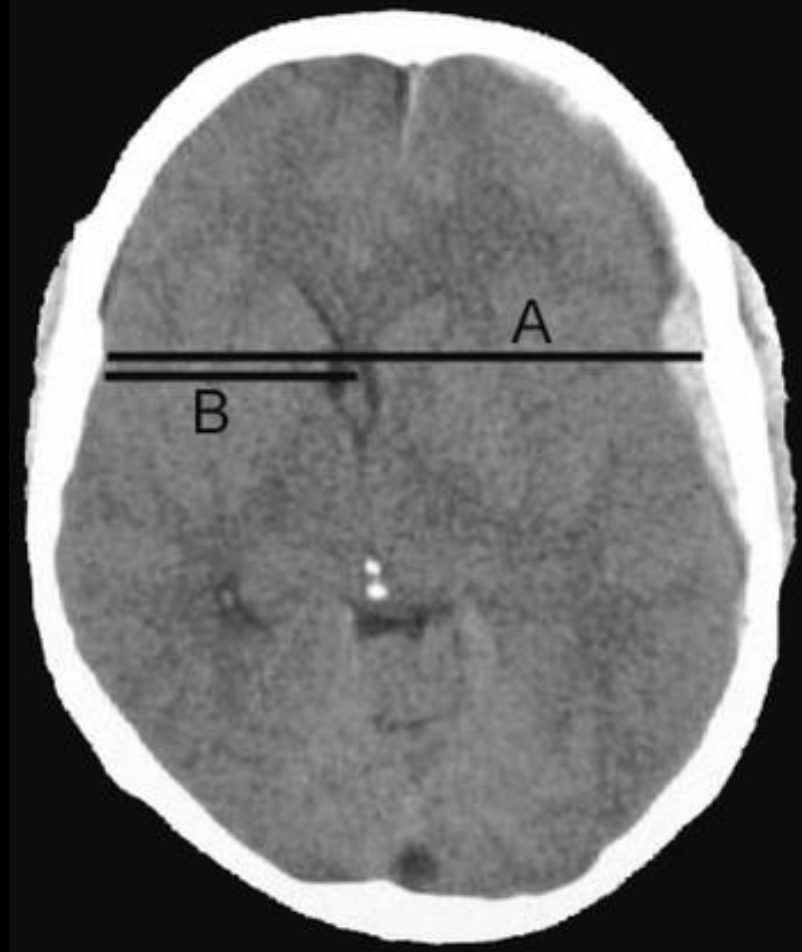
- 1 Brain focal lesions
- 2 Midline shift
- 3 Dilated ventricular system (Hydrocephalus)

Midline shift



→ draw a line btwn
2 falx & measure it
↳ Rt shift 10 mm

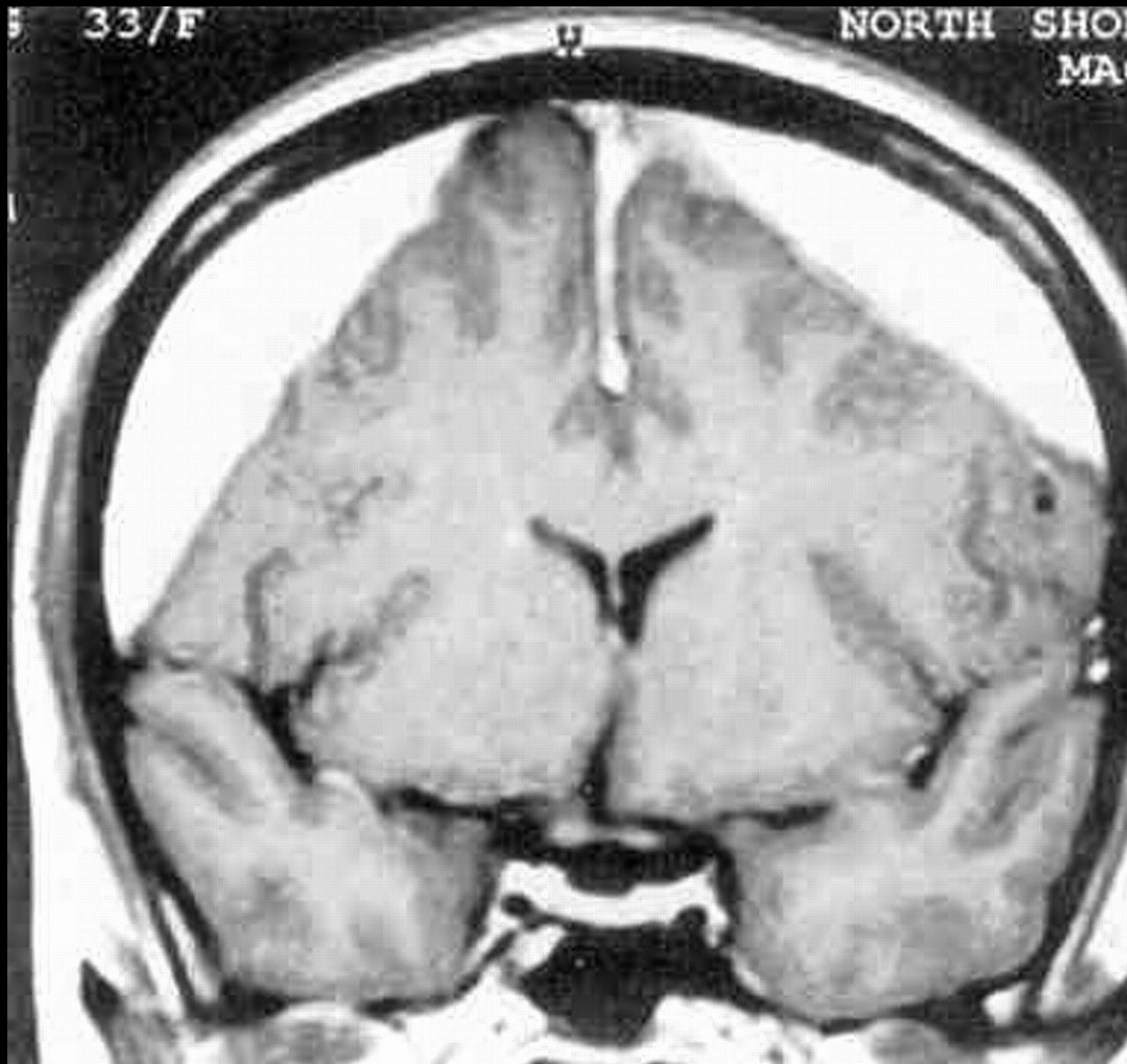
Midline shift v/s positional tilt



Not always there is **midline shift (MLS)** , there could be pathologies that don't cause MLS

1) Bilateral

no shifting



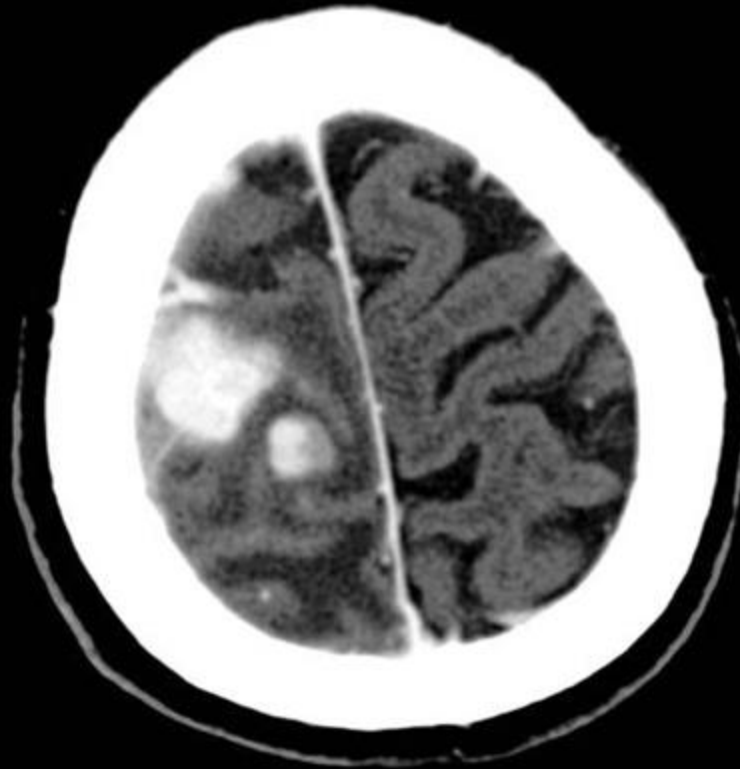
2) Small

not big enough
to shift



3) Lesion that are high up near the vertex

strong & hard
falx cerebri → not bended

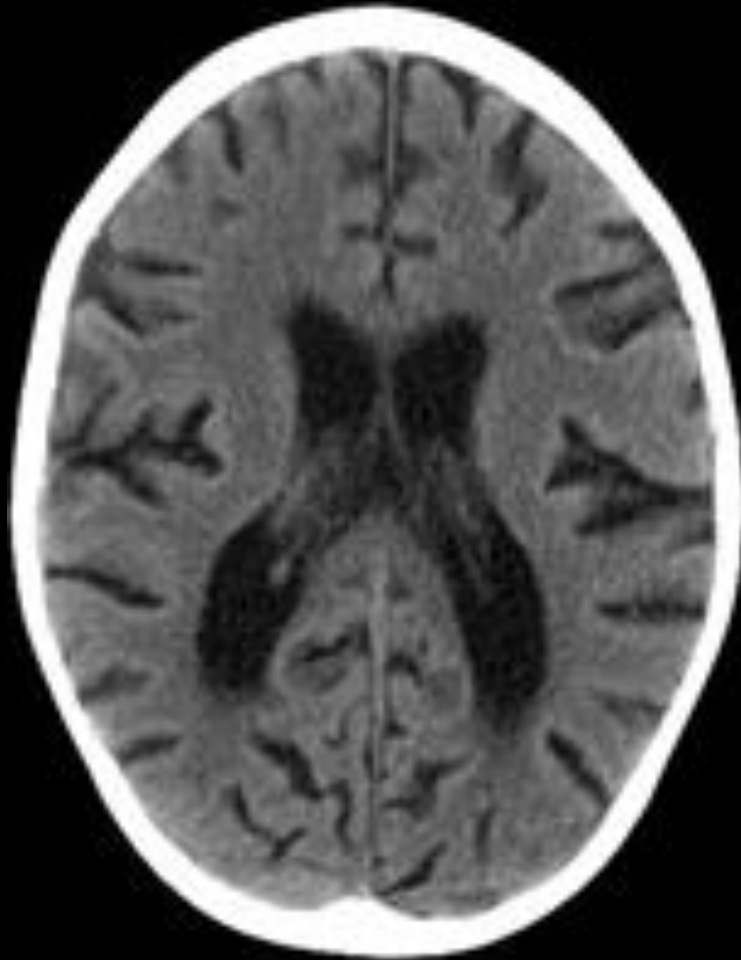


Ventricular Dilatation

Ex vacuo dilatation: due to diffuse brain atrophy → as the person ages, diffuse process

Hydrocephalus : communicating and non communicating

Brain atrophy v/s hydrocephalus

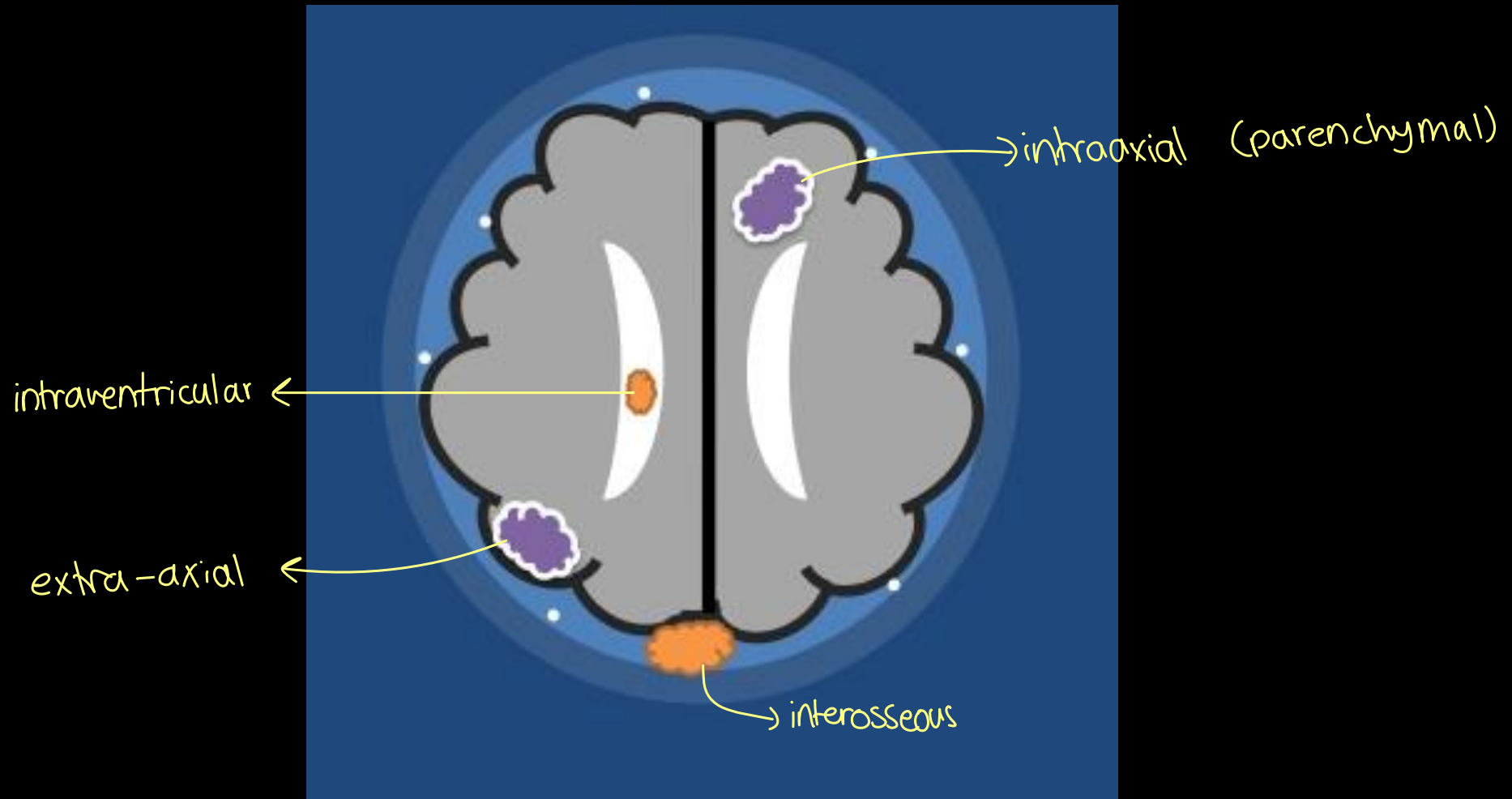


hydrocephalus



dilated ventricles
+
small brain parenchyma
(atrophied)

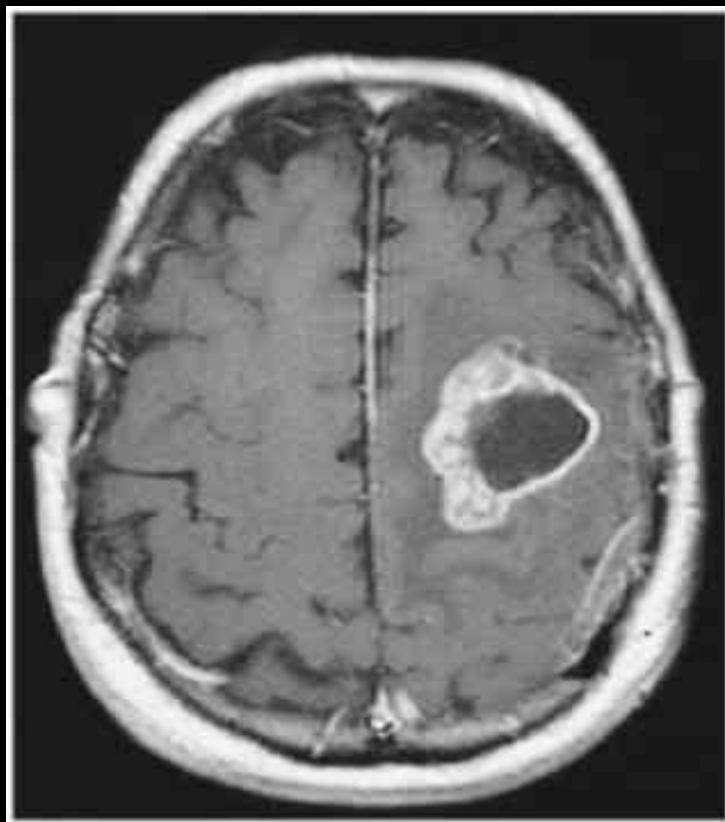
Brain focal leison



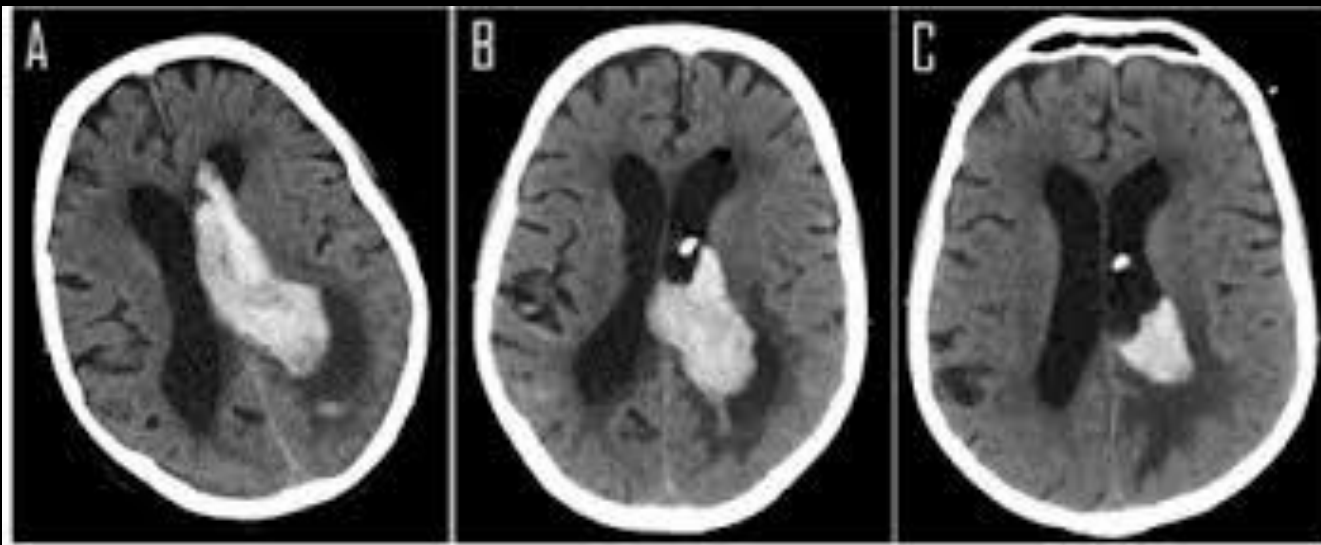
Abnormalities divided into :

- 1 Intraventricular
- 2 Intra-axial
- 3 Extra-axial
- 4 Intra-osseous
- 5 Scalp

Intra-axial

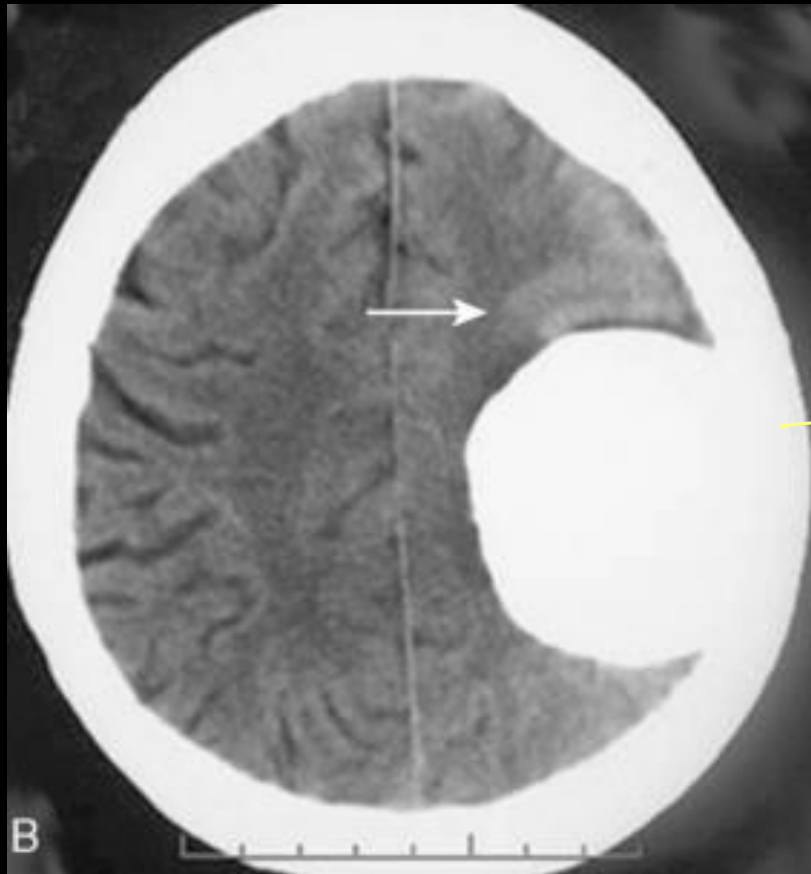


Intraventricular



Extra-axial

btwn brain & skull



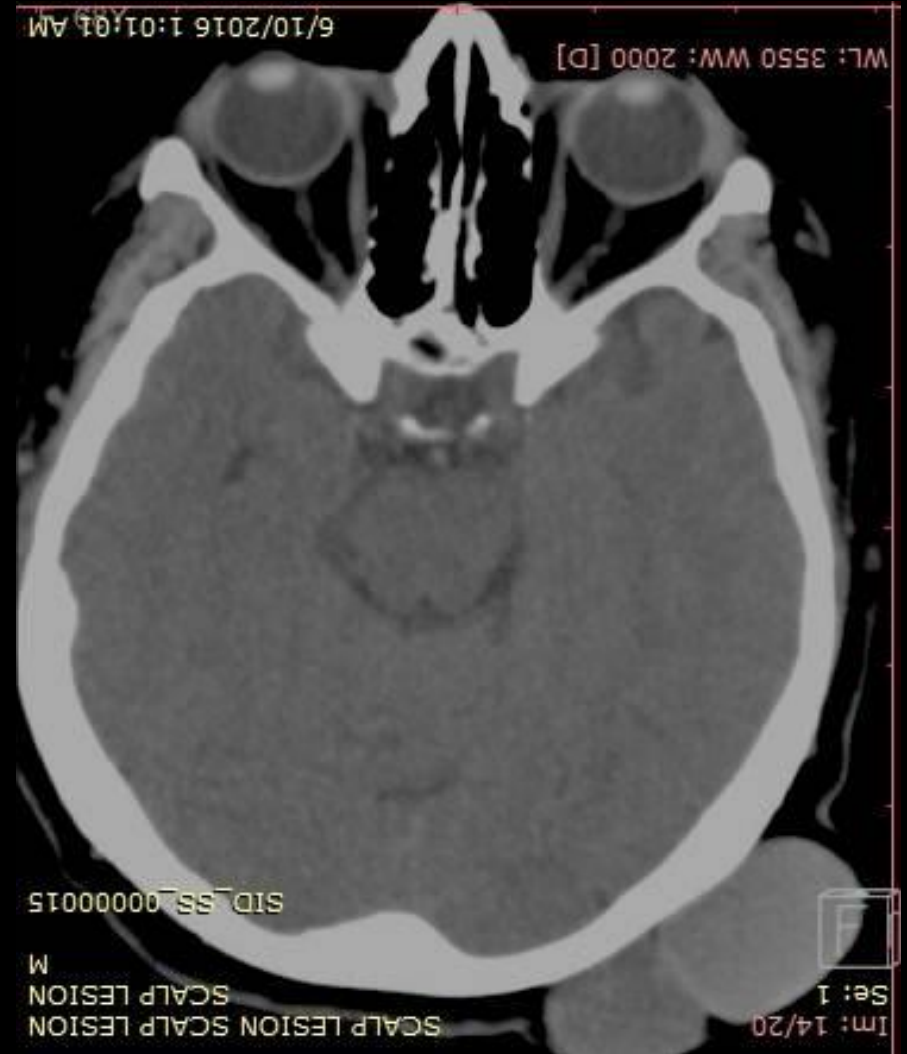
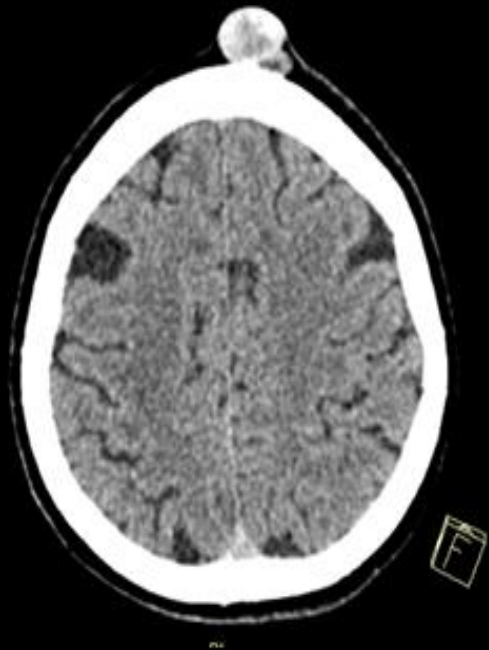
→ pregnant lady sign
"Previously"

now women right changed
the name (offensive) 🤔

Intra-osseous



Scalp



Brain Pathology - CT

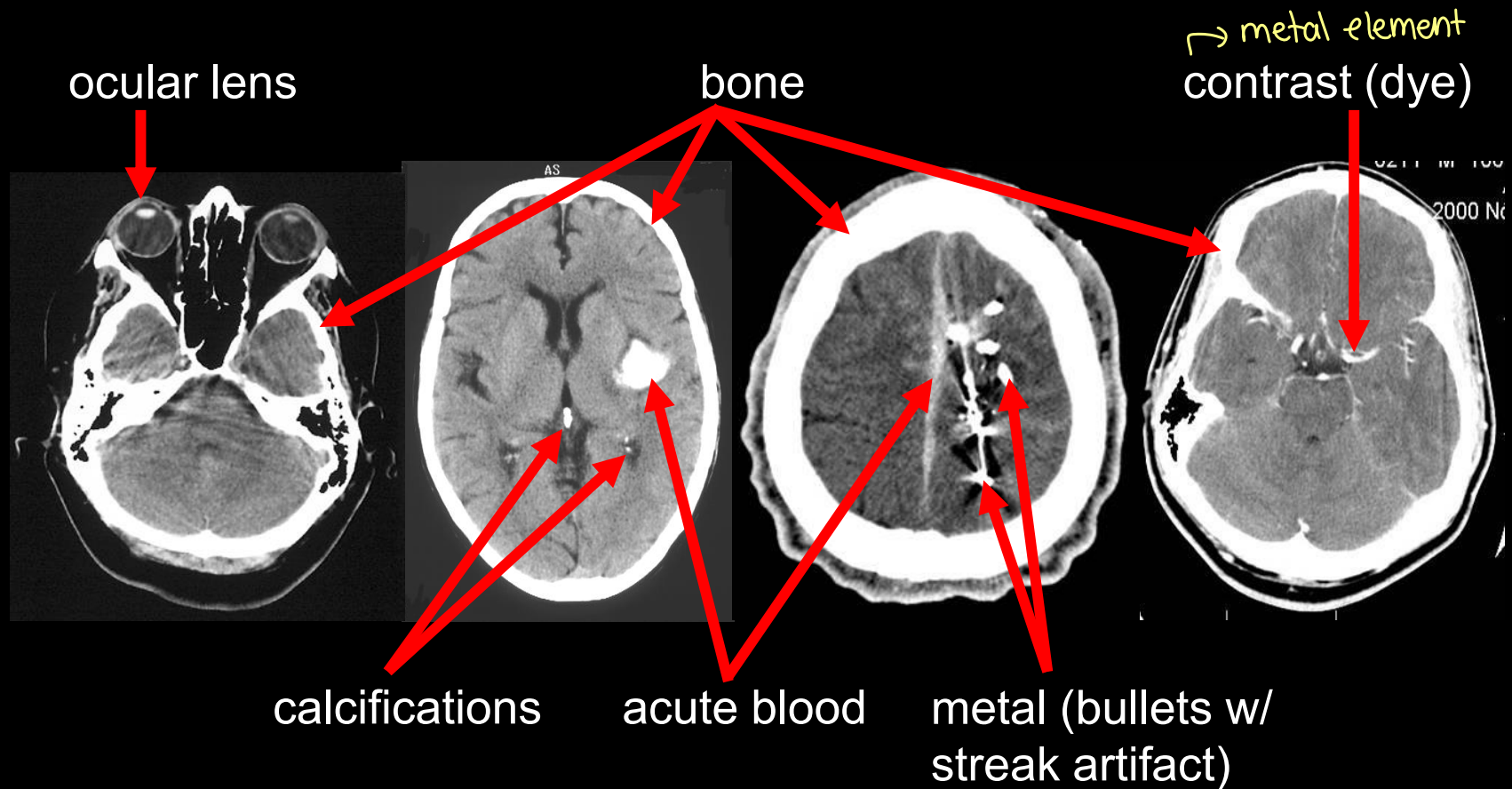
Brain pathology could be divided to two type according to their density on CT:

1- Hyperdense lesions *white (bone)*

2- Isodense lesions *grey (white matter)*

3- Hypodense lesions *black (air)*

Hyperdense things on CT



Isodense things on CT

- *Note that white matter is less dense than gray matter and therefore: white matter is darker than gray matter*

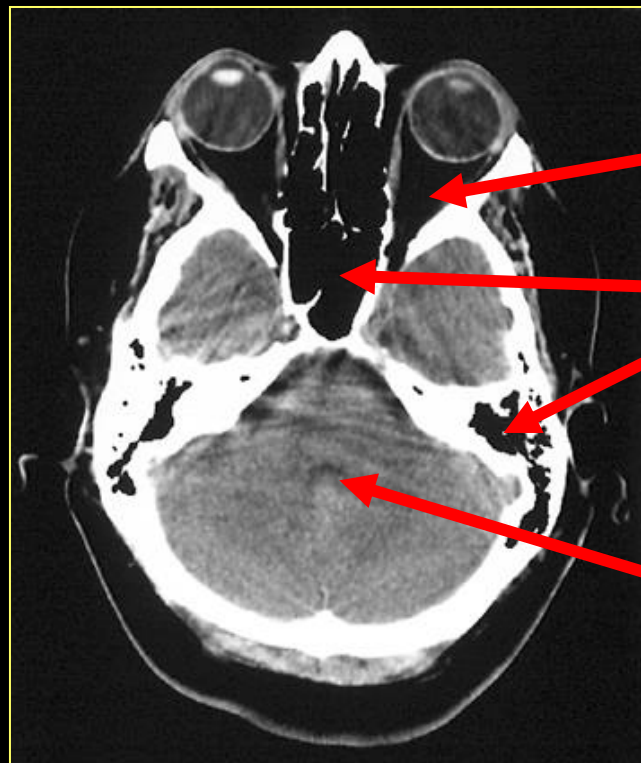
Gray matter (cerebral cortex)

Gray matter (basal ganglia)

White matter



Hypodense things on CT



fat

air

CSF
(water)

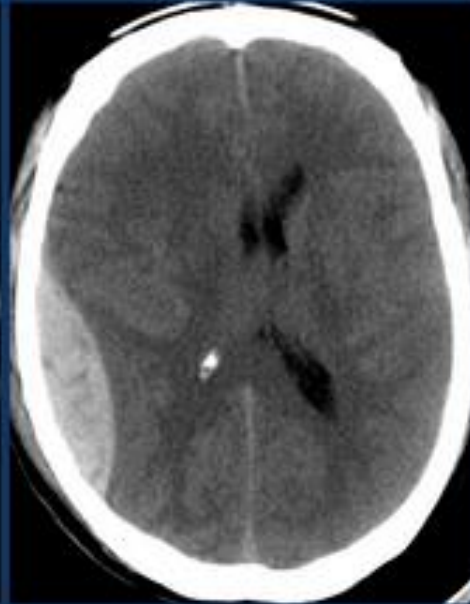


outside brain parenchyma but inside skull

Extra-axial Hemorrhage

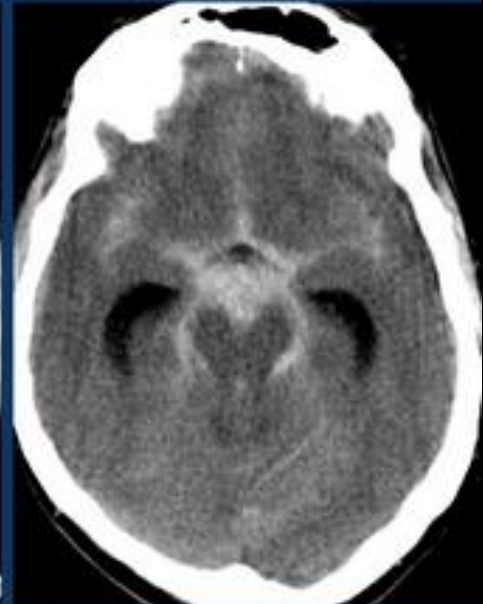


Subdural



Epidural

most
important!



Subarachnoid

only one with CSF
communication



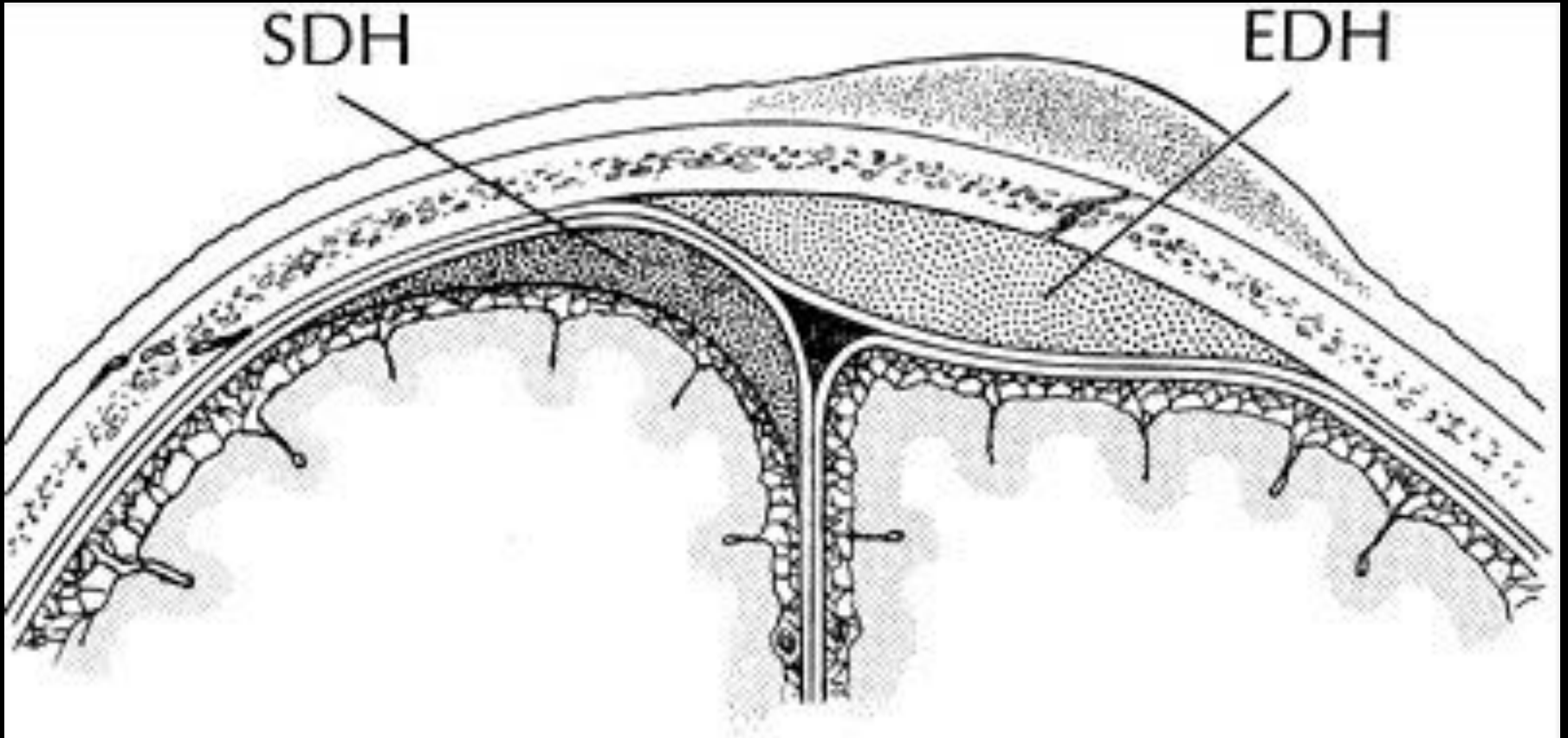
emergency

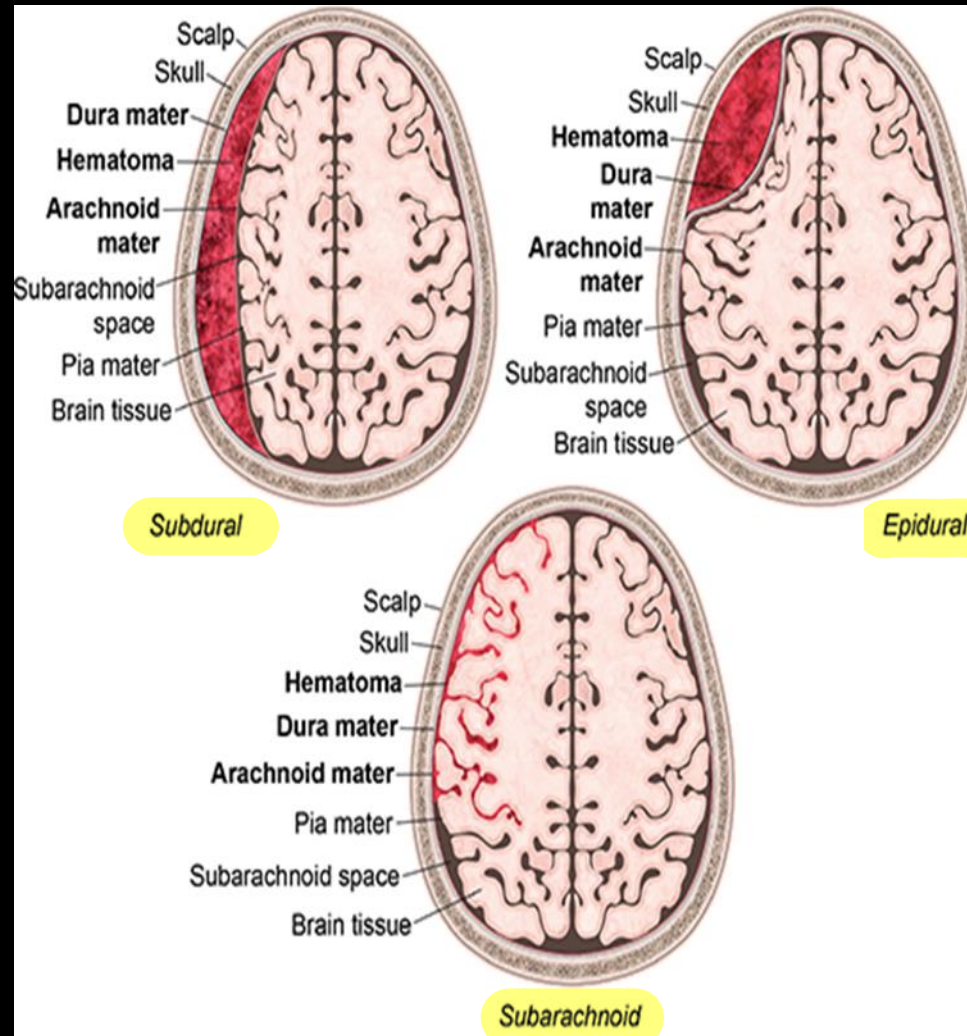
below dura

above dura

SDH

EDH





Source: Khaled M. Elsayes, Sandra A. A. Oldham: *Introduction to Diagnostic Radiology*:
www.accessmedicine.com
 Copyright © McGraw-Hill Education. All rights reserved.

Epidural hematoma (EDH)

respects sutures
cross reflexions

- young
- trauma
- arterial (middle meningeal A.)
- immediate craniotomy due to risk of clotting (no CSF)

- **Mechanism:** low-velocity blunt trauma to the head

- **Types:**

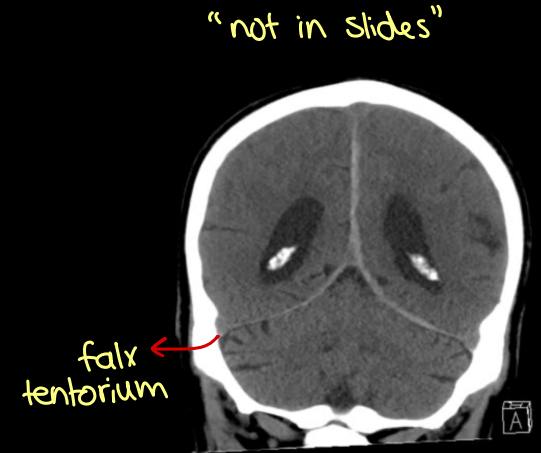
- 1 • • Arterial EDH, 90% (middle meningeal artery)
 - 2 • • Venous EDH, 10% (sinus laceration, meningeal vein)
 - Posterior fossa: transverse or sigmoid sinus laceration (common)
 - Parasagittal: tear of superior sagittal sinus
- Large EDHs are neurosurgical emergencies.
 - Small (<5 mm thick) EDHs adjacent to fractures are common and do not represent a clinical emergency.
 - 95% of all EDHs are associated with fractures.

Epidural hematoma

Imaging Features

Arterial EDH:

- 95% are unilateral, **temporoparietal**
- Biconvex, lenticular shape
- Does not cross suture lines
- May cross dural reflections (falx tentorium), in contradistinction to subdural hematoma (SDH)
- Commonly associated with skull fractures



Venous EDH

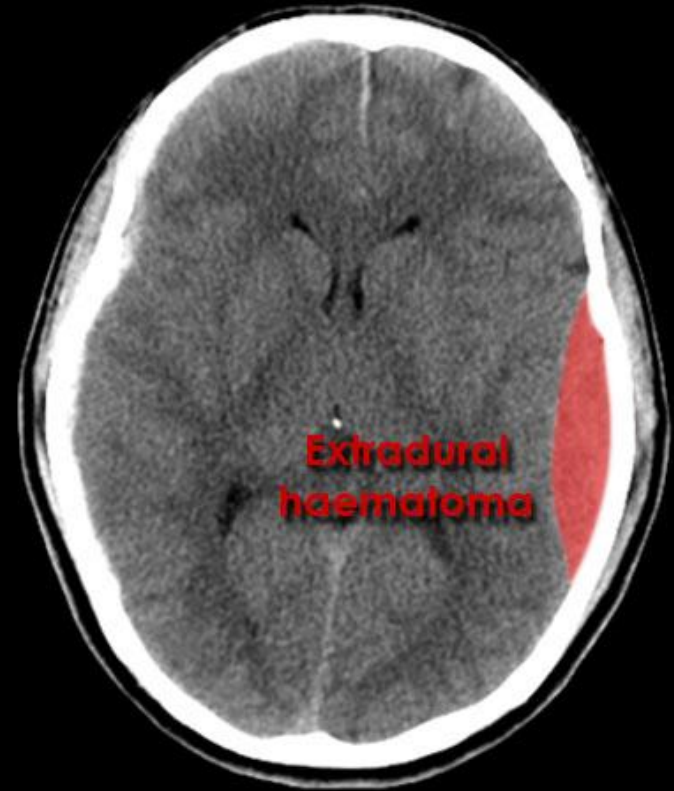
- More variable in shape (low-pressure bleed)
- Often requires delayed imaging because of delayed onset of bleed after trauma

Epidural hemorrhage

Origin: Arterial (middle meningeal artery) – associated with skull fracture

Lens in shape

Treatment: surgical - Craniotomy

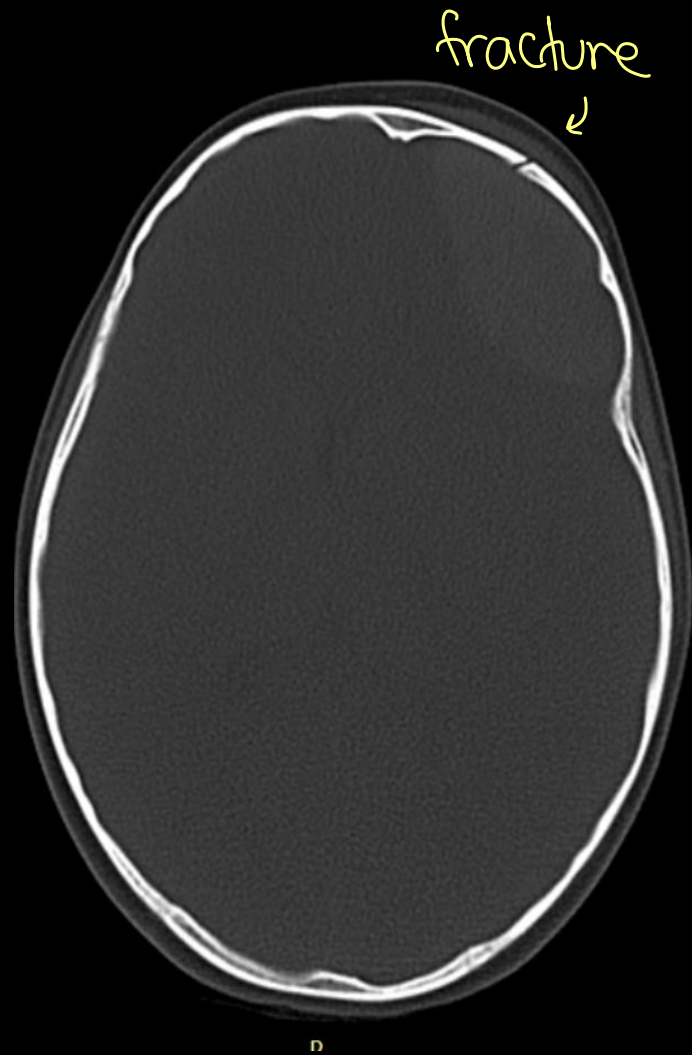


Brain without
contrast as
contrast can miss
hemorrhage

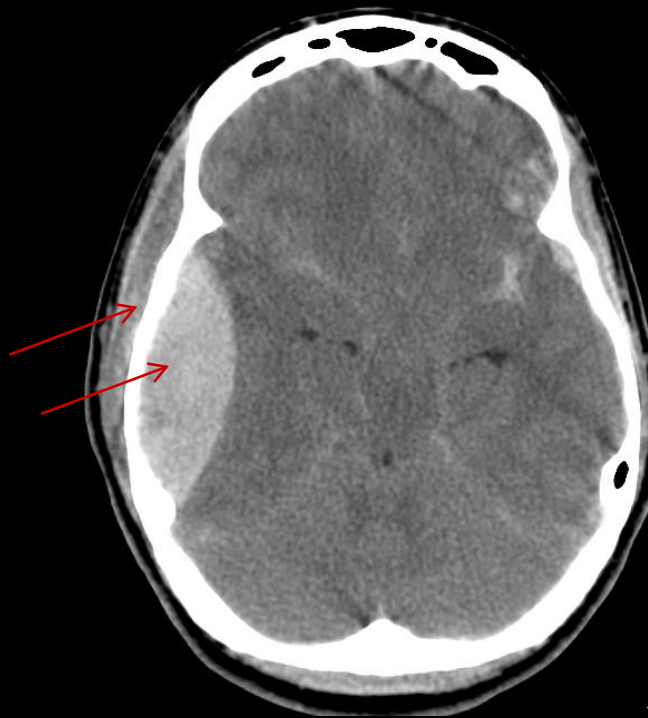
Acute epidural hemorrhage

convex





Acute epidural hemorrhage with overlying fracture



Note the soft tissue swelling adjacent to the hematoma explaining the mechanism of the injury

THK: 1
HFS

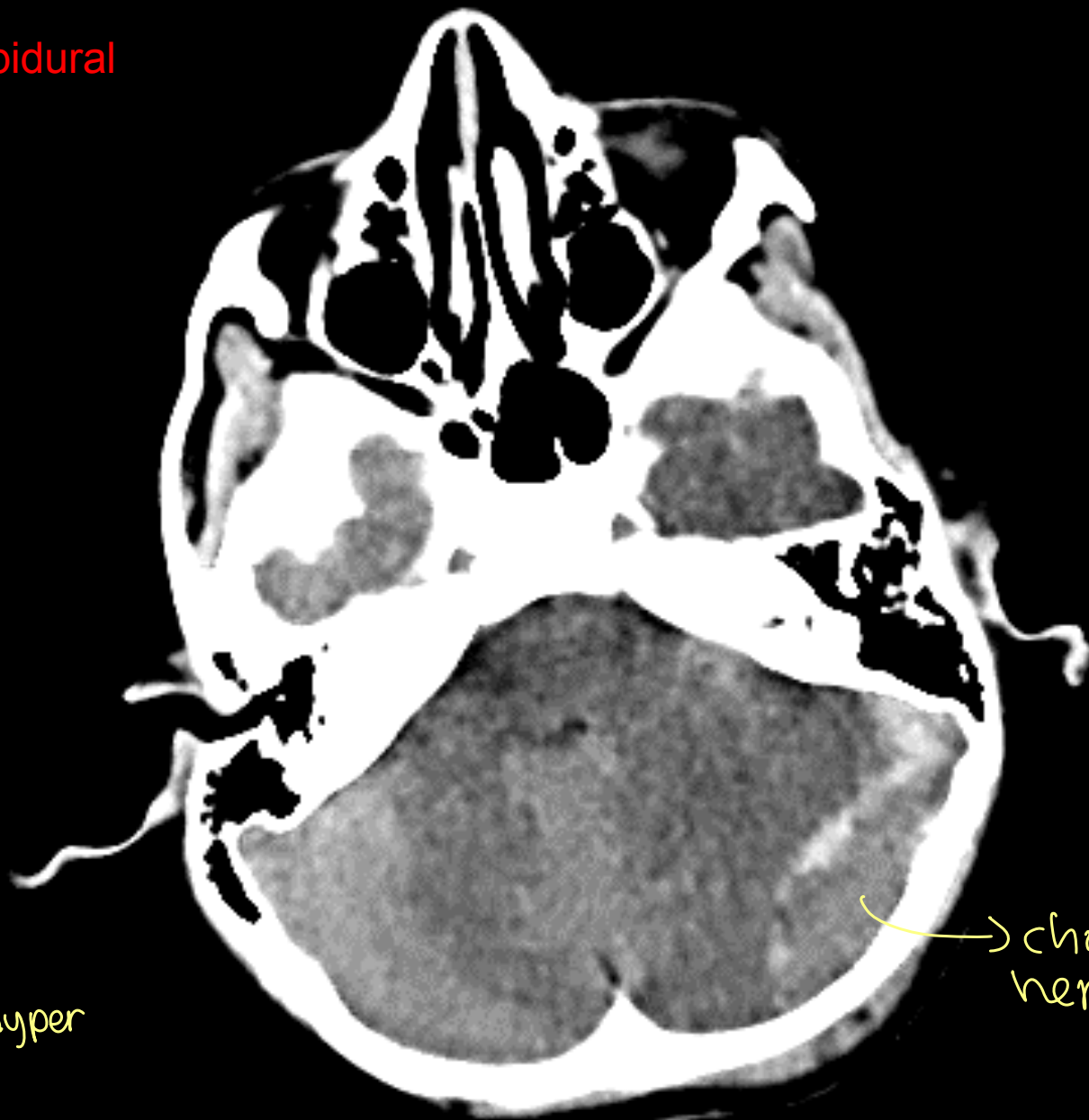
Isodense epidural

A

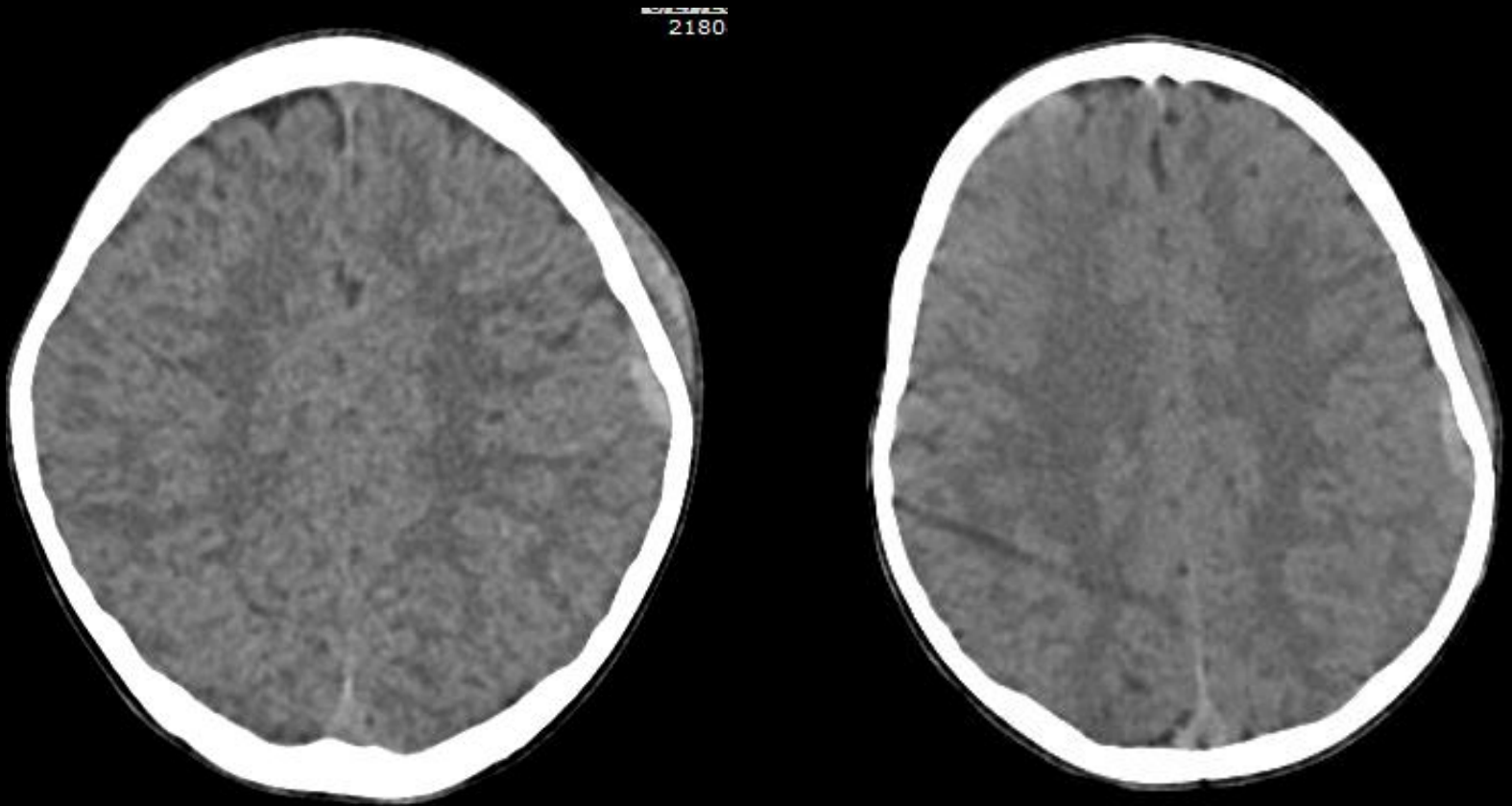
P

iso not hyper

chronic
hematoma



Peds + small $\leq 5\text{mm}$ epidural
observe in ICU for 3 day



After 3 days follow up

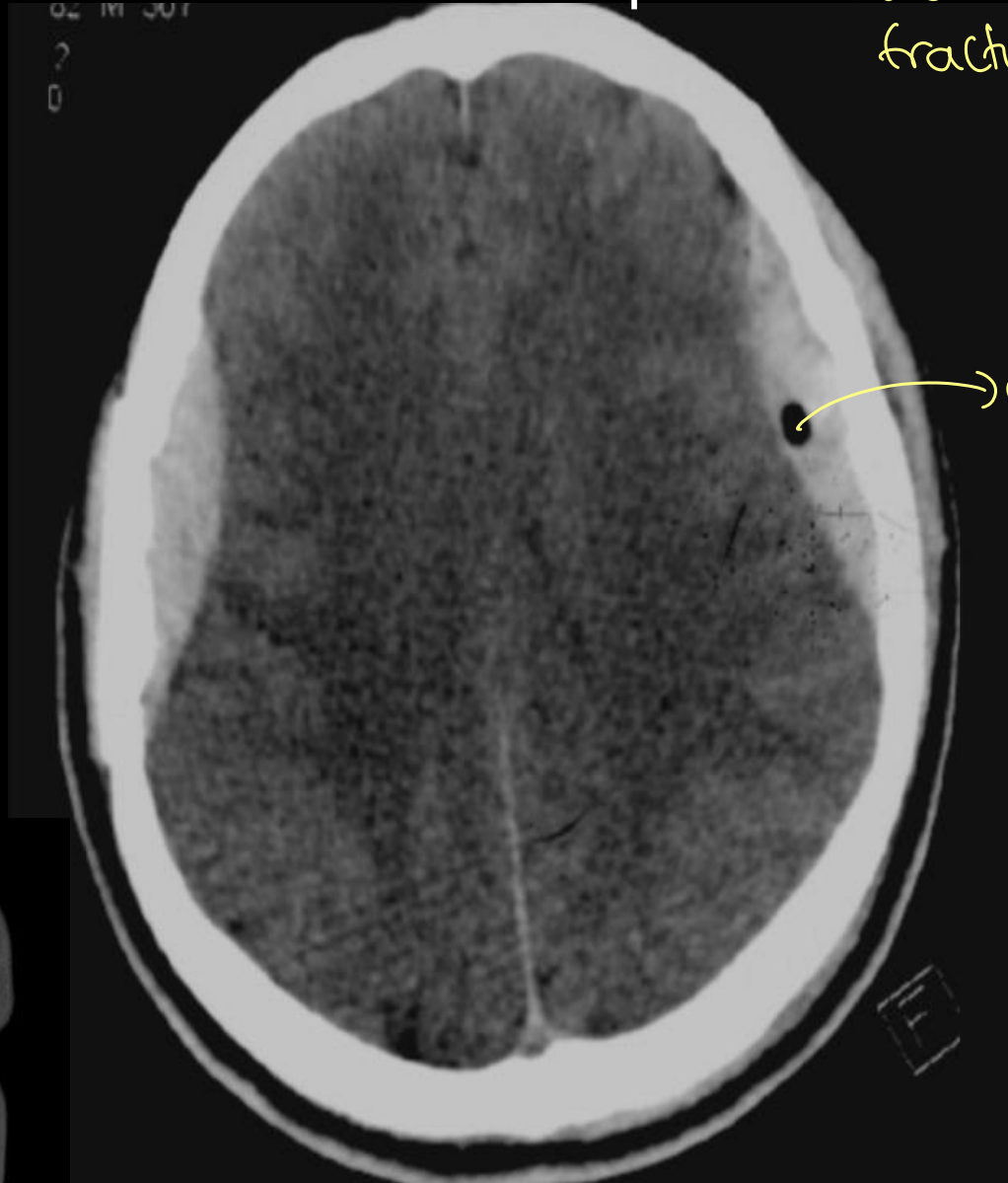
The epidural with **hypodensity** :

1 Clotting

2 Pneumocephalus (air)

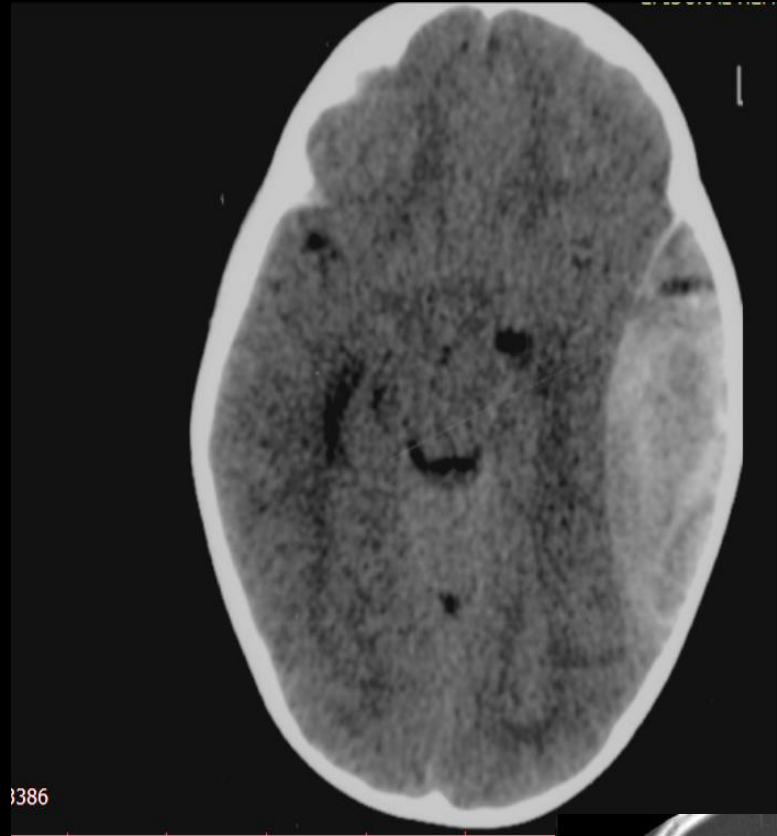
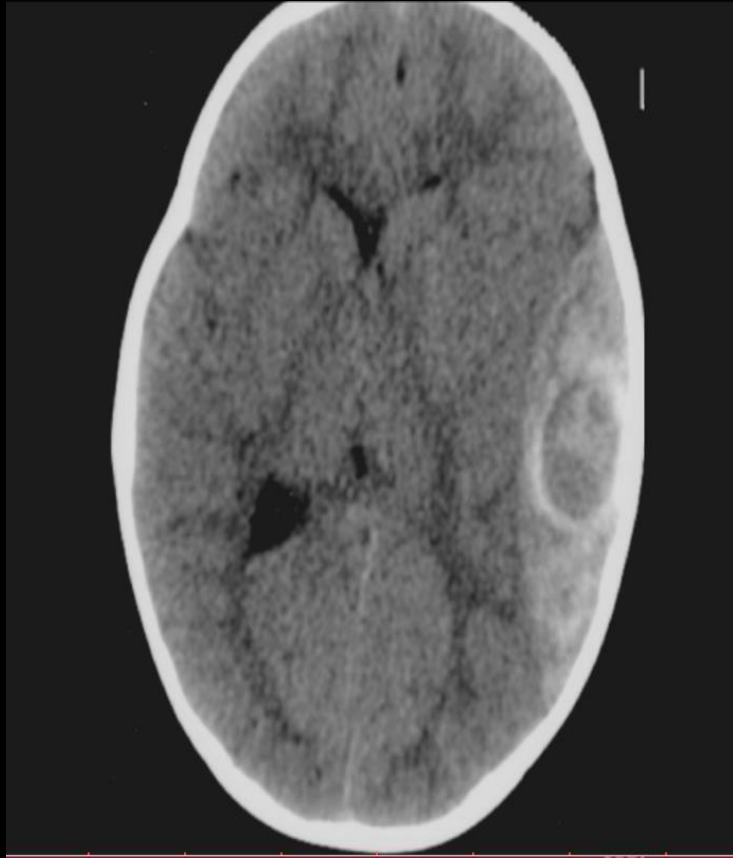
3 whirl sign

Pneumocephalus → associated with fracture

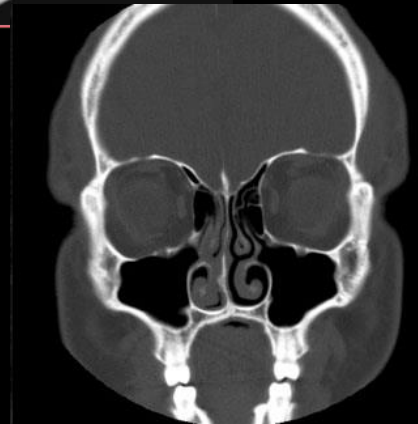


→ air





Clotting



*1/1/2013 M. 16M

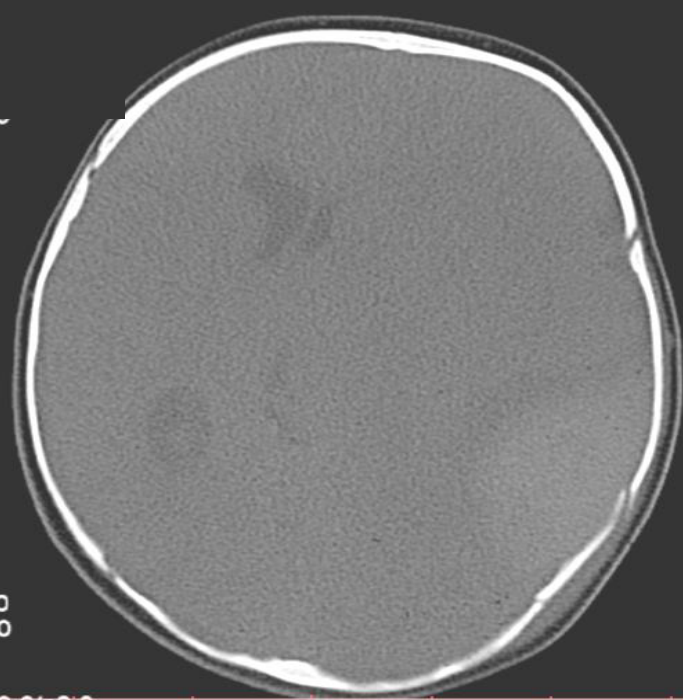
5/6/2014
19 12 47 25
2 IMA 17
SPI 2
SP -242.5

R



kV 120
eff mAs 186
ref mAs 190
TI 1.0
GT 0.0

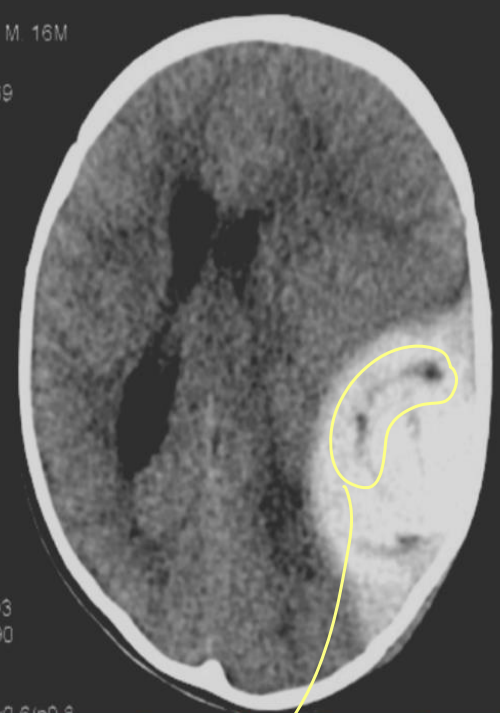
13
78.5



0
As 190
As 190
0

*1/1/2013 M. 16M
5/6/2014
19 12 45 69
2 IMA 13
SPI 2
SP -266.5

R

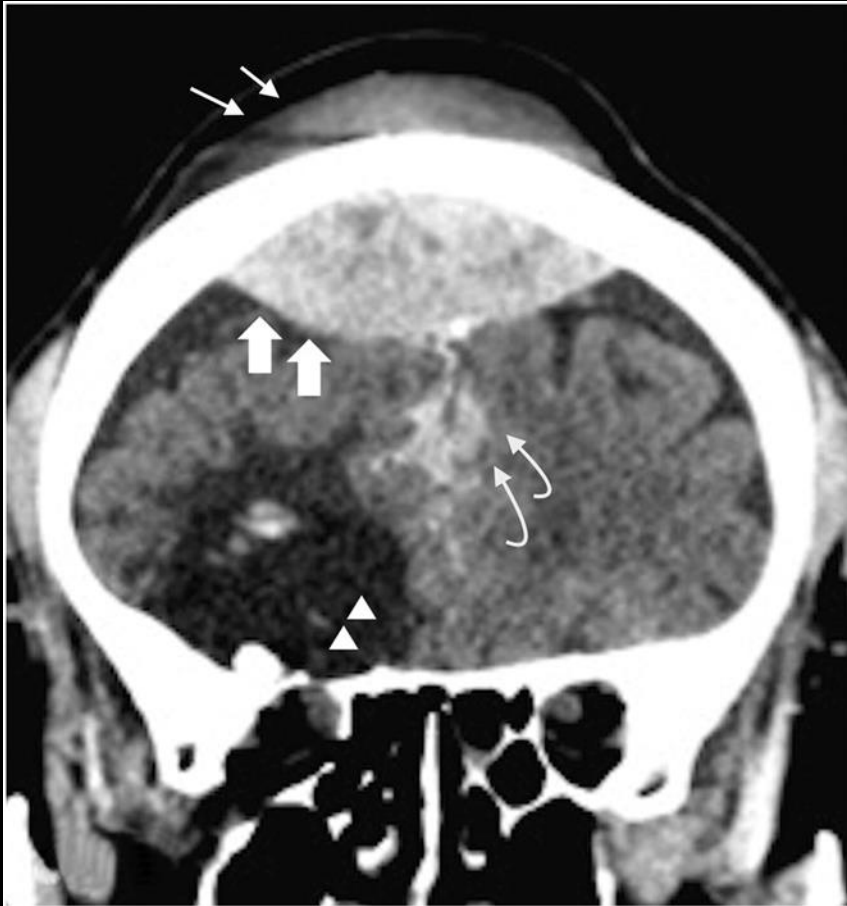


kV 120
eff mAs 193
ref mAs 190
TI 1.0
GT 0.0
SL 6.0/64x0.6/p0.8

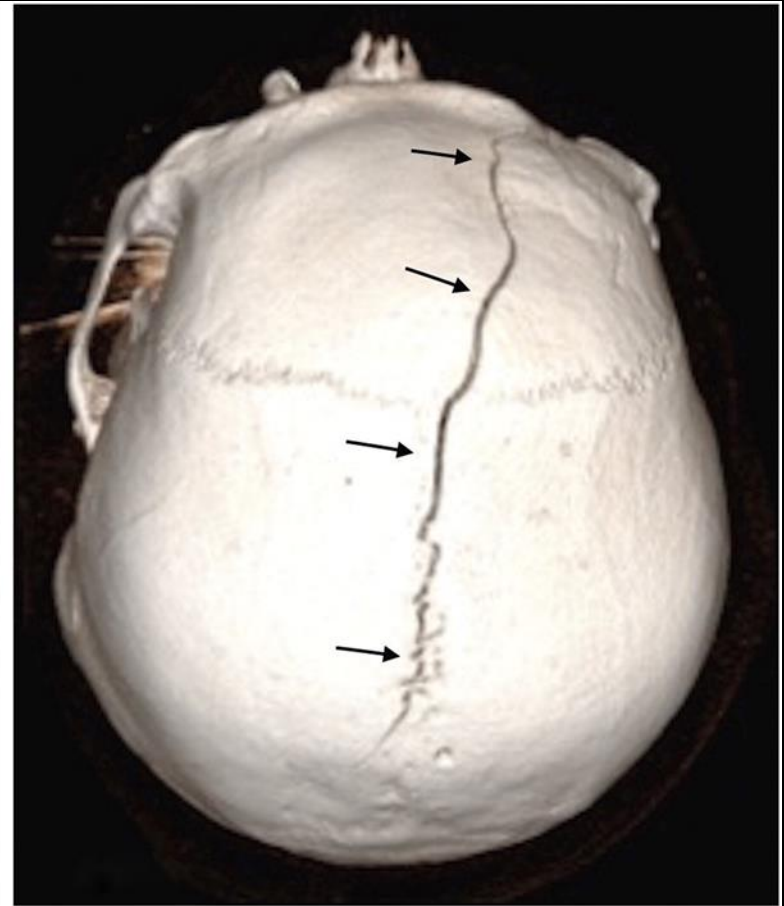
whirl sign
↓
active bleeding

- venous
- around sagittal sinus
- peds group

Subdural hematoma



(a)



(b)

Subdural hematoma (SDH)

Mechanism: caused by traumatic tear of bridging veins (rarely arteries).

In contradistinction to EDH, of skull fractures.

Common in infants (child abuse; 80% are bilateral or interhemispheric) and elderly patients (20% are bilateral).

burr hole surgery NOT craniotomy bc there is CSF → no clot risk

SDH	vs.	EDH
venous		arterial
no clotting		clott risk
leak through trabeculae ← has CSF		no CSF
cross suture line		doesn't cross suture line
doesn't cross reflections		crosses dural reflections

Subdural hematoma (SDH)

Imaging Features

- 95% supratentorial
- Crescentic shape along brain surface
- Crosses suture lines
- Does not cross dural reflections (falx, tentorium)
- **MRI > CT particularly for:**
 - Bilateral hematomas
 - Interhemispheric hematomas
 - Hematomas along tentorium
 - Subacute SDH

additional info ↴

MRI is superior because it:

- Has better soft tissue contrast.
- Avoids bone artifacts that obscure small or thin hematomas.
- Is better at detecting isodense (subacute) blood.
- Allows multiplanar views (sagittal, coronal, axial).

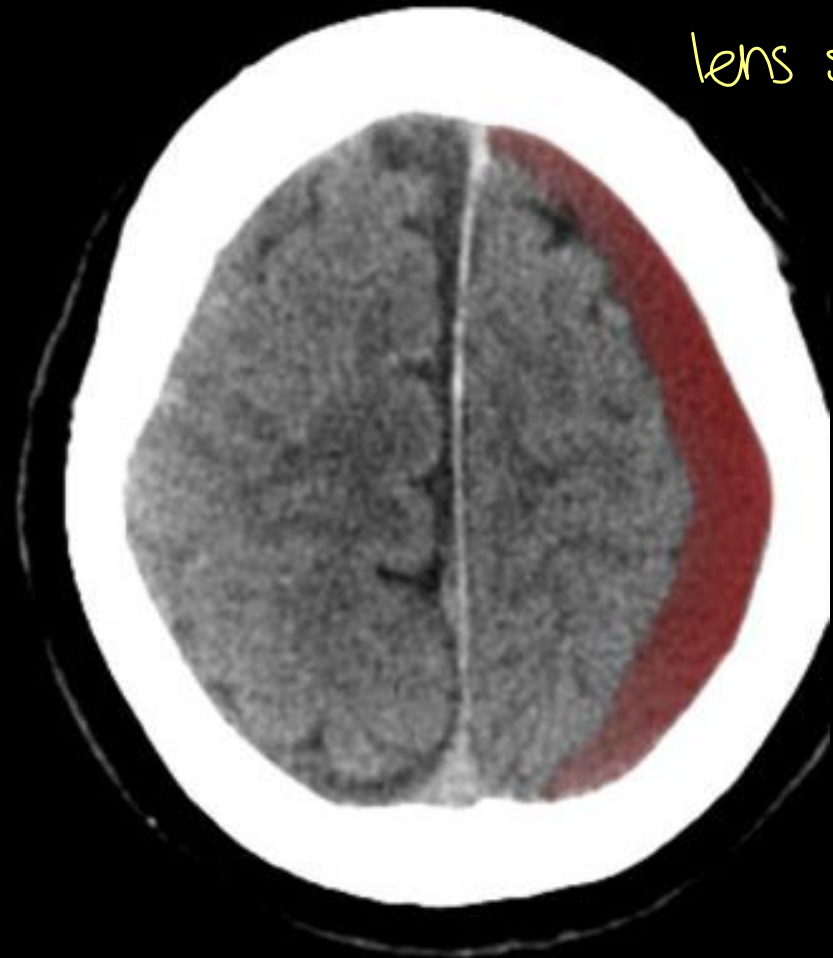
Subdural hemorrhage

Origin: Venous

Treatment: Burr hole

Crescent (semilunar) in shape

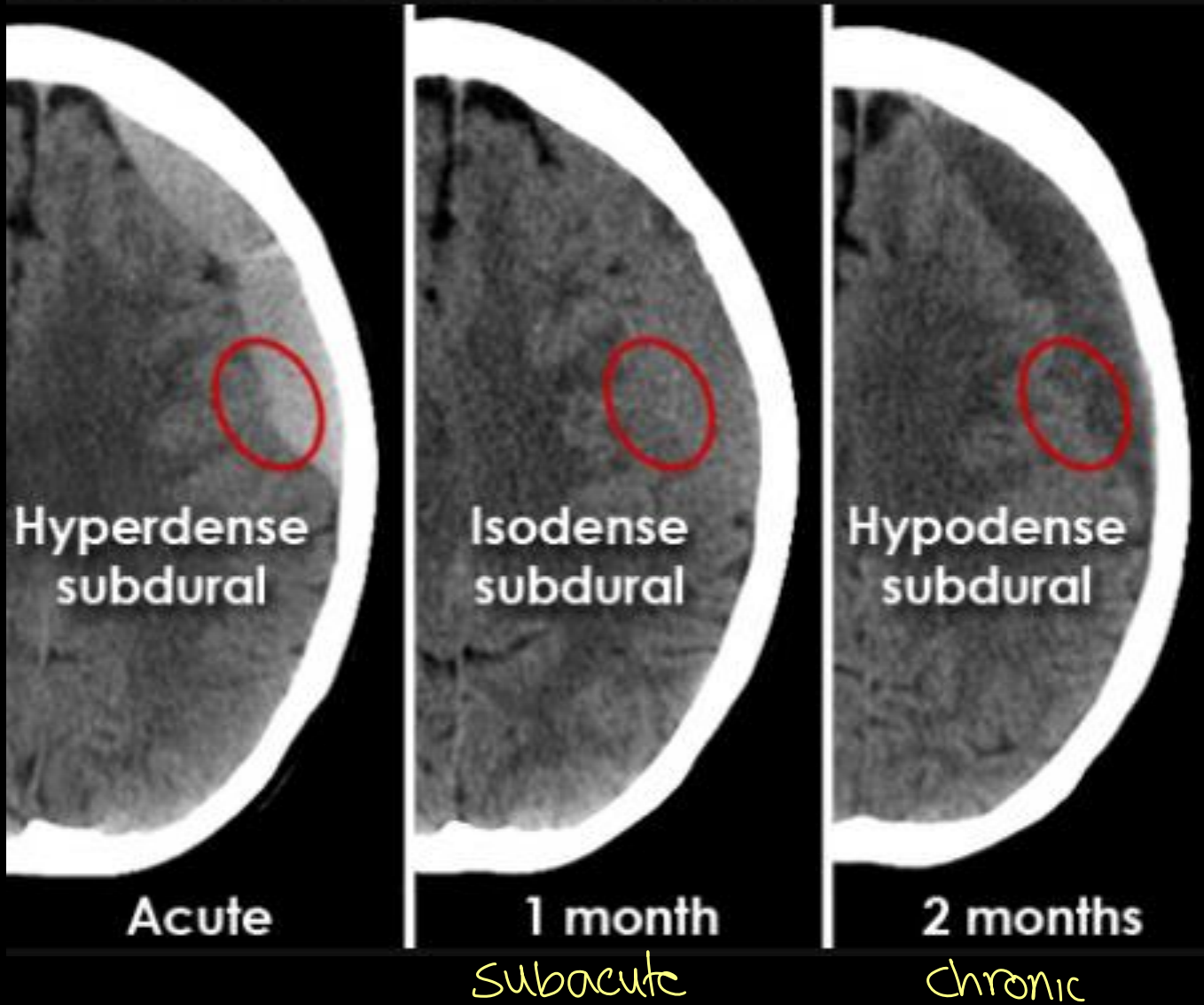
قلا لي



lens shape

changes in color due
to blood degradation

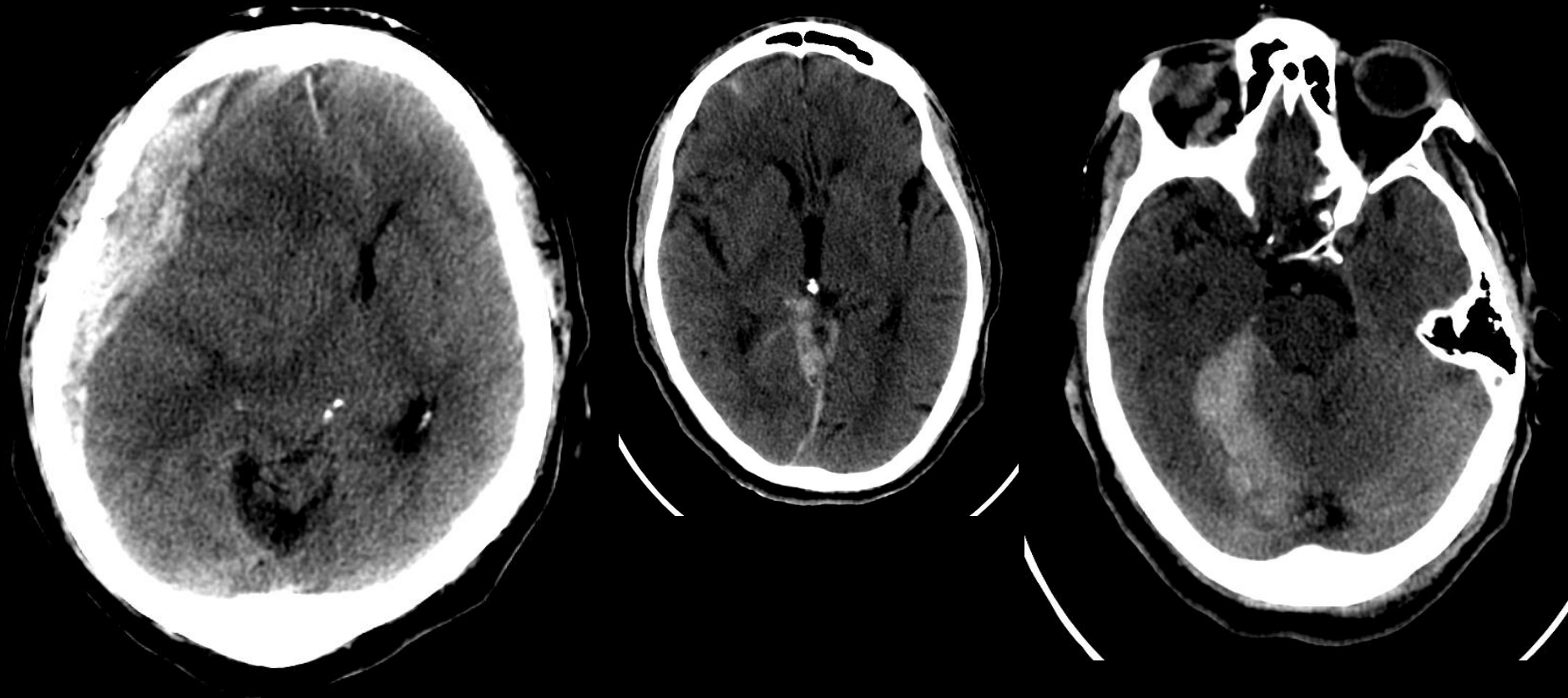
subdural haematoma (SDH) age



Stages of Subdural hemorrhage

Stage of hemorrhage	Appearance	Blood product
Acute (days)	Hyperdense	Oxyhemoglobin Deoxyhemoglobin
Subacute (Weeks)	Isodense	Methemoglobin (Intracellular and extracellular) <i>intact cell</i> <i>lysed cell</i> <i>no change in CT image btwn them</i>
Chronic (months)	Hypodense	Ferritin Hemosiderin

Acute Subdural Hematoma

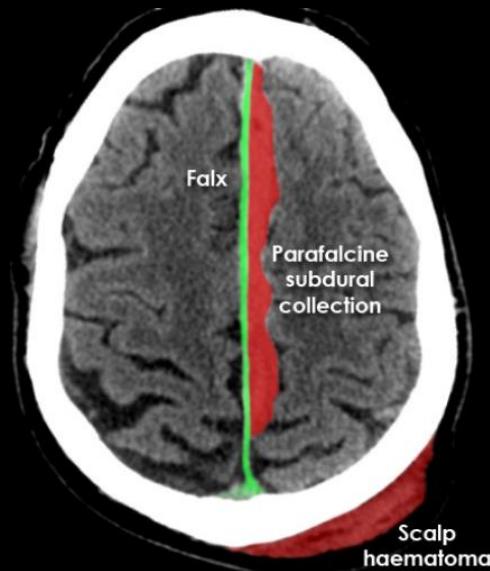
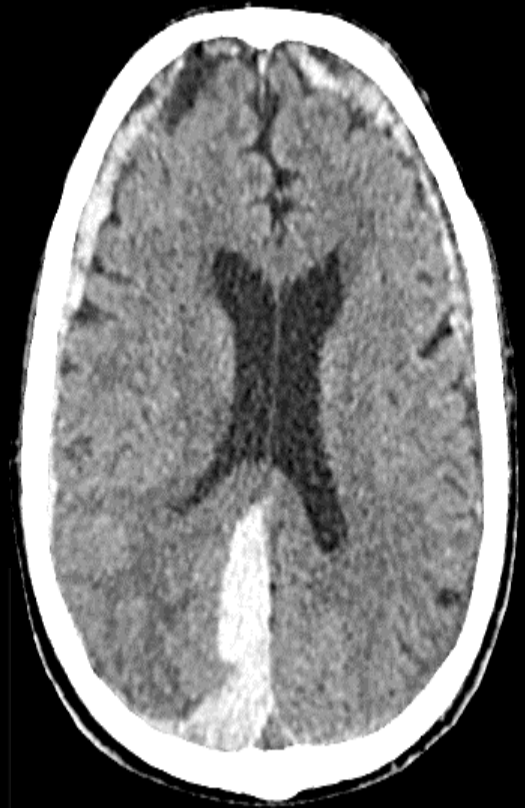




Semi-lunar
Shape



→ more white + thick falx



Compressed 11:1
IM: 63 SE: 2

er on/off image to show/hide findings

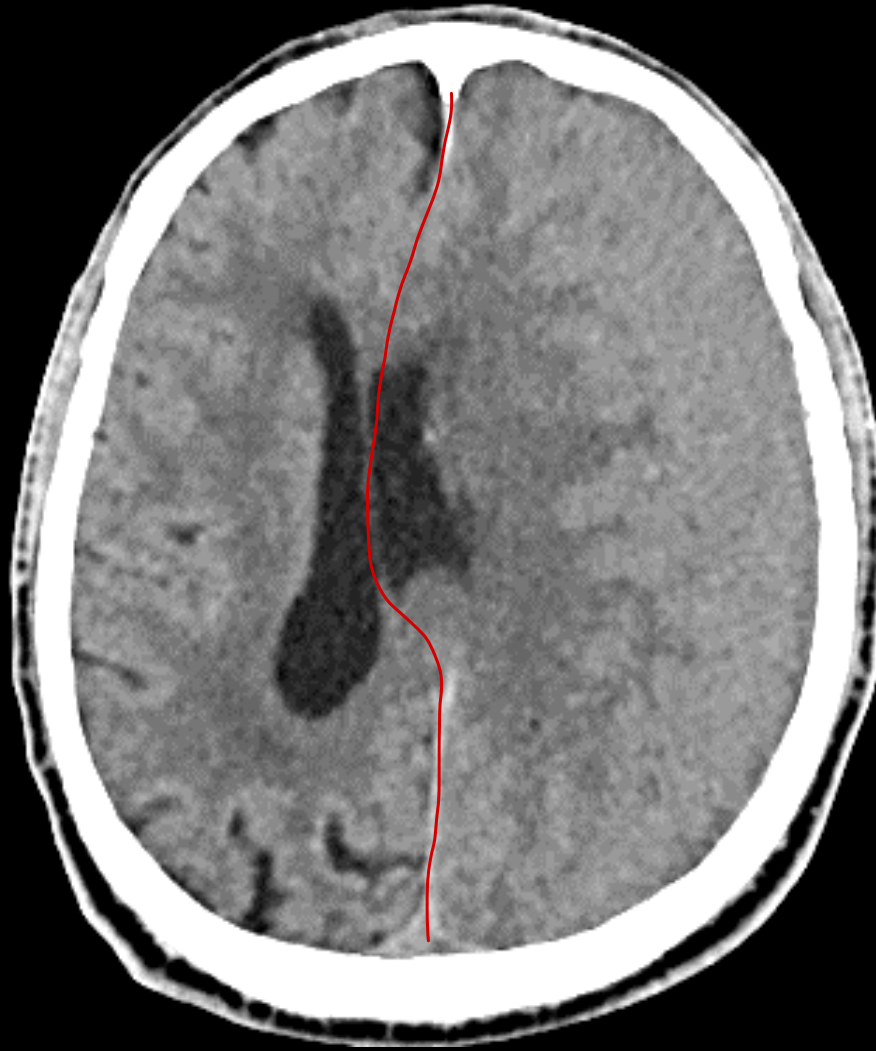


Subacute Subdural Hemorrhage

↳ isodense



midline shift





→ hypodense
chronic SDH

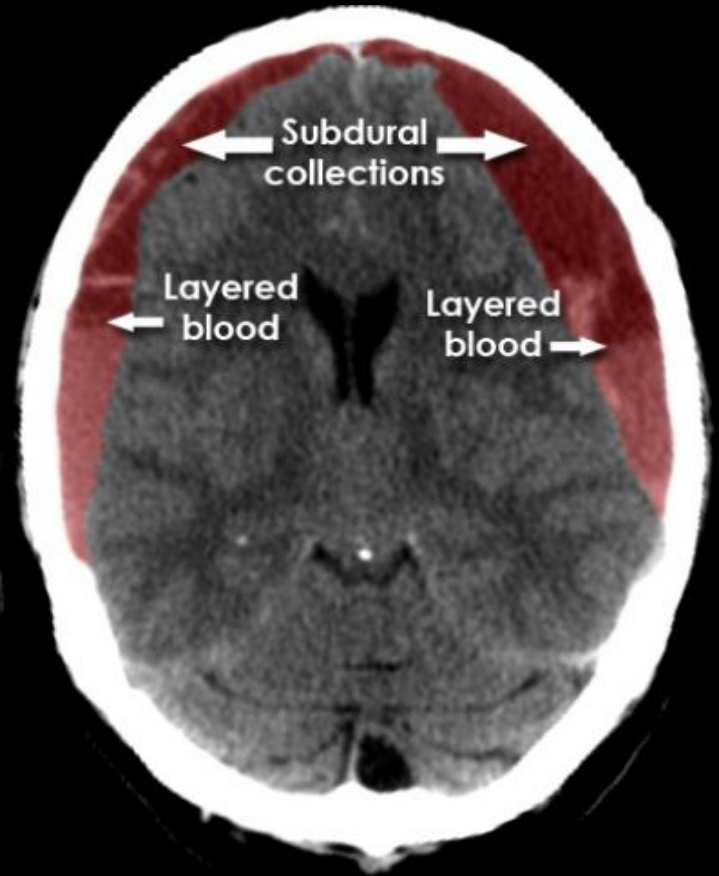
Chronic SDH with rebleeding

right



→ chronic

→ acute

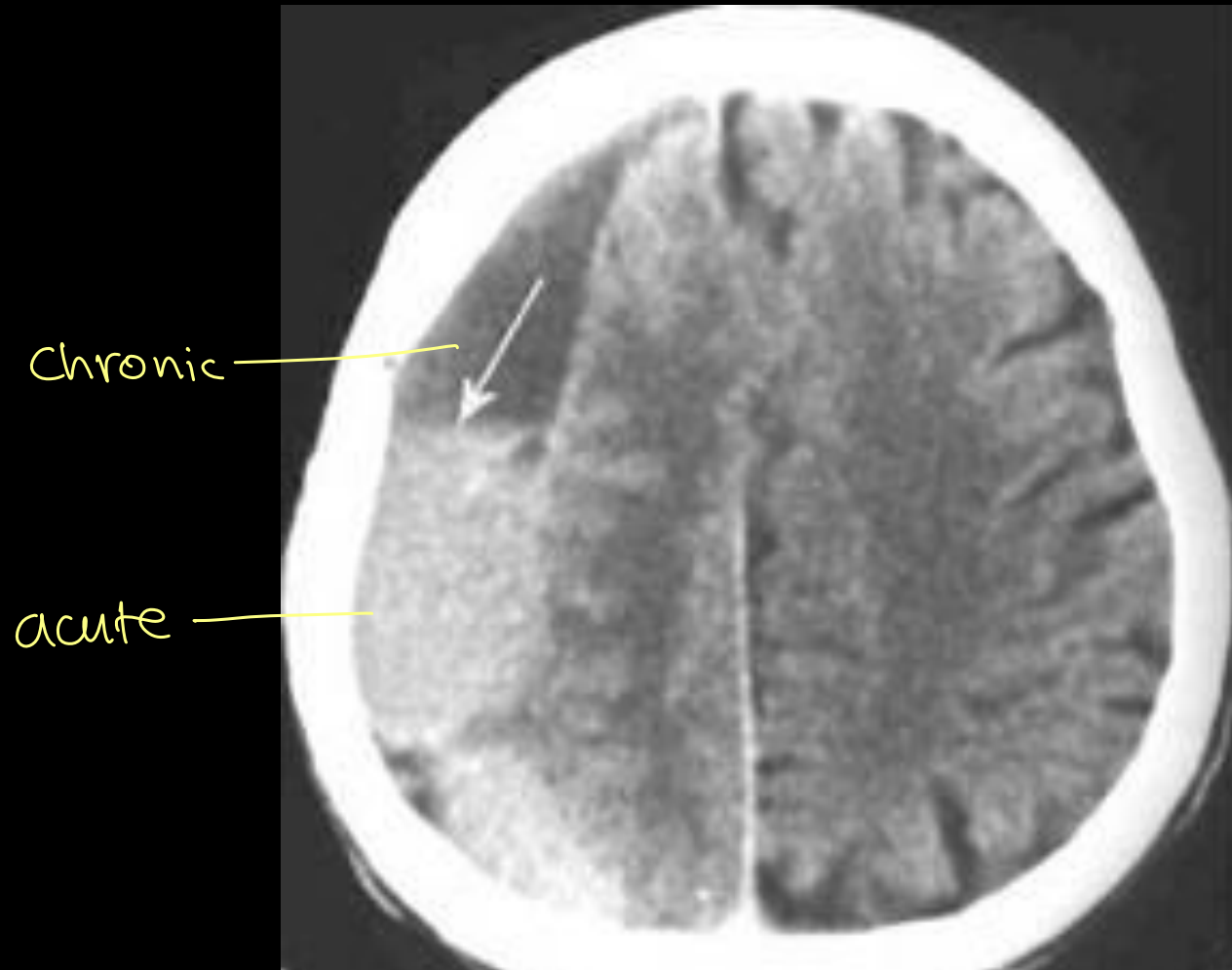


Subdural
collections

Layered
blood

Layered
blood

Acute on top of chronic Subdural Hemorrhage



SUBDURAL HEMMO



chronic

acute



Hyperacute component



The less dense blood (grey) is not due to a chronic haematoma, it is hyperacute blood which has not yet had time to clot

still bleeding (like whirl sign)



LOC: -29.10
THK: 1
HFS

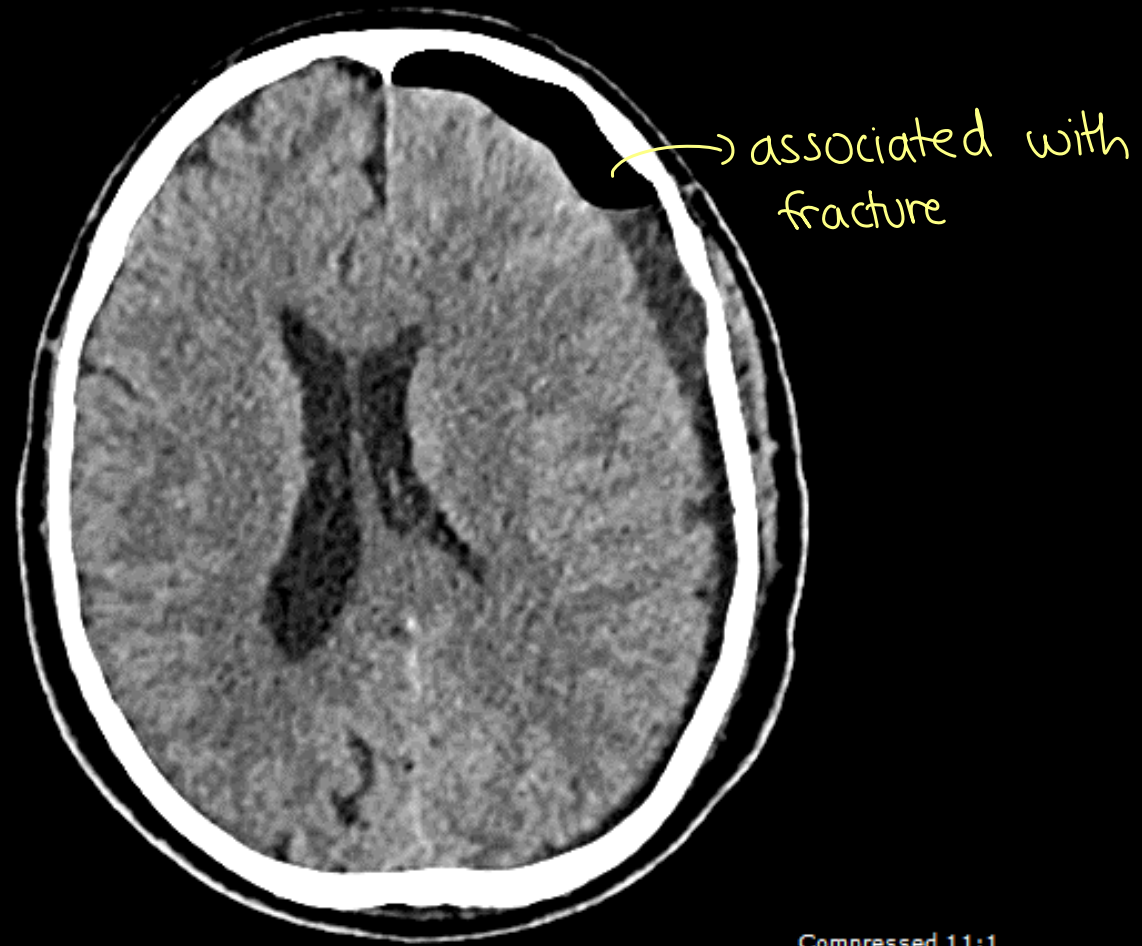
L

C: 57
W: 80
DFOV: 22.4x22.4cm
Compressed 11:1
IM: 114 SE: 4

P

cm

Subdural hematoma with pneumocephalus



Mohammed Ahmad, Mousa
1074634
5/6/1996
21 YEAR
M

A

88157
BRAIN CT Without Contrast
Head 1.0 MPR ax (Dup)
8/14/2017 9:27:49 AM
217094842!CT0001

THK: 1
HFS



RD: 237
Tilt: 0
mA: 137
KVp: 130
Acq no: 2

Z: 1
C: 35
W: 80
DFOV: 23.7x26.6cm
Compressed 11:1
IM: 69 SE: 3

Page: 68 of 195



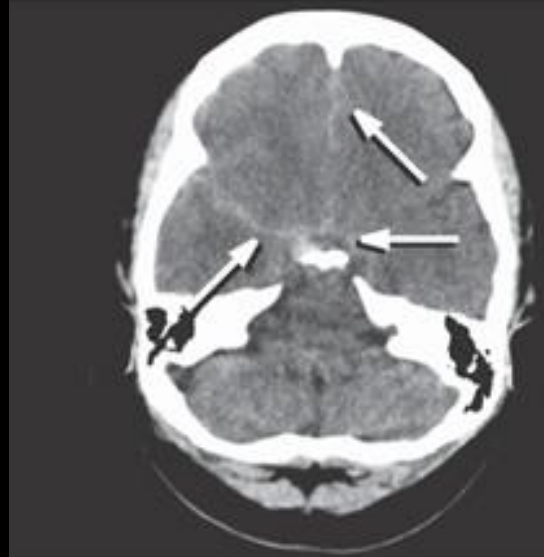
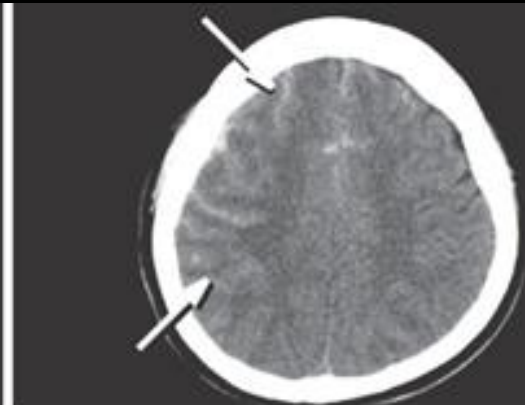
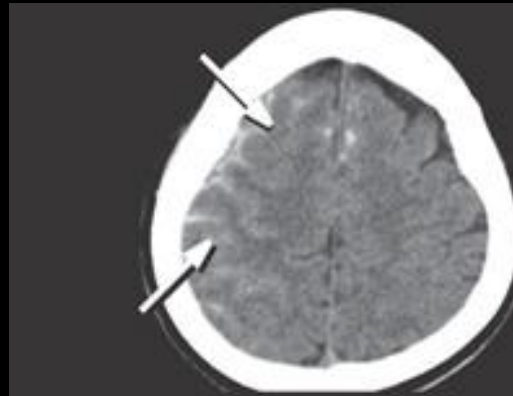
Subarachnoid hemorrhage

Mechanism: results from injury to small subarachnoid vessels or extension of intraparenchymal hemorrhage beyond the pial limiting membrane and into the subarachnoid space.

CT: SAH appears as areas of high-density conforming to the shape of the cerebral sulci and basal cisterns.

trx : according to the cause

- **Subarachnoid Hemorrhage** : post trauma or ruptured aneurysm



AY-2008
4:56.83

SUBARCHNOID HEMMORAGE SUB/
SUB/



5
51
26
R>0

W
C

AY-2008
4:53.43

SUBARCHNOID HEMMORAGE SU
SU



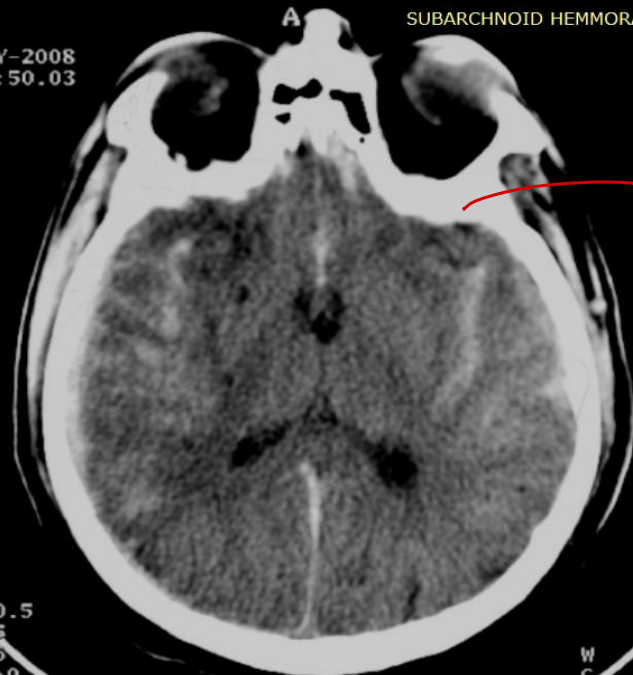
12.5
18
26
3>0

W
C

Y-2008
:50.03

SUBARCHNOID HEMMORAGE SUBARCHNOID HEMM
SUBARCHNOID HEMM

SID_SS_00



5
51
26
R>0

W
C

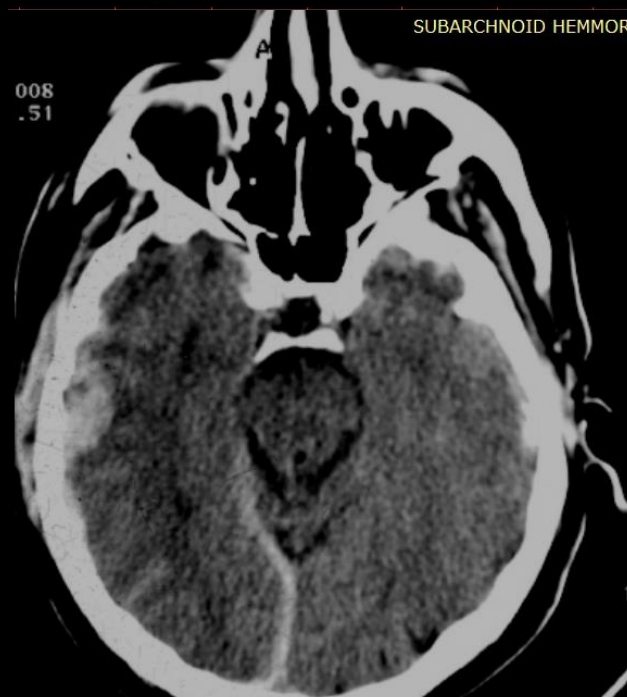
→ normally less white



SUBARCHNOID HEMMORAGE SUBARCHNOID
SUBARCHNOID

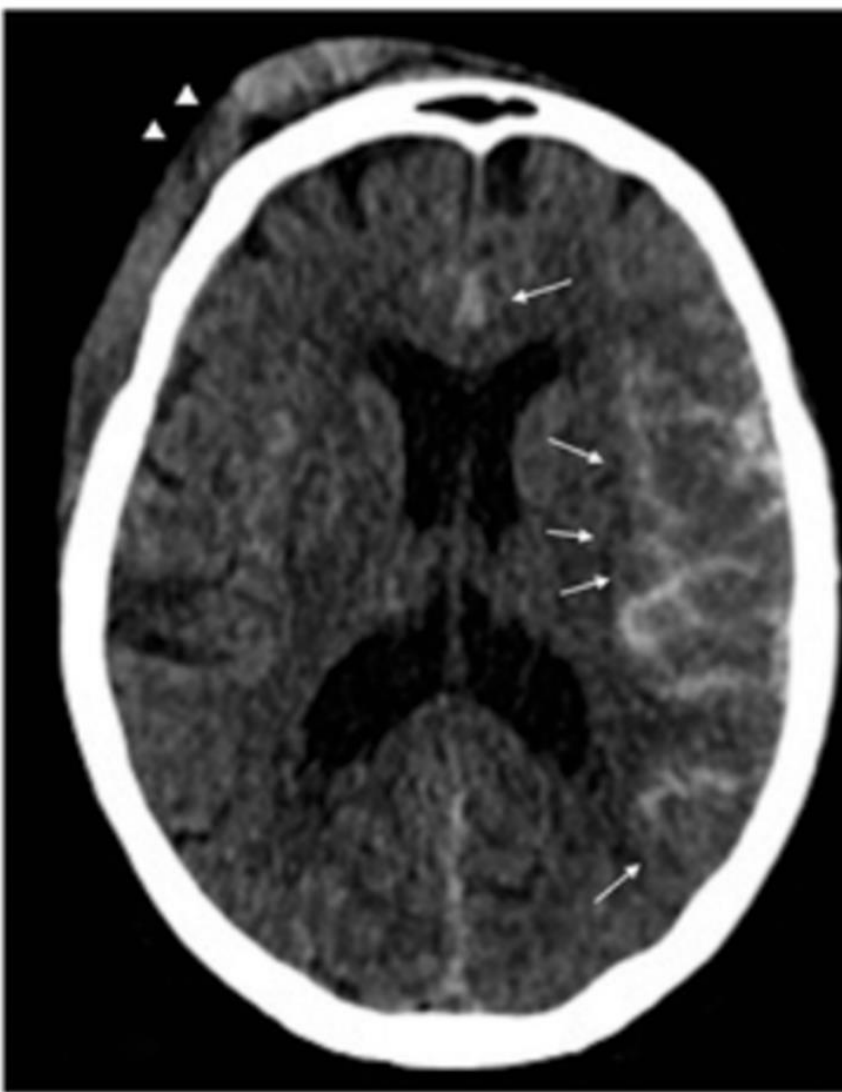
008
.51

S



diffuse SAH





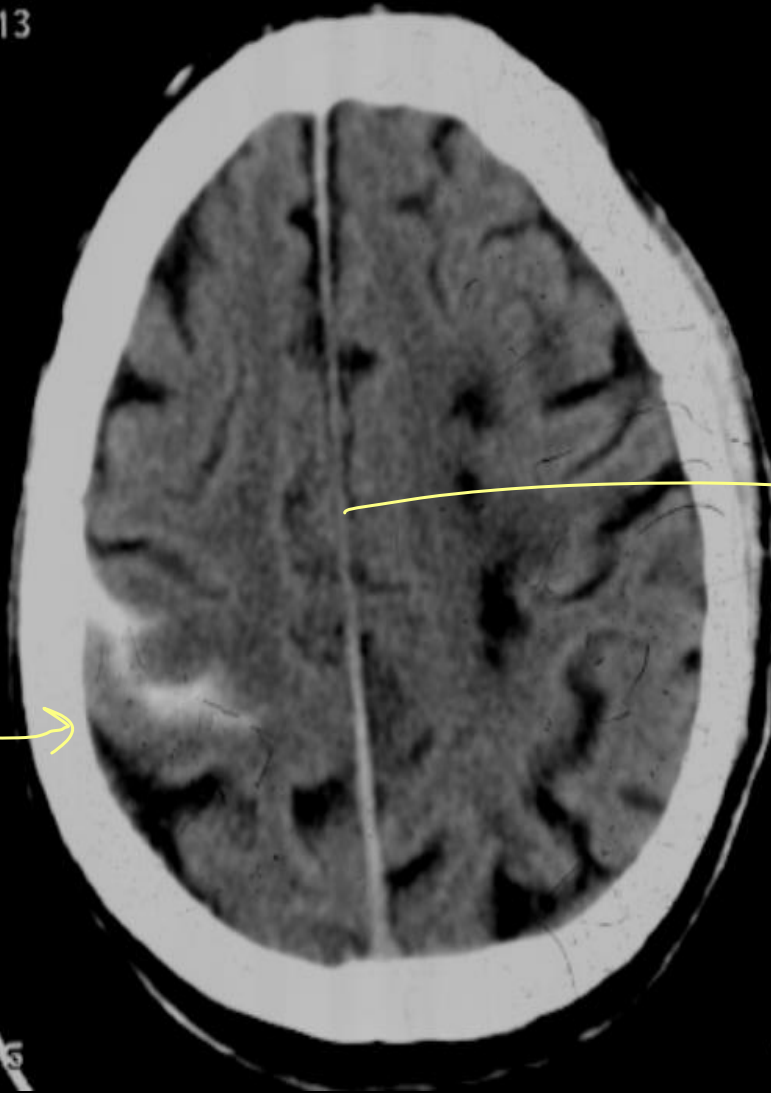
1-2008
:50.13

focal SAH

falk less dense

546.5

W



Intraventricular hemorrhage IVH

Mechanism:

- result from shearing of the choroid plexus or subependymal veins along the surface of the ventricles,
- an extension of a parenchymal hematoma into the ventricles,
- by retrograde flow of blood from a SAH into the ventricular system.

Patients with IVH can develop complications including hydrocephalus and even ependymitis

bad prognosis !!

ends up with hydrocephalus bc production takes place & no reabsorption

Imaging features:

On CT, IVH is most commonly seen as hyperdense collections that layer within the occipital horns .

Intraventricular hemorrhage

Jamila Hasan, Mohammed
1094754
1/1/1949
68 YEAR
F

88157
BRAIN CT Without Contrast
Head 1.0 MPR ax (Dup)
10/31/2017 4:12:02 PM
217133640!CT0001

THK: 1
HFS



RD: 276
Tilt: 0
mA: 83
KVp: 130
Acq no: 2

Z: 1
C: 35
W: 80
DFOV: 27.6x27.6cm
Compressed 11:1
IM: 75 SE: 3

Page: 74 of 181

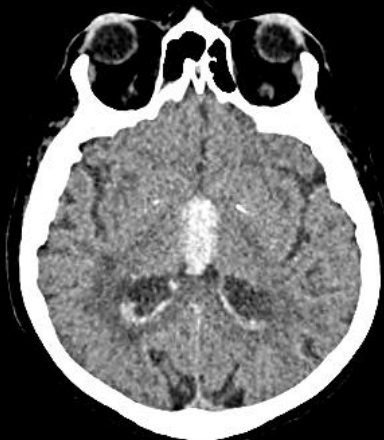
Jamila Hasan, Mohammed
1094754
1/1/1949
68 YEAR
F

88157
BRAIN CT Without Contrast
Head 1.0 MPR ax (Dup)
10/31/2017 4:11:59 PM
217133640!CT0001

THK: 1
HFS

88157
BRAIN CT Without Contrast
Head 1.0 MPR ax (Dup)
10/31/2017 4:11:51 PM
217133640!CT0001

THK: 1
HFS



RD: 276
Tilt: 0
mA: 87
KVp: 130
Acq no: 2

Z: 1
C: 35
W: 80
DFOV: 27.6x27.6cm
Compressed 11:1
IM: 89 SE: 3

Page: 88 of 181



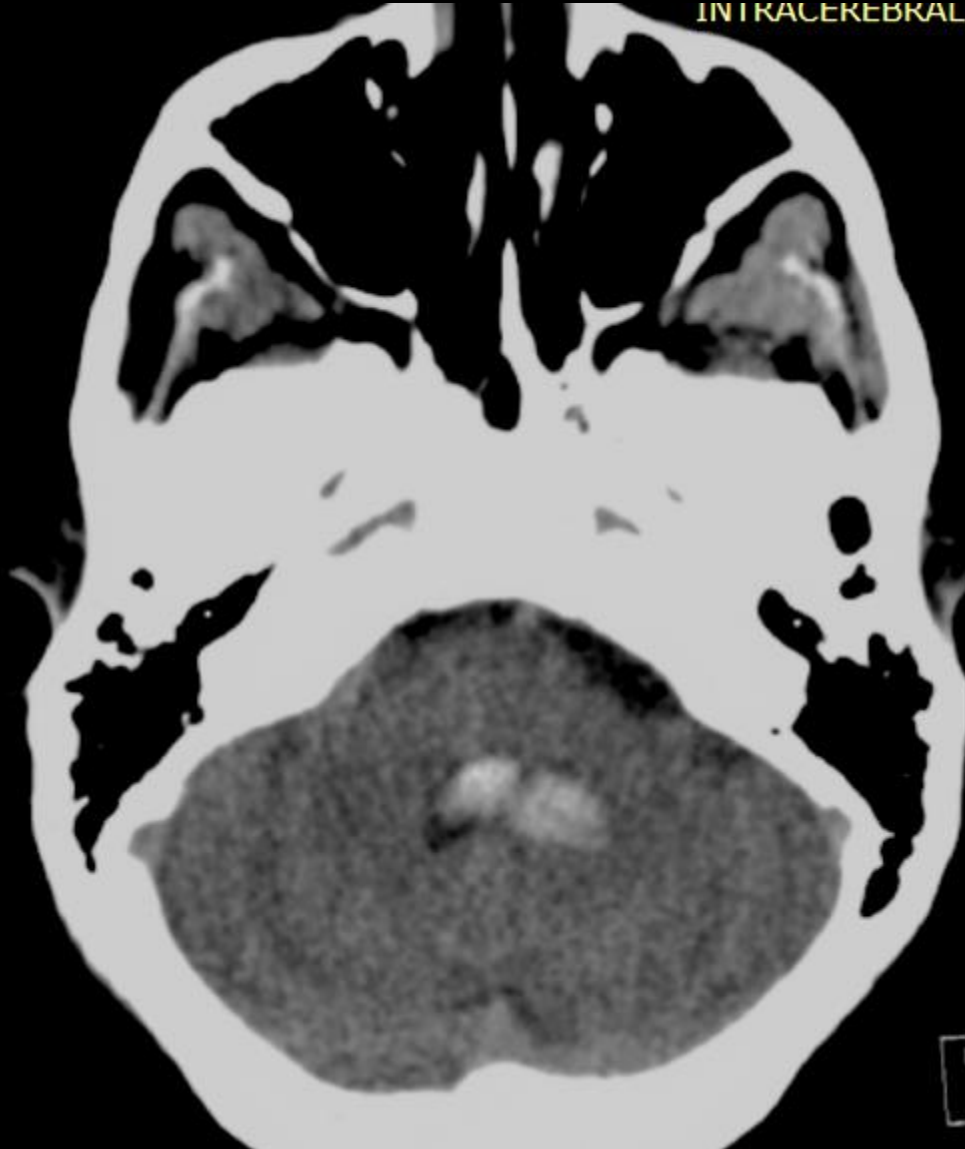
RD: 276
Tilt: 0
mA: 91
KVp: 130
Acq no: 2

Z: 1
C: 35
W: 80
DFOV: 27.6x27.6cm
Compressed 11:1
IM: 123 SE: 3

Page: 122 of 181



INTRACEREBRAL AI



02-FEB-2009
00:40:59.16

INTRACEREBRAL AND INTRAVENTRICULAR HEMORRHAGE

M

SID_II_00000014



WL: 3436 WW: 2005 [D]
A 13

6/10/2016 1:01:01 AM

02-FEB-2009
00:40:56.12

SID_II_00000014



WL: 3436 WW: 2005 [D]
A 12

6/10/2016 1:01:01 AM

Primary intra-axial injuries → intraparenchymal hematoma

HTN → MCC

Includes:

Diffuse axonal injury

Cortical contusion

Intracerebral hematoma

Brain stem injury

\ Cortical contusion

Mechanism: when the brain forcibly impacts the irregular surface of the overlying skull, which typically occurs at (coup injury) or opposite (contrecoup) the site of blunt trauma.

Contusions frequently contain hemorrhagic foci ranging in size from punctate cortical surface petechiae to much larger confluent regions of hemorrhage occupying an entire lobe.

Cortical contusion

Imaging Features

Multifocal and bilateral, usually involving the superficial grey matter.

Location:

Anterior temporal lobes, 50% (adjacent the petrous bone and posterior to the greater *sphenoid wing*)

Frontal lobes, 30% (superior to the *cribriform plate*, orbit roof and lesser *sphenoid wing*)

CT appeared as irregular hyperdense foci at gyral surfaces with associated areas of surrounding vasogenic edema

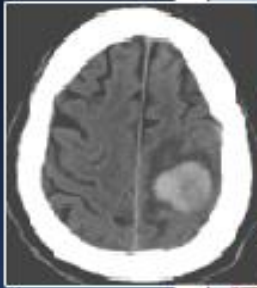
Intraparenchymal hematomas

Mechanism: result from injury to intraparenchymal arteries or veins secondary to rotational strain or penetrating trauma .

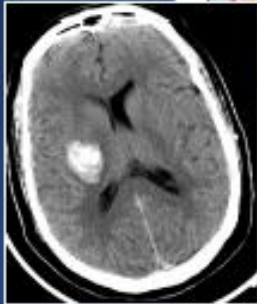
Intraparenchymal hematomas are usually located **deeper** in the brain parenchyma compared with cerebral contusions, but hematomas may also develop from a superficial cortical contusion.

intracerebral hemorrhage of HTN

**A) Lobar
Subcortical
Hemorrhage
(~20-30%)**



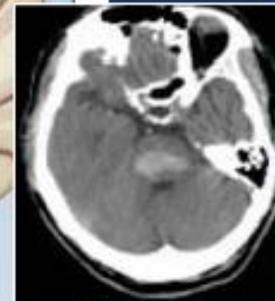
**B) Putaminal
Hemorrhage
(~40-50%)**



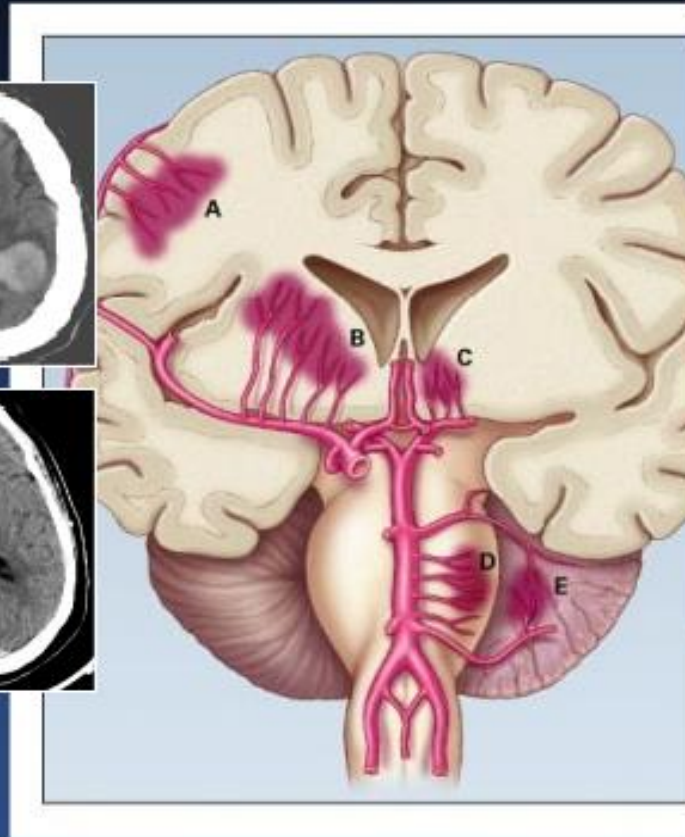
**C) Thalamic
Hemorrhage
(~20-30%)**



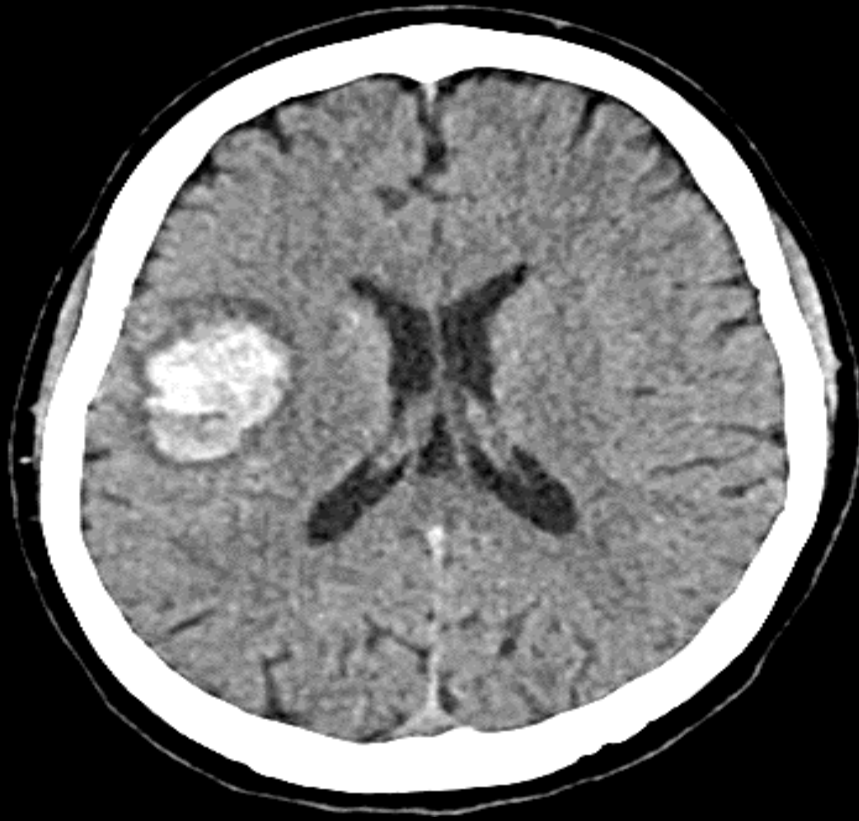
**D) Pontine
Hemorrhage
(~8%)**



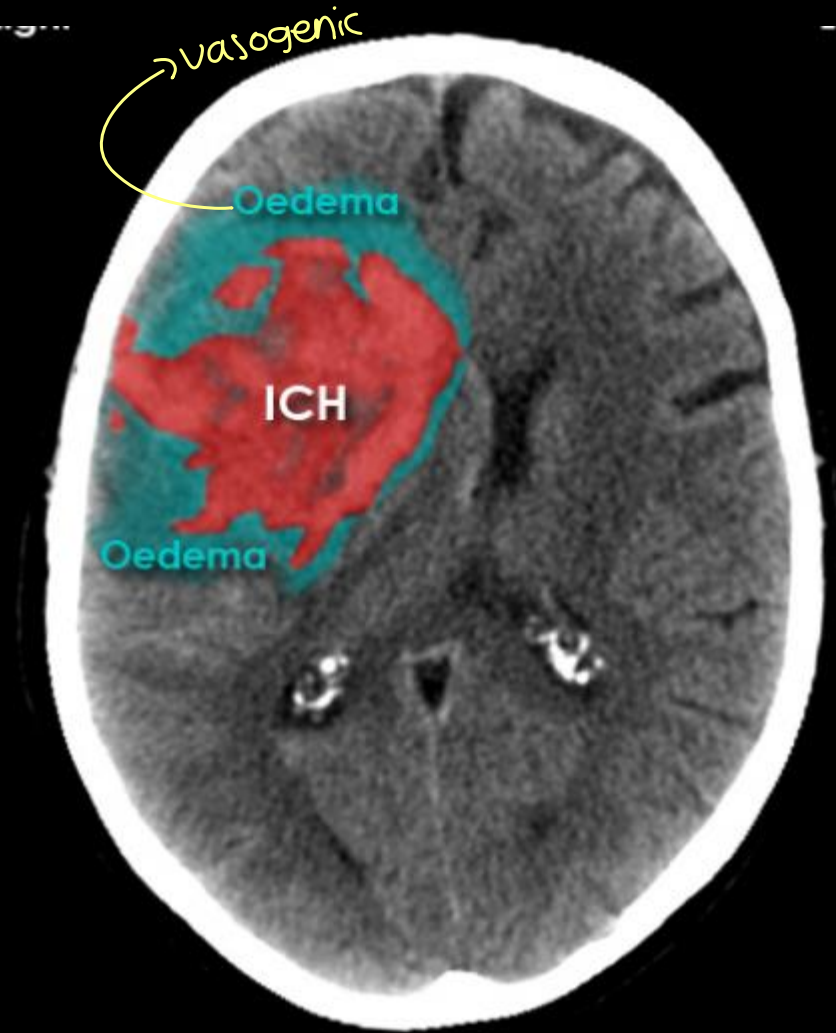
**E) Cerebellar
Hemorrhage
(~8%)**



Mayer SA, Rincon F. *Lancet Neurol.* 2005;4:662-672.
Qureshi AI, et al. *N Engl J Med.* 2001;344:1450-1460.
Terayama Y, et al. *Stroke.* 1997;28:1185-1188.



acute putamenal haematoma





Se: 1 INTRACEREBRAL AND INTRAVENTRICULAR HEMMORAGE
M

SID_II_00000014

WL: 3444 WW: 1852 [D]

Z4awa

5/10/2016 1:01:01 AM





36.1
JUL-2007
56:56.98

INTRACRANIAL INTRAVENTRICULAR HEMORRHAGE

M

SID_II_00000014

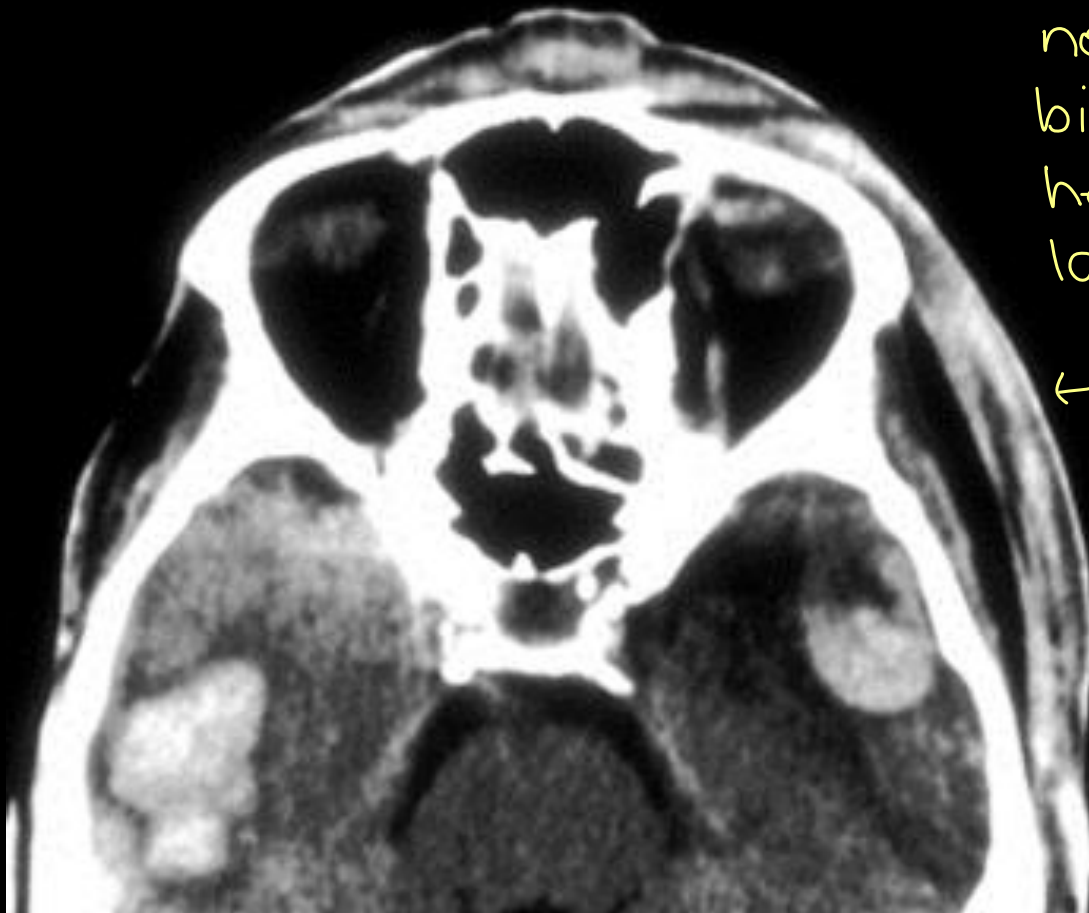


173.5

WL: 3036 WW: 1721 [D]

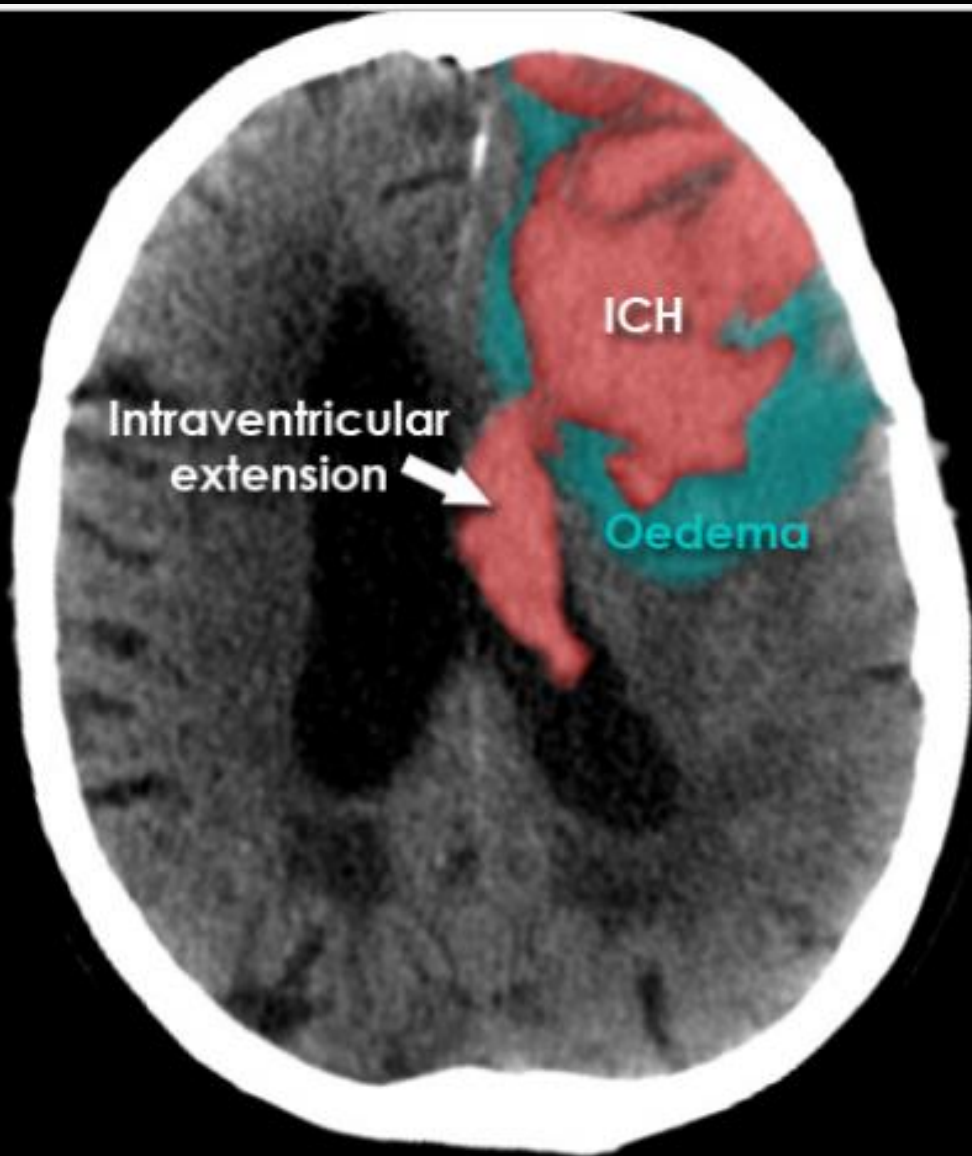
W
C

6/10/2016 1:01:01 AM



non-traumatic
bilateral
herpes enceph.
late stage "





Intracerebral & intraventricular hemorrhage



F

218003775!CT000

THK:
HF

R

RD: 175
Tilt: 0
mA: 280
KVp: 130

Z:
C: 3
W: 8



Se: 1

14073

13-Apr-1980, M, 34Y

13-Apr-2014

13:32:51.95

IMA 5

SPO 2

INTRACEREBRAL AND INTRAVENTRICULAR HEMMORAGE

Le

CT

H-S

SID_IL_00000014



RPF

kV 120

mAs 329

ref.mAs 410

TI 1.0

WL: 3550 WW: 2000 [D]

SI 0.0

SL 7.0



6/10/2016 1:01:01 AM

Im: INTRACEREBRAL INTRACEREBRAL AND INTRAVENTRICULAR HEMMORAGE
Se: 1
13-Apr-2014
03:33:02.34
4 IMA 16
SPO 2



SID: II_00000014

RPF

kV 120
mAs 329
ref.mAs 410
TI 1.0
GT 0.0
SL 7.0
WL: 3550 WW: 2000 [D]
H31s S201C0 Z4awa

6/10/2016

Im: INTRACEREBRAL INTRACEREBRAL AND INTRAVENTRICULAR HEMMORAGE
Se: 1
13-Apr-2014
03:32:57.25
4 IMA 11
SPO 2



RPF

kV 120
mAs 329
ref.mAs 410
TI 1.0
GT 0.0
WL: 3550 WW: 2000 [D]
246

Im: INTRACEREBRAL INTRACEREBRAL AND INTRAVENTRICULAR HEMMORAGE
Se: 1
13-Apr-2014
03:32:55.11
4 IMA 9
SPO 2



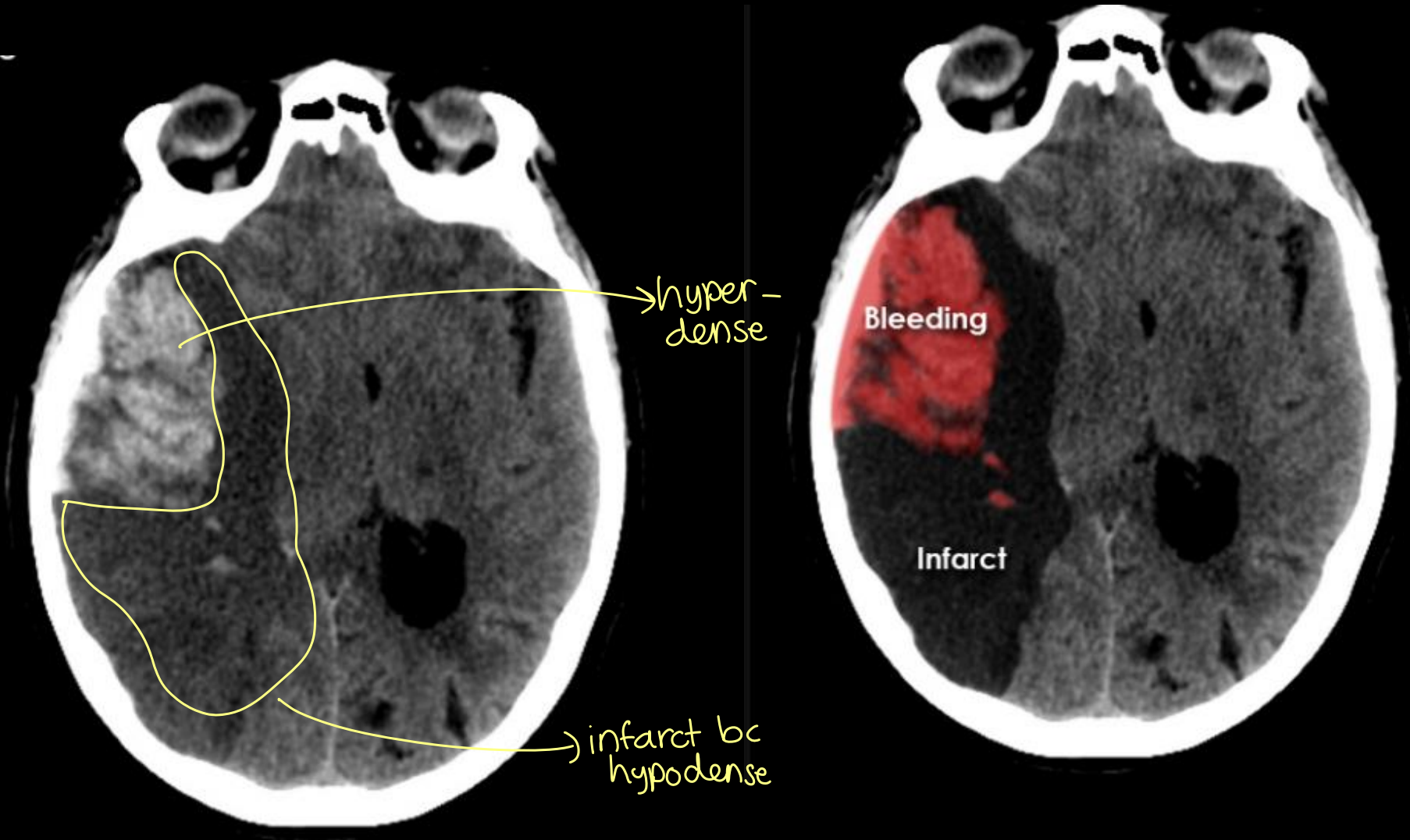
SID: II_00000014

RPF

kV 120
mAs 329
ref.mAs 410
TI 1.0
GT 0.0
WL: 3550 WW: 2000 [D]

6/10/2016 1:01:01 AM

Infarct with haemorrhagic transformation



hemorrhagic transformation due to anticoagulation

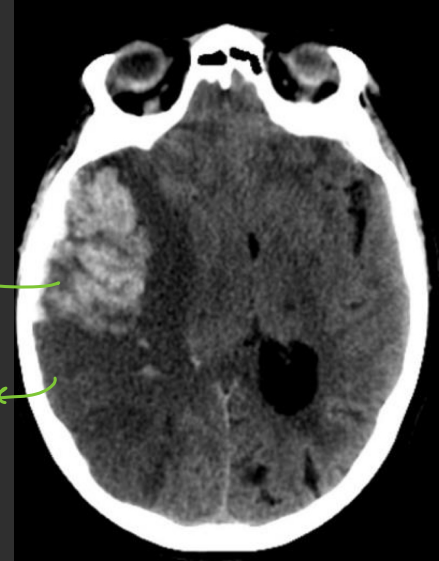
Q: how to differentiate btwn acute on top of chronic & hemorrhagic transformation from an infarct?

acute on top of chronic



- layered
- crescent, crosses suture
- SDH

hemorrhagic transformation



- patchy
- matches vascular territory
- intraparenchymal hemorrhage



BRAIN CT Without Contra:
Head 1.0 D2C
5/21/2017 10:10:46 A 1/1/1943
217059736!CT000 74 YEAR
--- M
LOC: -554.1
THK:
HF

RD: 218
Tilt: 0
mA: 276
Z: 3
C: 3 KVp: 140
W: 8 Acq no: 2

DFOV:22.7x22.7c page: 92 of 192
Compressed 11:
IM: 111 SE: 5



BRAIN CT Without Contrast
Head 1.0 MPR
6/15/2017 10:27:42 AM
217069791!CT0001

THK: 1
HFS



BRAIN CT Without Contrast
Head 1.0 H30s
10/22/2017 3:36:36 PM
217119590!CT0001

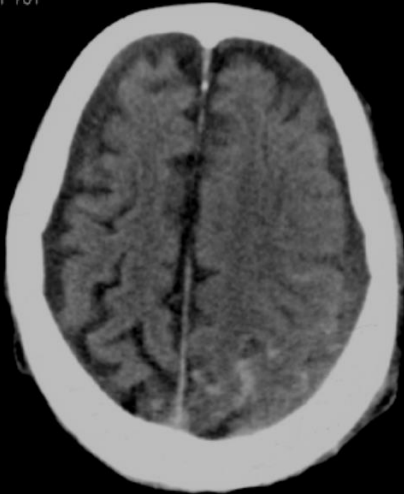
LOC: 642.40
THK: 1
HFS

Z: 1
C: 35
W: 80
DFOV:22.4x22.4cm
Compressed 11:1
IM: 88 SE: 4

Degradation of blood products with time

Different types of hemorrhage in the same patient

05-C8.33.17-DST-1.3.12.2.1107.5.1.4.60533
in-1942 M 70Y
1-2012
16.51
19
5
90.6



SUBARCHNOID HEMMORAGE
SUBARCHNOID HEMMORAGE

05-C8.33.17-DST-1.3.12.2.1107.5.1.4.60533
an-1942 M 70Y
1-2012
14.02
16
5
269.3



SUBARCHNOID HEMMORAGE

0
480
1
0
2/24x1.2
5-C8.33.17-DST-1.3.12.2.1107.5.1.4.60533
1-1942 M 70Y
2012
4.02
14
4.9



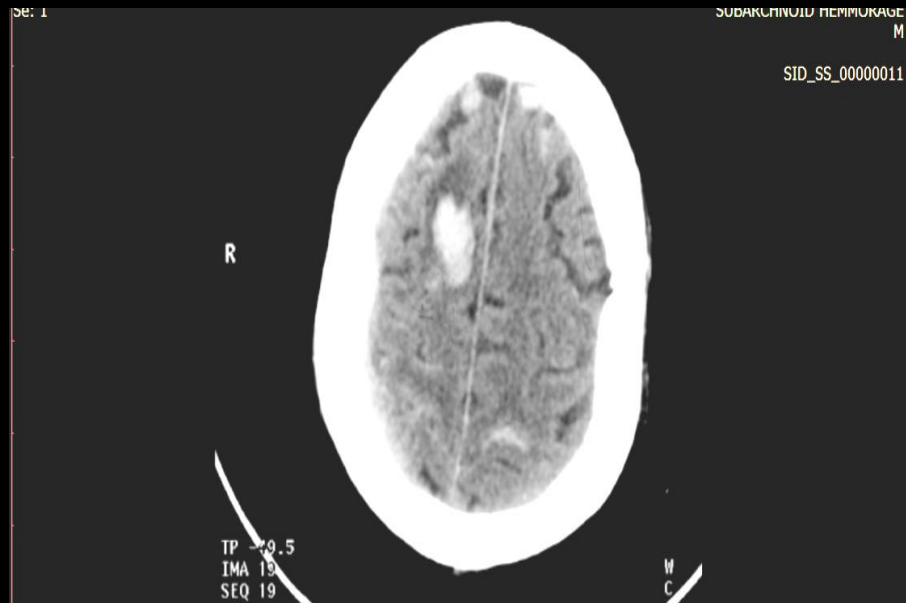
SUBARCHNOID HEMMORAGE
SUBARCHNOID HEMMORAGE

0
480
1
0
2/24x1.2
5-C8.33.17-DST-1.3.12.2.1107.5.1.4.60533
1-1942 M 70Y
2012
0.52
1
3.6



SUBARCHNOID HEMMORAGE
SUBARCHNOID HEMMORAGE

Another example



Cephalohematoma

Traumatic subperiosteal haematomas of the skull that are usually caused by birth injury. They are bound between the periosteum and cranium, and therefore cannot cross sutures. Being bound by a suture line distinguishes them from subgaleal haematoma, which can cross sutures.

subperiosteal vs. subgaleal
bound by suture line crosses suture line

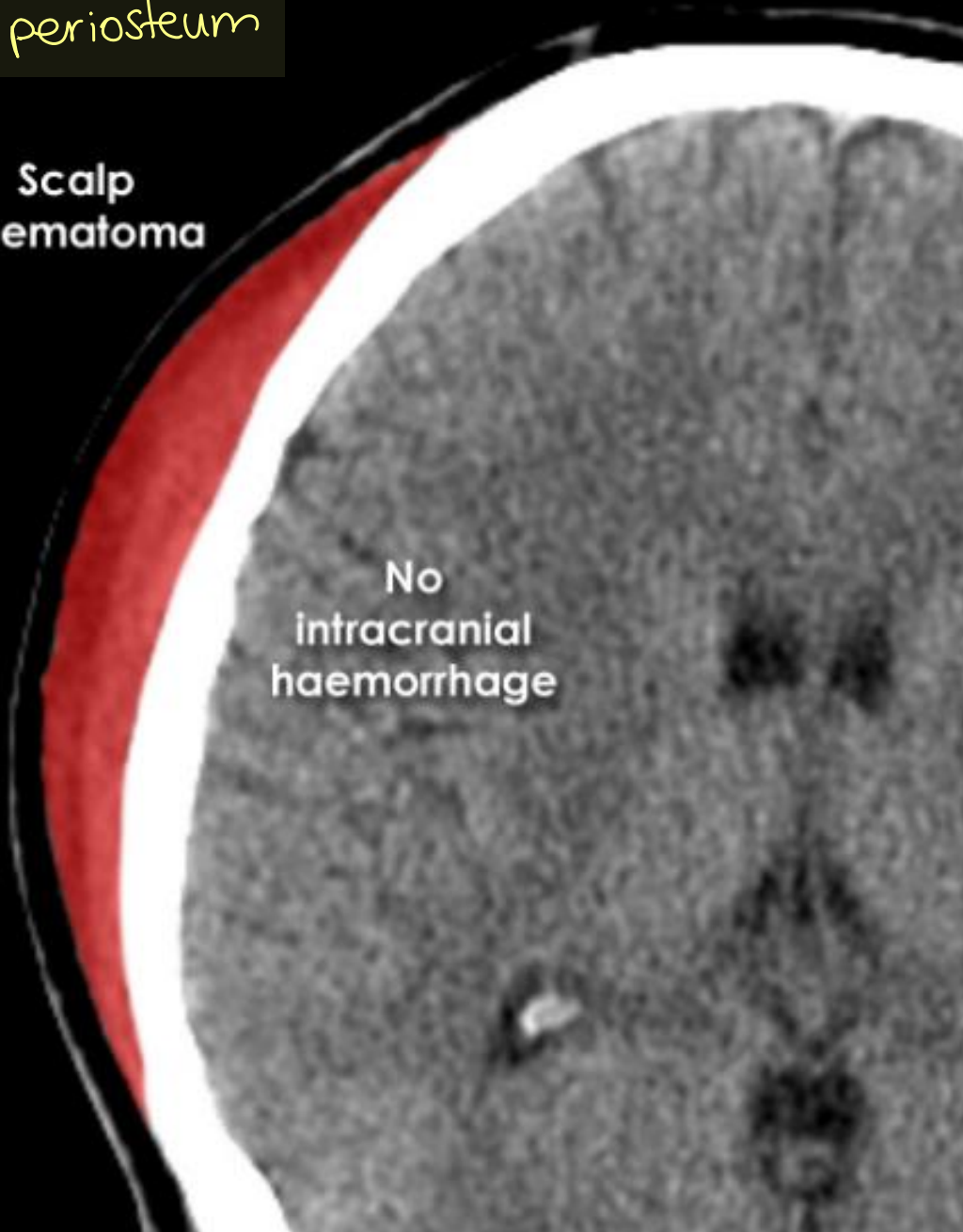
Feature	Cephalohematoma	Scalp hematoma
Space	Subperiosteal	Subgaleal (superficial to periosteum)
Crosses sutures?	✗ No	✓ Yes
Common cause	Birth trauma	Any scalp trauma
Spread	Limited to one bone	Can spread widely

above periosteum

subgaleal =

Scalp
haematoma

No
intracranial
haemorrhage



Cephalo-hematoma



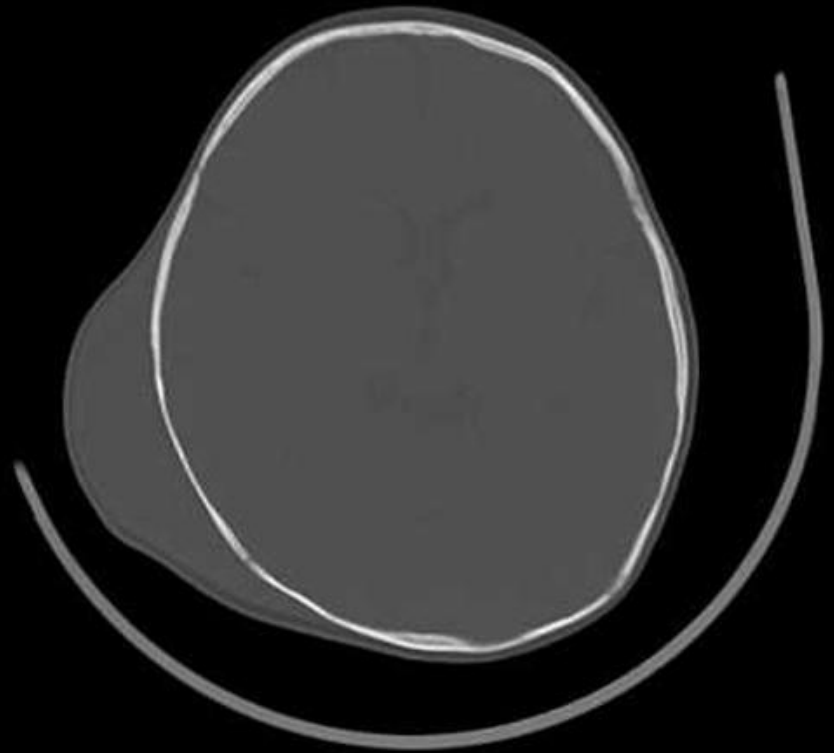
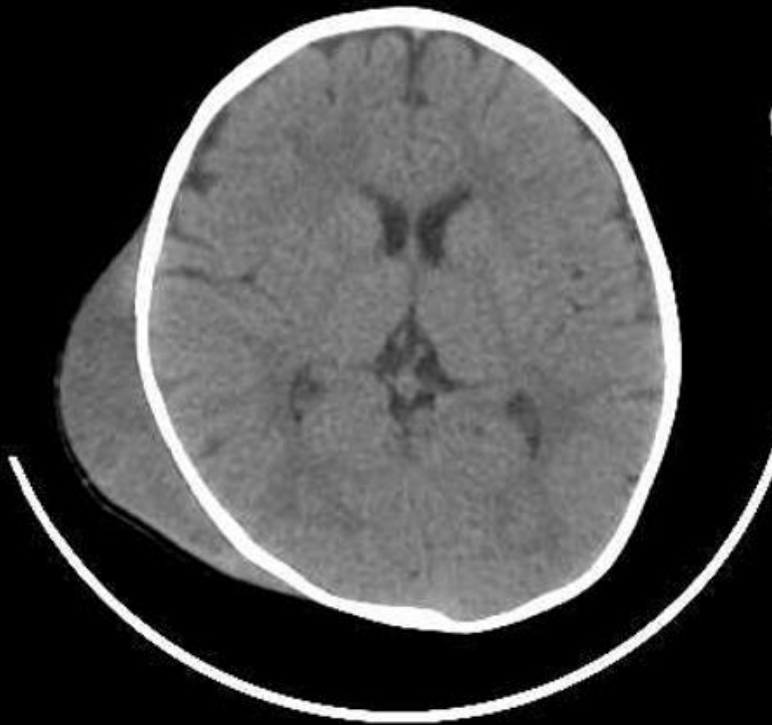
Subgaleal hematoma

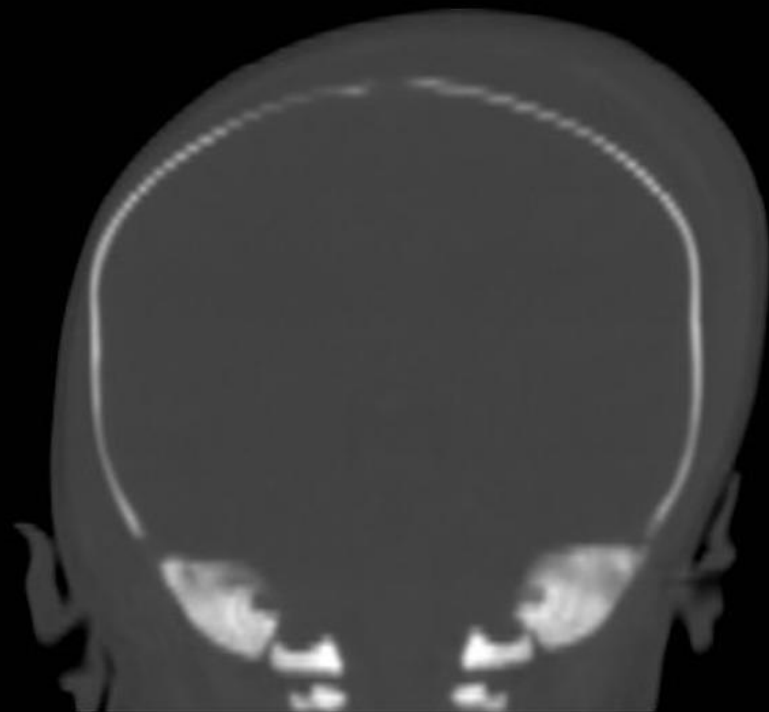
Describes scalp bleeding in the potential space between the periosteum and the galeal aponeurosis. It is a rare but possibly **lethal emergency**.

Bleeding occurs as a result of rupture to emissary veins which drain the scalp veins into the dural sinuses

Due to being superficial to the periosteum, subgaleal haematomas are able to cross suture lines and surround the entire skull.

Subgaleal hematoma





Calcification hyper

- Normal variation
- Pathological :

Penial gland
& choroidal plexus
calcification
NL in young

1- AVM

2- Infection (congenital in pediatrics)

3- Tumors

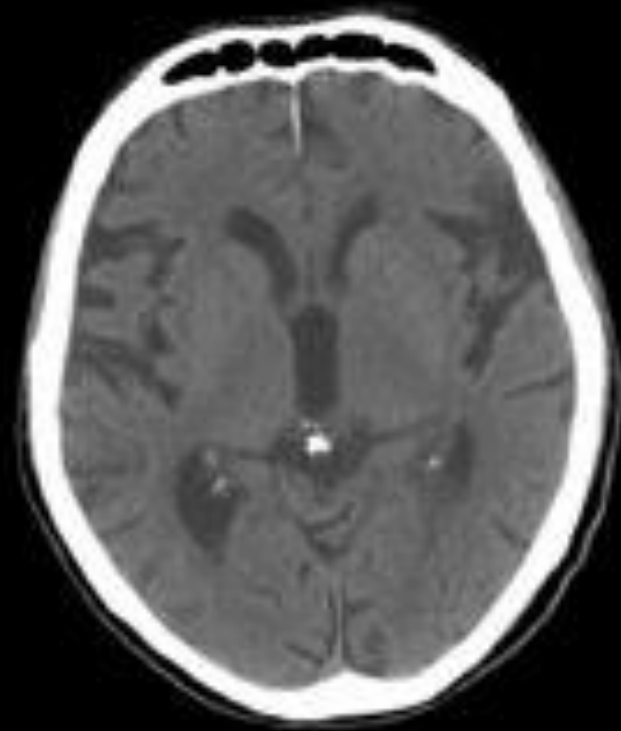
4 – metabolic CKD

Calcification

1- Normal variation/ normal aging *not young*

basal ganglia , vascular calcifications , Choroid plexus
, Pineal gland , dentate nucleus , calcified falx .

Choroid plexus and Pineal gland

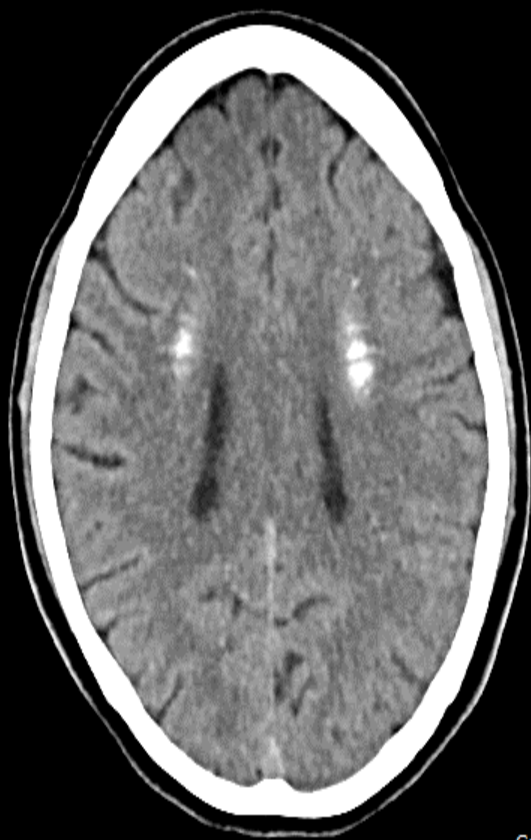


Basal ganglia



Basal ganglia



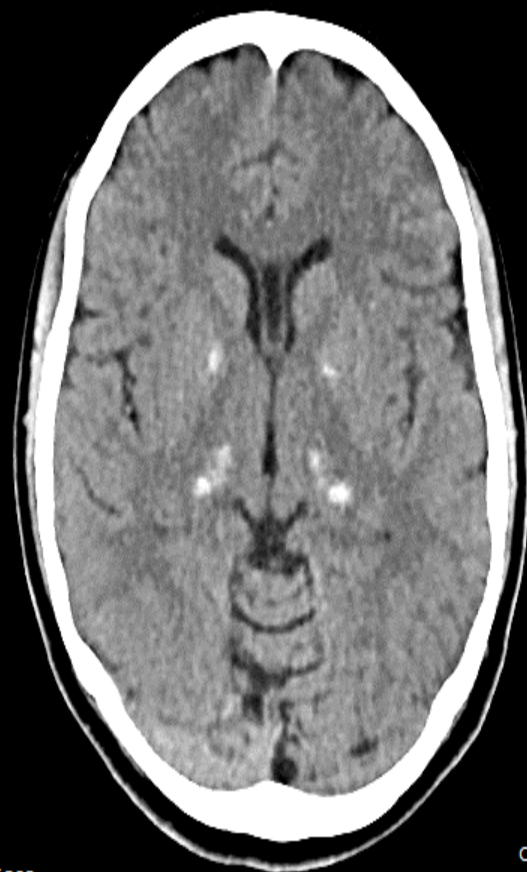


Page: 103 of 382



Compressed 11:1
IM: 65 SE: 3

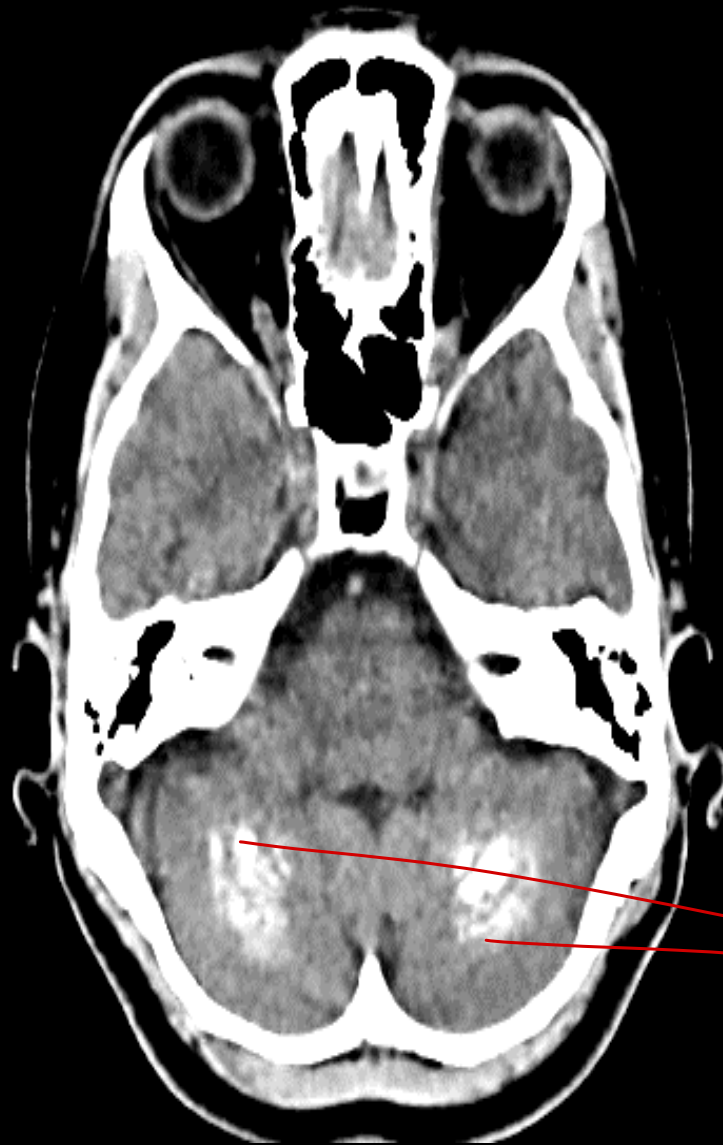
Page: 129 of 382



Compressed 11:1
IM: 91 SE: 3



Dentate nucleus



dentate

vascular calcification

JOR

+



F

Pathological Calcification

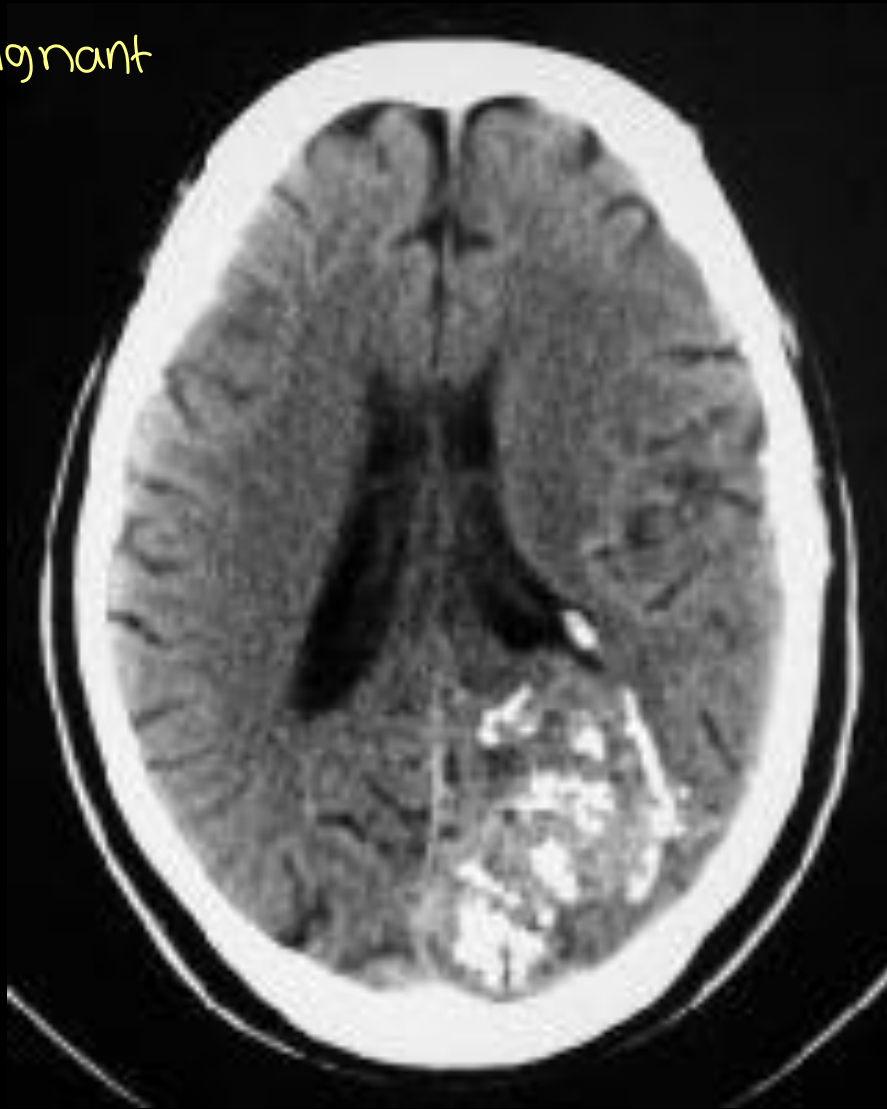
AVM

benign

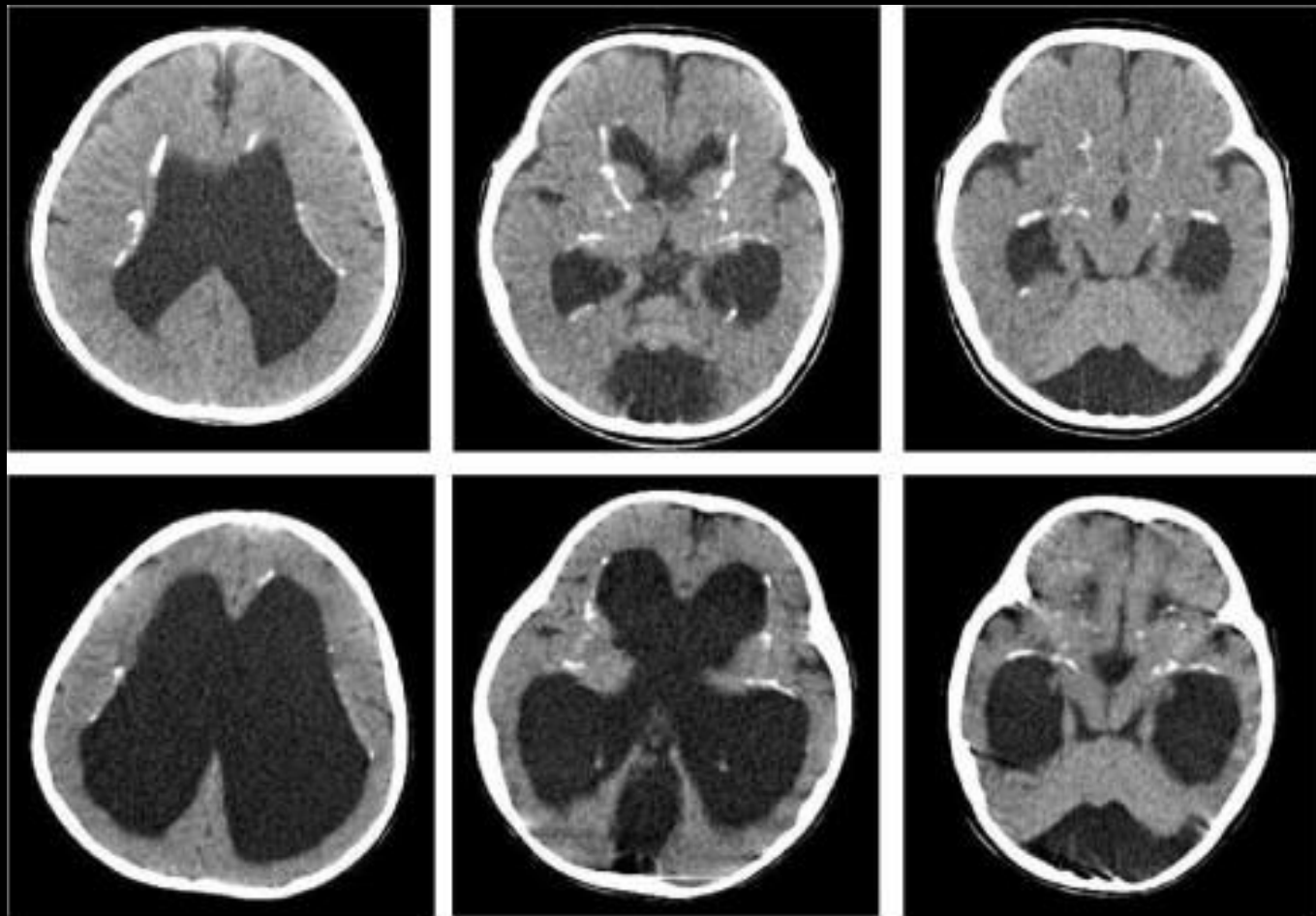


AVM

malignant



Infection (congenital) : TORCH → Toxoplasmosis
Others (e.g., syphilis, varicella, HIV, Zika)
Rubella
Cytomegalovirus (CMV)
Herpes simplex virus (HSV)



Im: 49/180
Se: 1

2011, F, 4Y
015
76



WL: 3550 WW: 2000 [D]

3 A4awa

6/10/2017 12:00:00

Test 1 Test 1
Im: 50/180
Se: 1

SID_TT_00000005

2011, F, 4Y
015
07



WL: 3550 WW: 2000 [D]

3 A4awa

6/10/2017 12:00:00 PM

Test 1 Test 1
test123
M

SID_TT_00000005

metabolic

Kidney failure

04-OCT-2008
17:15:10.11

R

TP -88.0
IMA 13

W

6/1



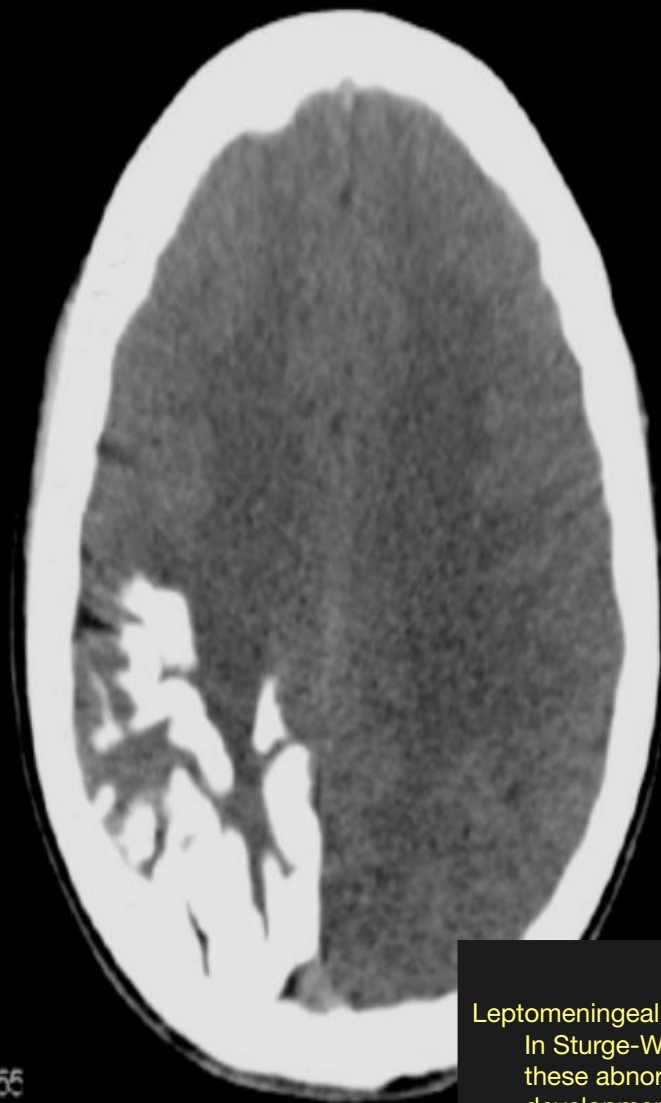
Im: 129/180
Se: 1

12
5

H-SP-CK

Test 1 Test 1
test123
M

SID_TT_00000005



Sturge weber

- Face: Port-wine stain in trigeminal distribution
- Brain: Leptomeningeal angioma → seizures, calcifications
- Eye: Glaucoma, choroidal angioma

5cm

Leptomeningeal Angiomatosis:

In Sturge-Weber syndrome, the leptomeninges are affected by these abnormal blood vessels, which can disrupt normal brain development and function.

Sturge-Weber Syndrome:

This syndrome is defined by a combination of facial port-wine stains (a type of birthmark), leptomeningeal angiomatosis, and sometimes glaucoma.

WL: 3072 WW: 2006 [D]

CU 4awa

MAJDI ALAONAH

A

JO

Im: 66/180

Se: 1

C-2006
:56.68

Tumor

SID_



intraparenchymal



benign mostly

WL: 2799 WW: 2043 [D]

6/10/2017

Tumors that usually calcifies :

Meningioma

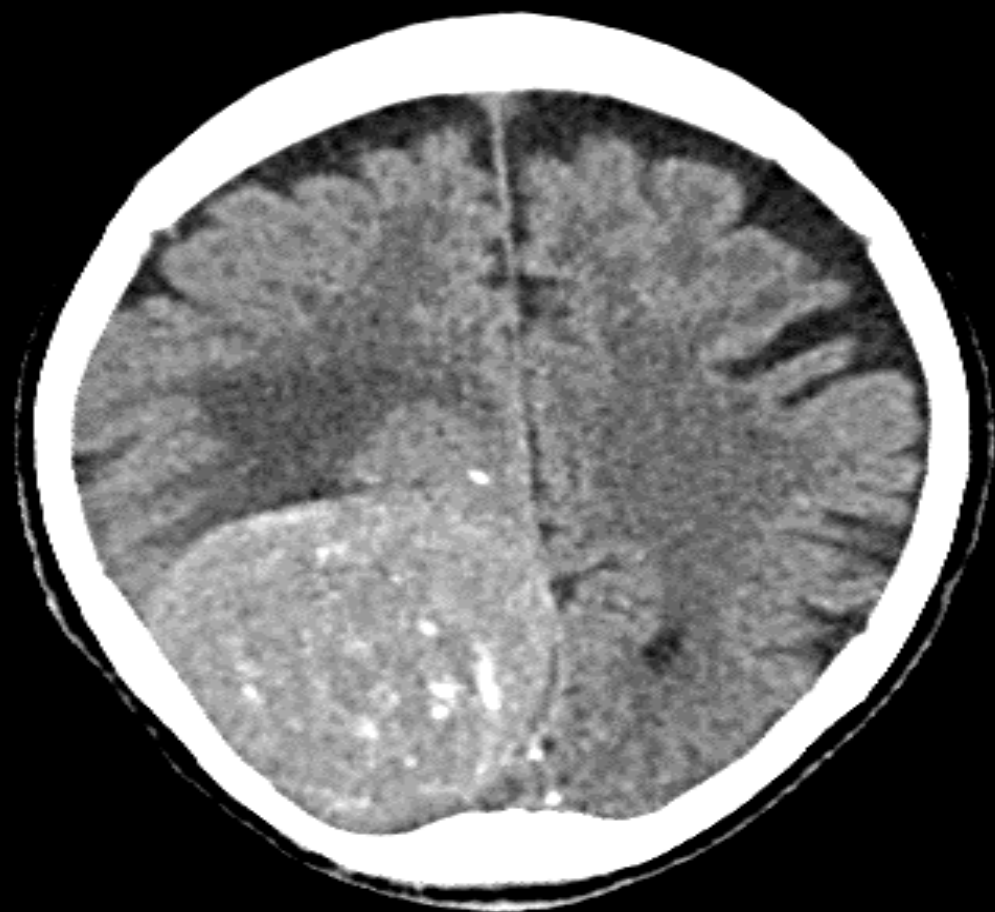
Craniopharangioma

Low grade astrocytoma

Oligodendroglioma

Meningioma





Craniopharangioma *extremities of age*

Peds & geriatric



Low grade Astrocytoma

no calcifications in high grade
bc highly aggressive, pts die
before calcification takes place



Oligodendroglioma

young, frontal lobe



Thrombosed cerebral venous
sinuses

Thrombosed cerebral venous sinuses

JORI

H



sup. sagittal sinus

Betoul Shaker, Ahmad
1084726
8/5/1999
18 YEAR
F

A

88157
BRAIN CT Without Contrast
Head 1.0 H21s
8/13/2017 9:18:37 PM
217096201!CT0001

LOC: -564.70
THK: 1
HFS

R

RD: 216
Tilt: 0
mA: 137
KVp: 130
Acq no: 2

Page: 123 of 161



p
cm

Z: 1
C: 43
W: 88
DFOV: 21.6x21.6cm
Compressed 11:1
IM: 123 SE: 3

Betoul Shaker, Ahmad
1084726
8/5/1999
18 YEAR
F

A

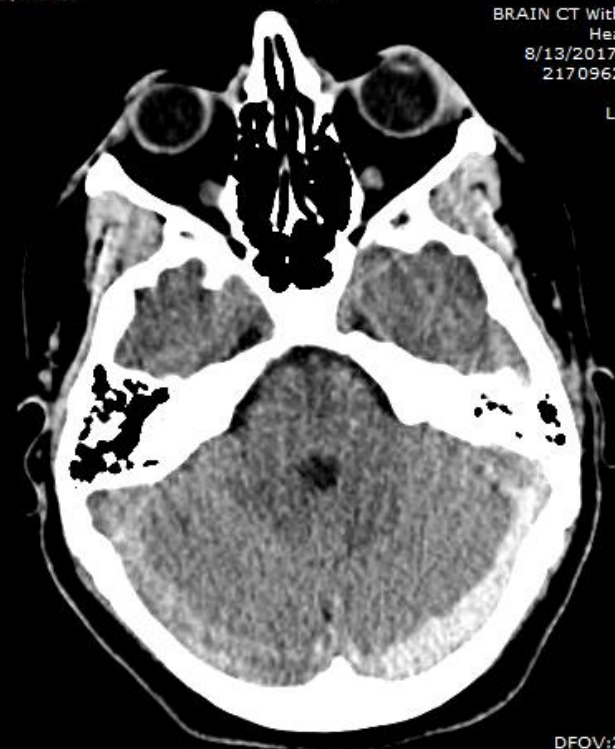
88157
BRAIN CT Without Contrast
Head 1.0 H21s
8/13/2017 9:18:15 PM
217096201!CT0001

LOC: -636.70
THK: 1
HFS

R

RD: 216
Tilt: 0
mA: 137
KVp: 130
Acq no: 2

Page: 51 of 161



p
cm

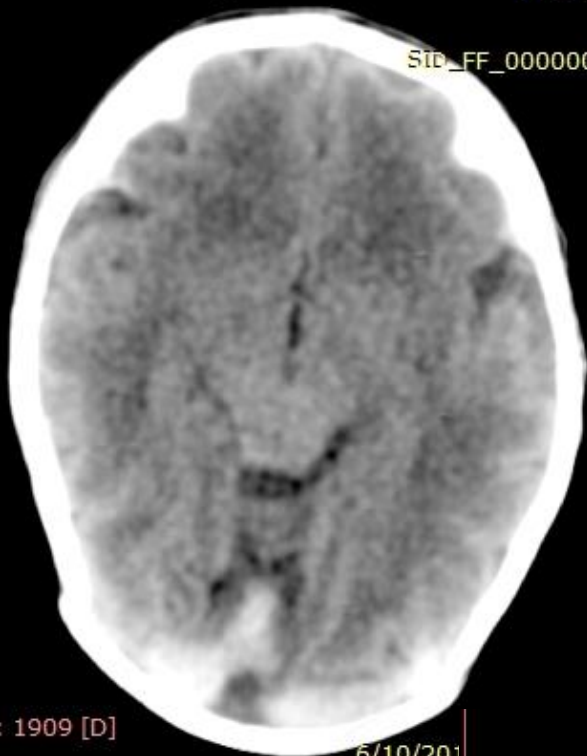
Z: 1
C: 43
W: 88
DFOV: 21.6x21.6cm
Compressed 11:1
IM: 51 SE: 3

Fetal HB

Fhb

↳ hyperdense

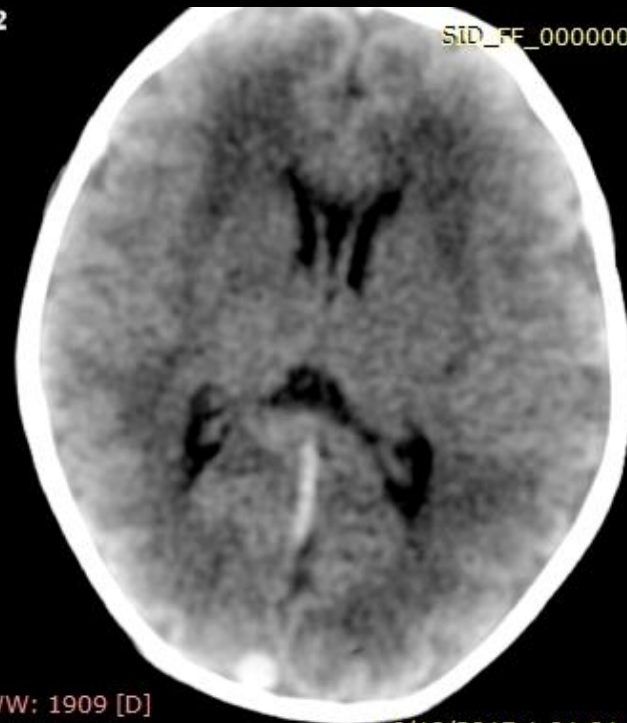
Se: 1
5-NOV-2009
1:31:23.39
A
FETAL HB
M
SID_FF_00000010



WL: 2850 WW: 1909 [D]
P -130.5
MA 10

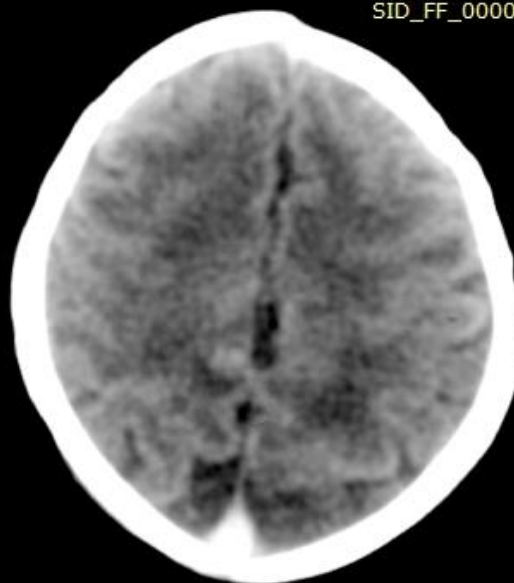
6/10/2017

1:31:31.92
SID_FF_00000010
R
P -115.5
WL: 13850 WW: 1909 [D]
MA 13
SID_FF_00000010



6/10/2017 1:01:01 AM

R



WL: 13850 WW: 1909 [D]
MA 17

6/10/2017 1:01:01 AM

SID_FF_000



Im: 47/56
Se: 1

FETAL HB FETAL HB
FETAL HB
M

SID_FF_00000010

WL: 3499 WW: 1666 [D]

6/10/2017 1:01:01 AM

HAMZEH HAJEER

Im: 44/56
Se: 1
4. M. 2D

JORDAN UNIVE

FETAL HB FETAL HB
FETAL HB
M

SID_FF_00000010



WL: 3499 WW: 1666 [D]

6/10/2017 1:01:01 AM

Contrast enhancing lesions

healthy brain → no contrast in parenchyma due to BBB

if parenchyma enhanced → pathology

Benign

Malignant

When there is breakage in BBB , there will be enhancement

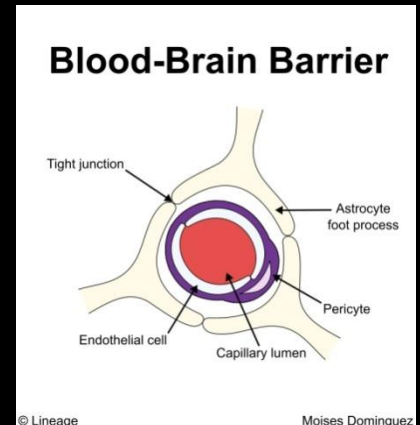
Structures that normally enhance(no BBB) :

pineal gland , pituitary gland and choroid plexus NL

→ do not calcify, but NL enhance

3P's :

Penial
Pituitary
plexus (choroid)



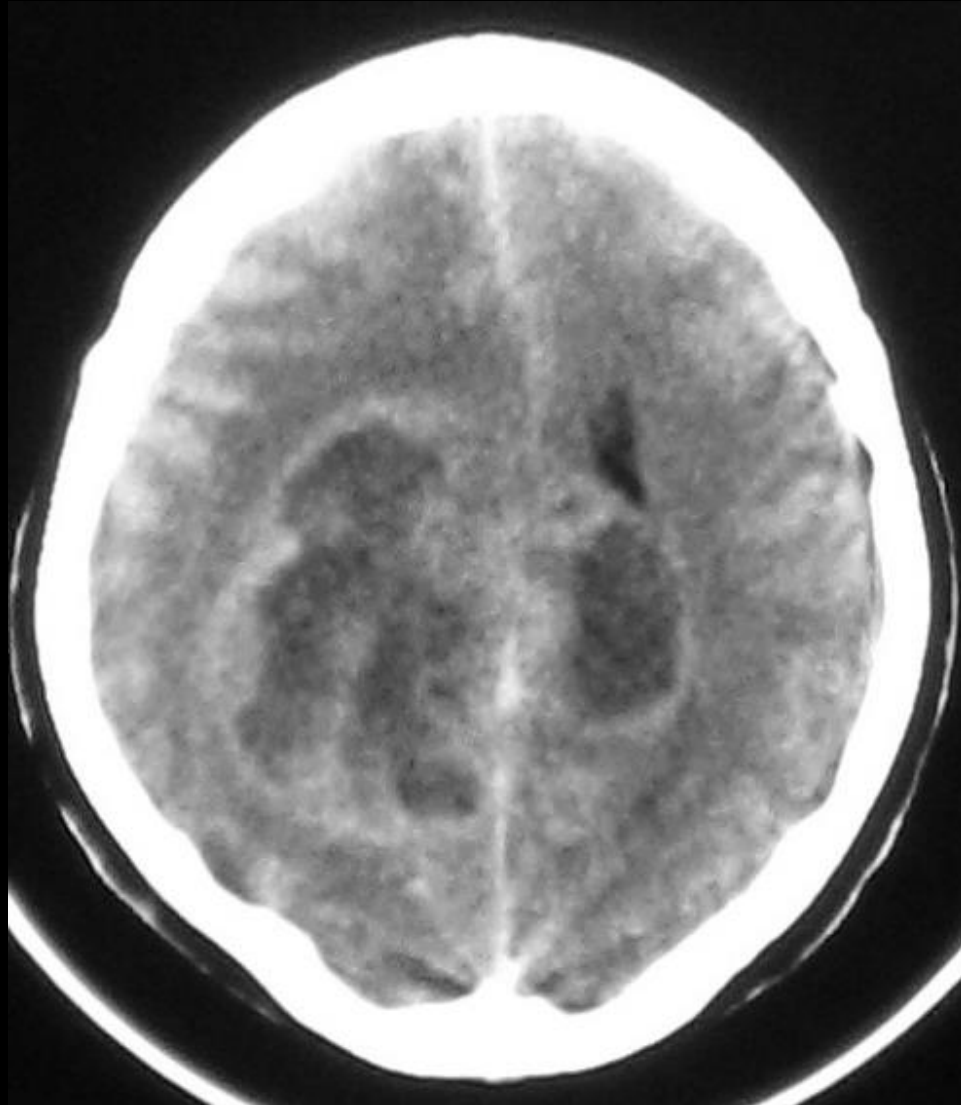
Benign: Meningioma

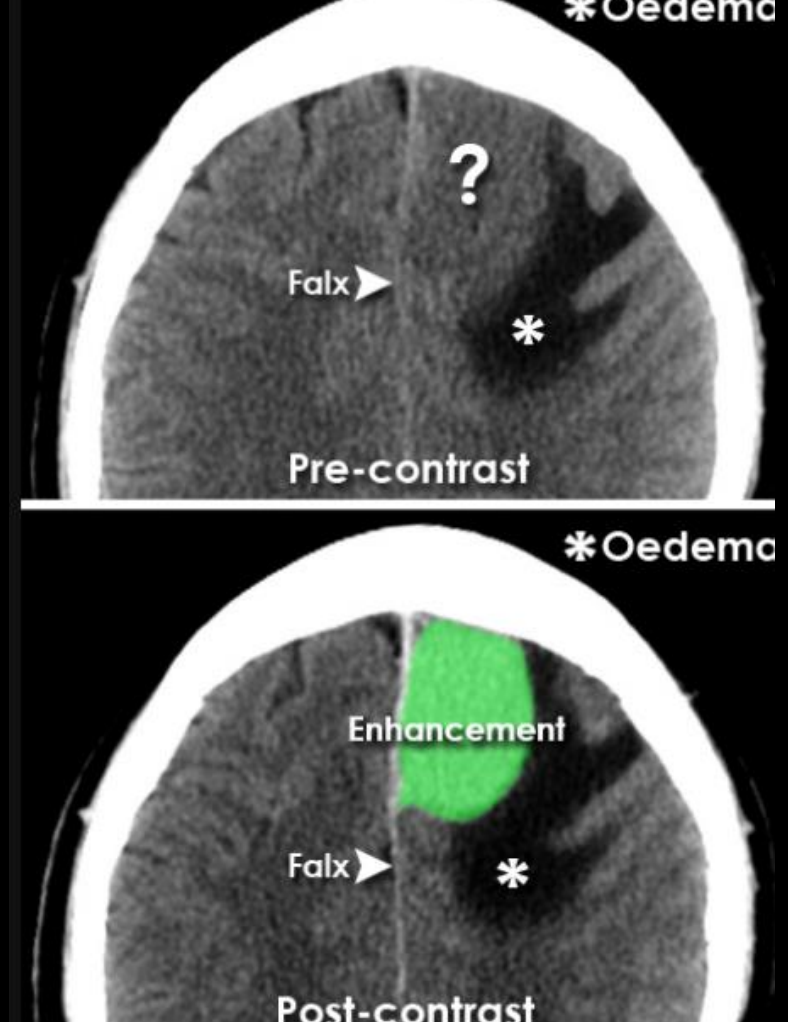
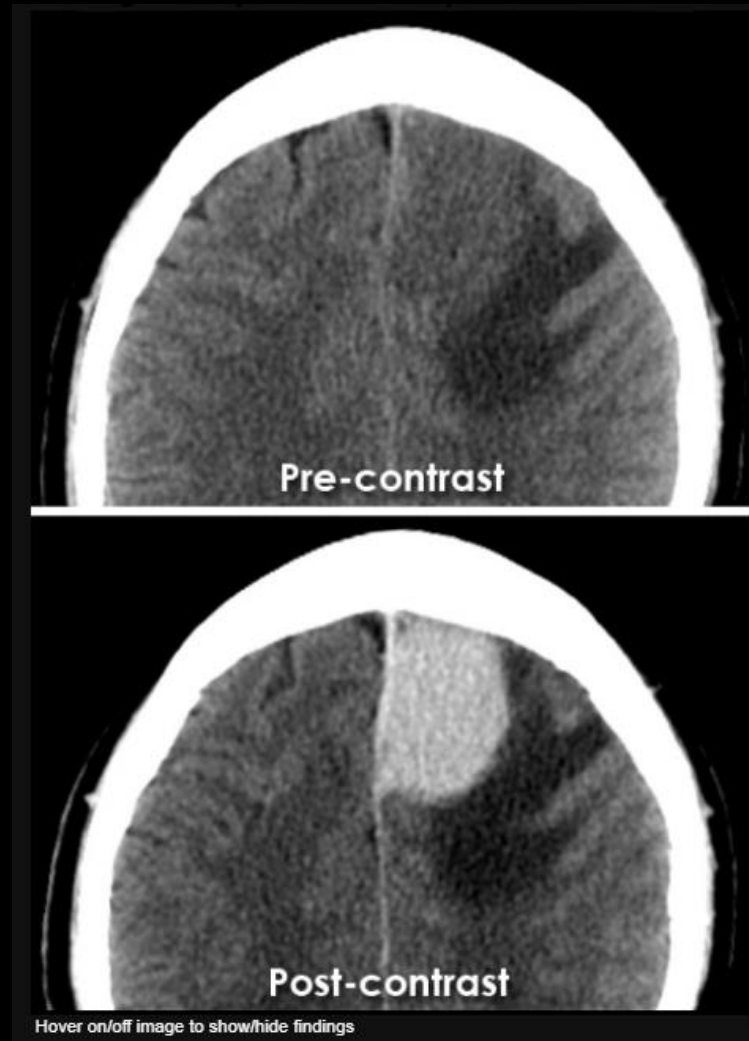


Benign: Abscess



Malignant : GBM → glioblastoma multiforme





Before contrast is given this meningioma is barely visible

Post-contrast it enhances brightly and its location next to the meningeal surface (falx) is clearly seen

Cerebral oedema - black area next to the meningioma (asterisk) - is a finding often associated with a large meningioma

Hypodense Lesions:

1- Fluid

2- air

3- Fat

Hypodense Lesions:

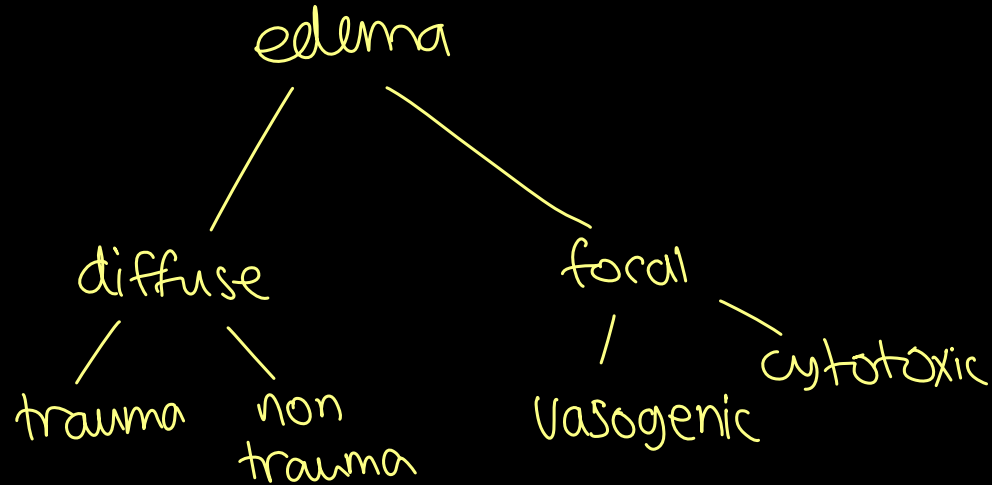
Fluid:

CSF: normal v/s hydrocephalus

Edema: vasogenic v/s cytotoxic

Diffuse brain edema

Necrotic tissue: tumor v/s abscess



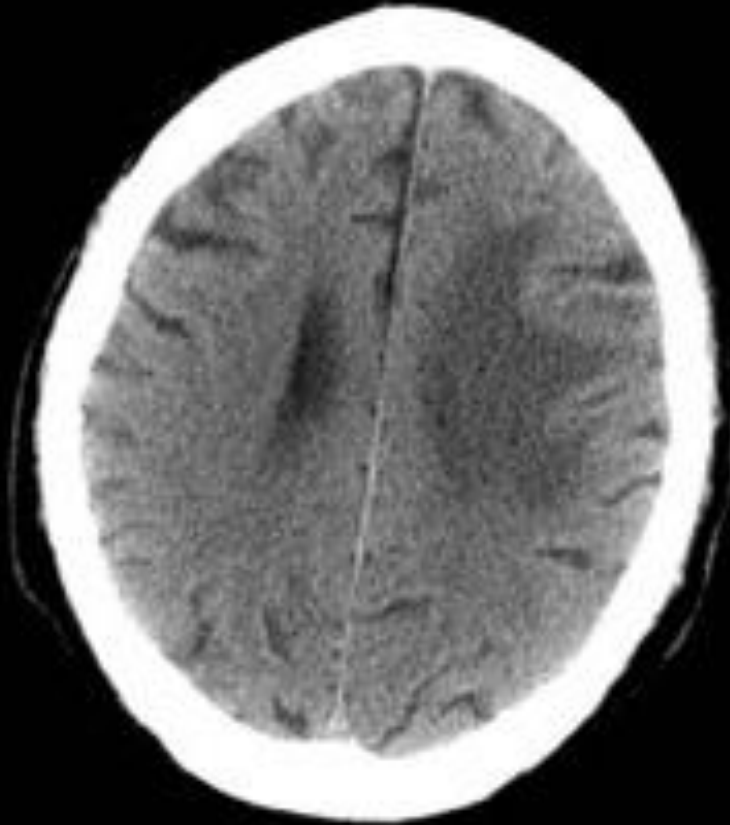
CSF: normal v/s hydrocephalus



Edema: vasogenic v/s cytotoxic
Mass lesion v/s infarction

occlusion of artery
edema in grey &
white matter

due to angiogenesis,
only in white matter



qadoml

1, F, 32Y

A

JORDAN UNIVERSITY
FOCAL EDEMA FOCAL BRAIN
FOCAL BRAIN

intradigitation ←
edema around
meningeoma

6/p0.55



Vasogenic edema

EF-2008
3:49.27

FOCAL BRAIN EDEMA INFARCT FOCAL BR
FOCAL BR



hypodensity in
territory of artery
due to occlusion

98.0
14
14

6/

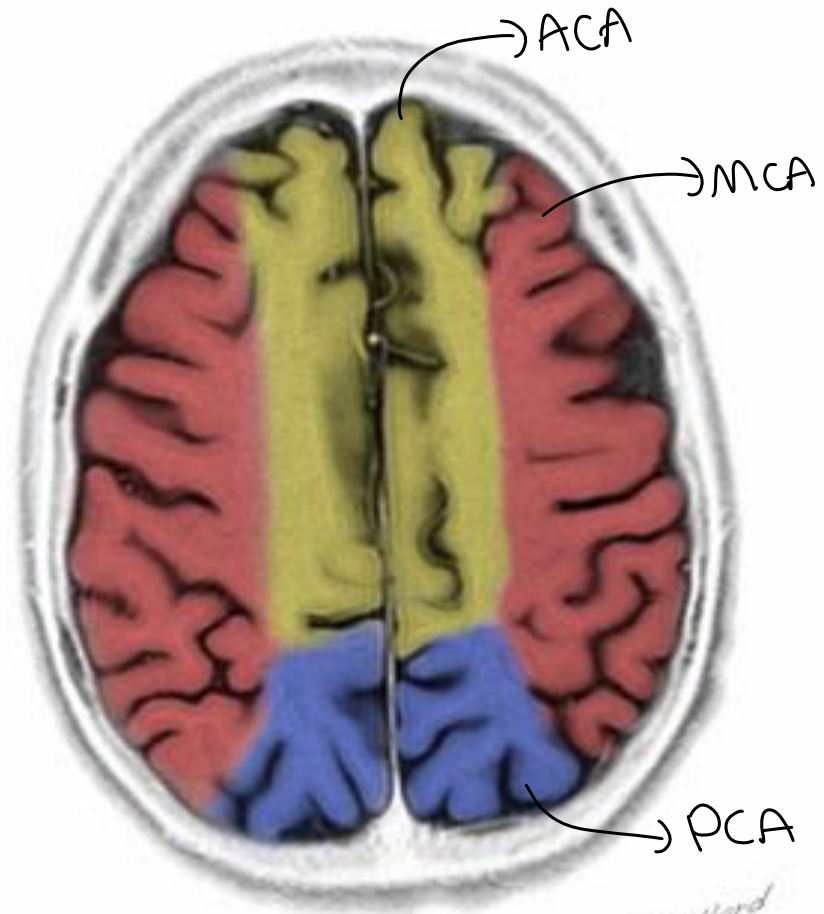
Cytotoxic edema
white & grey matter

Cerebral Vascular Territories

Anterior cerebral artery (ACA)

Middle cerebral artery (MCA)

Posterior cerebral artery (PCA)



F. Galland
200
Hollmann & Co. (H.C.)

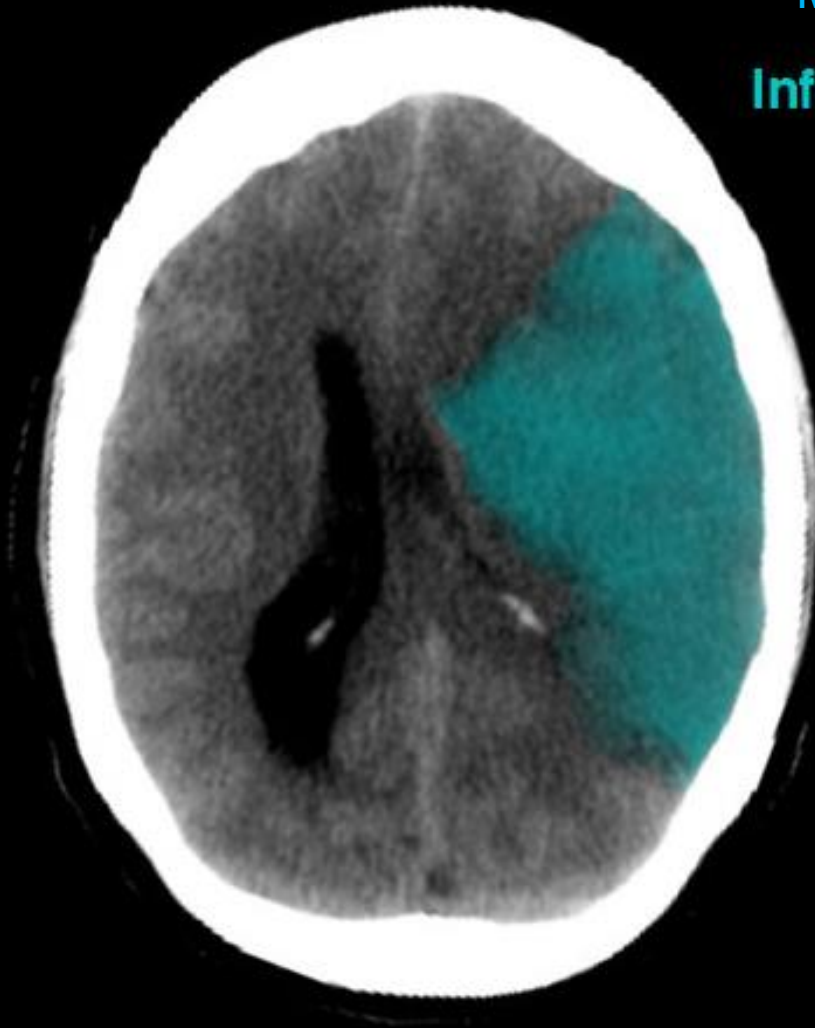
ACA INFARCT



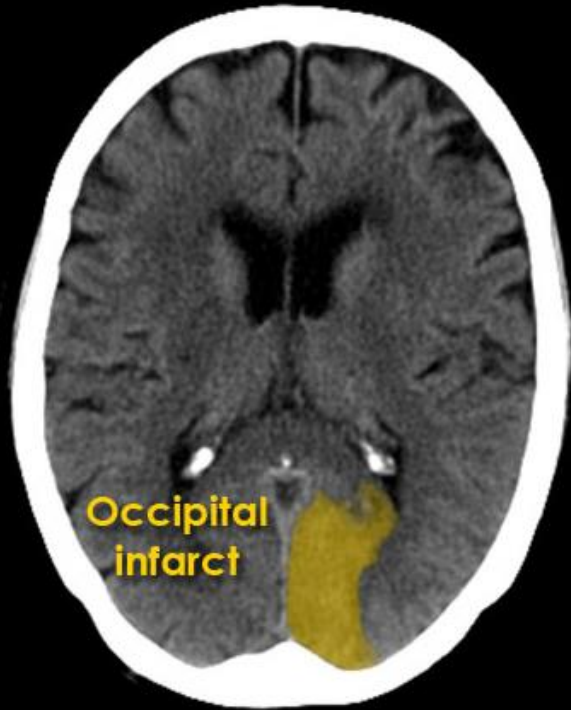
3817 :: Source: Michael Krasnokutsky :: 2003-03-22 16:2

MCA

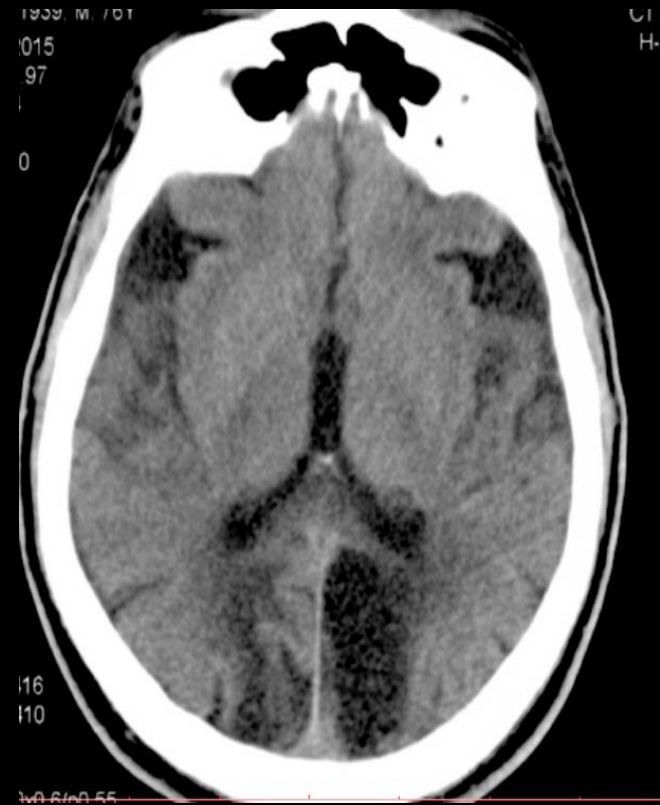
Infarct



1st PCA



PCA infarct



bilateral

:41.83

ACA

16.5

977

4

W

217107347!C

RT MCA



DFOV:21.9cm

Se: 1

-OCT-2007
:25:53.93

FOCAL BK

Rt PCA



1.10

-173.0

WL: 3030 WW: 1977

10

W

6/

lt homonymous hemianopia (ipsilateral deficit)

58 YEAR
M

13/03/2021 11:52:05
221030282!CT0001

THK: 1
HFS

left PCA

R

L

RD: 231
Tilt: 0
mA: 198
KVp: 130
Acq no: 2

Page: 90 of 154

Z: 1
C: 35
W: 80
DFOV: 23.1x23.1cm
Compressed 11:1
IM: 91 SE: 4

p
cm

27/1968, M, 45Y

7/2013

39.26.25

MA 18

12

950.5

FOCAL BRAIN EDEMA INFARCT I
I

120

mAs 410

1.0

0.0

7.C/40x0.6/p0.55

both MCA

27/1968, M, 45Y

7/2013

39.26.25

MA 18

12

950.5

FOCAL BRAIN EDEMA INFARCT

410

7.C/40x0.6/p0.55

WL: 3019 WW: 1602 [D]



Right

Left



Se: 1

12:38:11.81

FOCAL

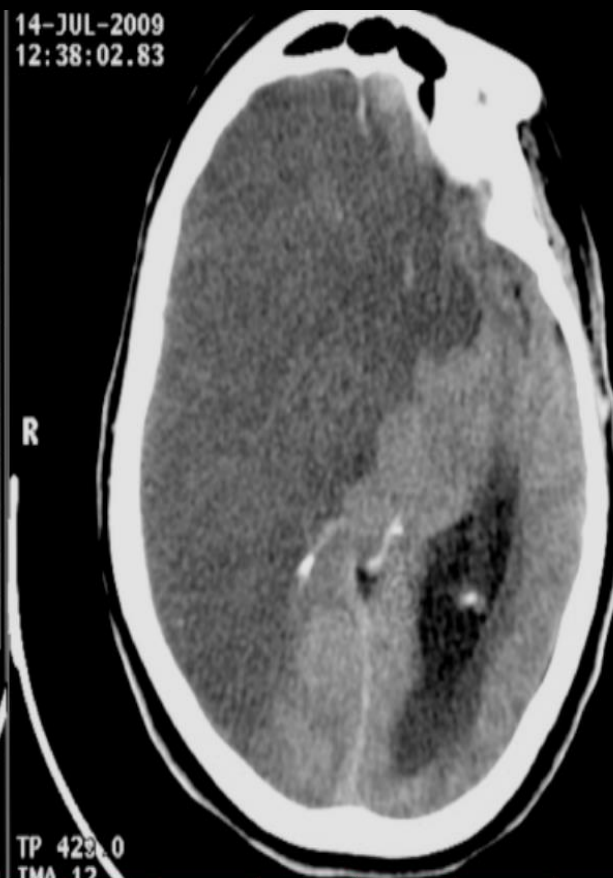


WL: 2986 WW: 2260

TP 453.0
IMA 15

14-JUL-2009
12:38:02.83

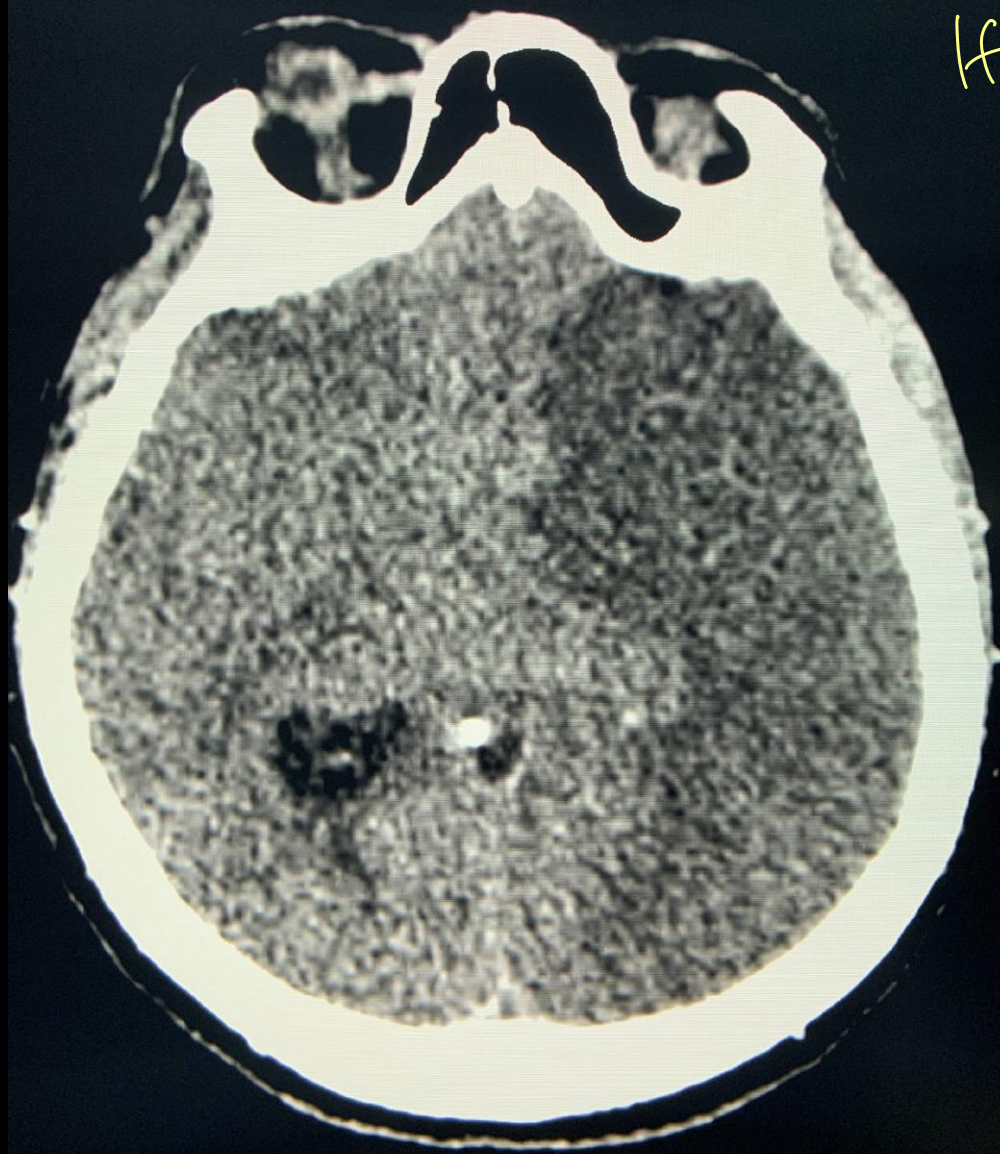
FOCAL BR



WW: 2260

TP 429.0
IMA 12

67



lft MCA

ahmoud Marawah, Saadah
180834
7/1/1936
3 YEAR

A

BRAIN CT Withou
Head 1.0 MPR
10/19/2019 6
2191397



PD: 222
Tilt: 0
mA: 189
KVp: 130
Acq no: 2

Page: 130 of 184

P

cm

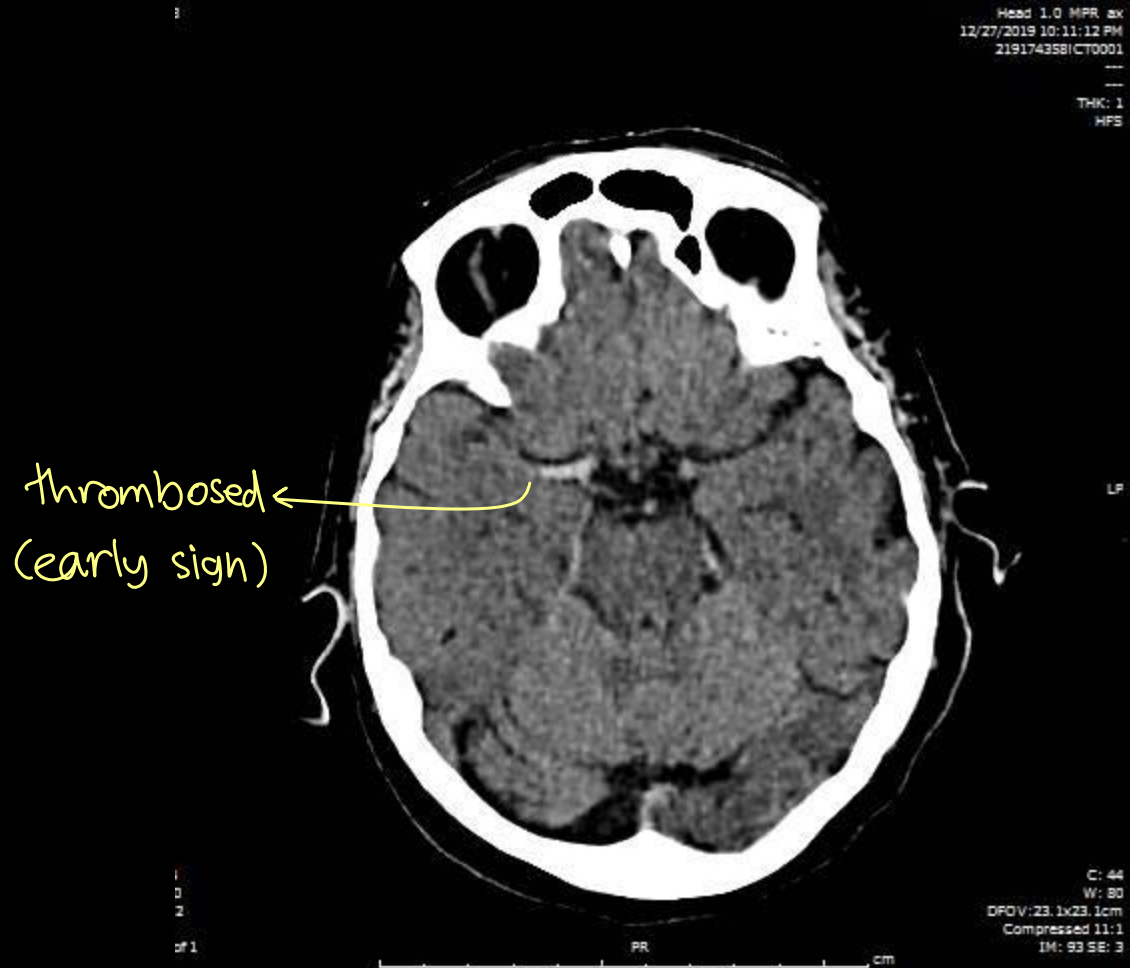
Z: c
W
DFOV: 22.2x26
Compressed
IM: 131 S

Hyperdense MCA sign

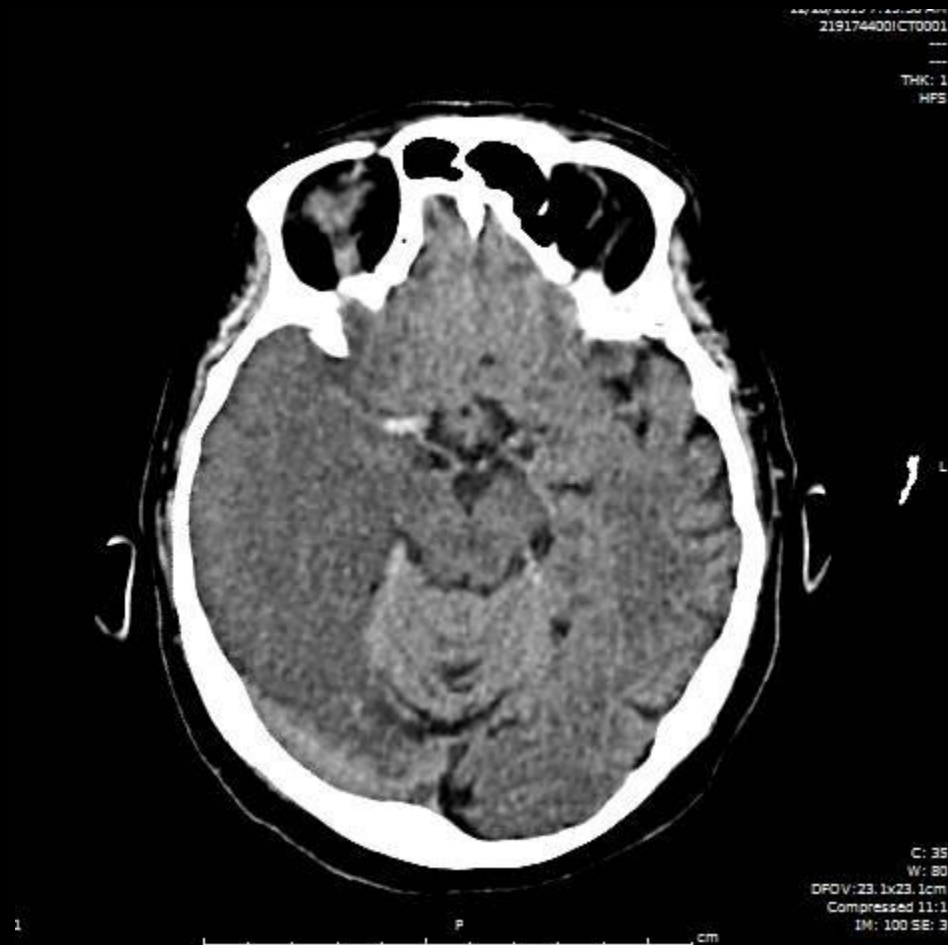


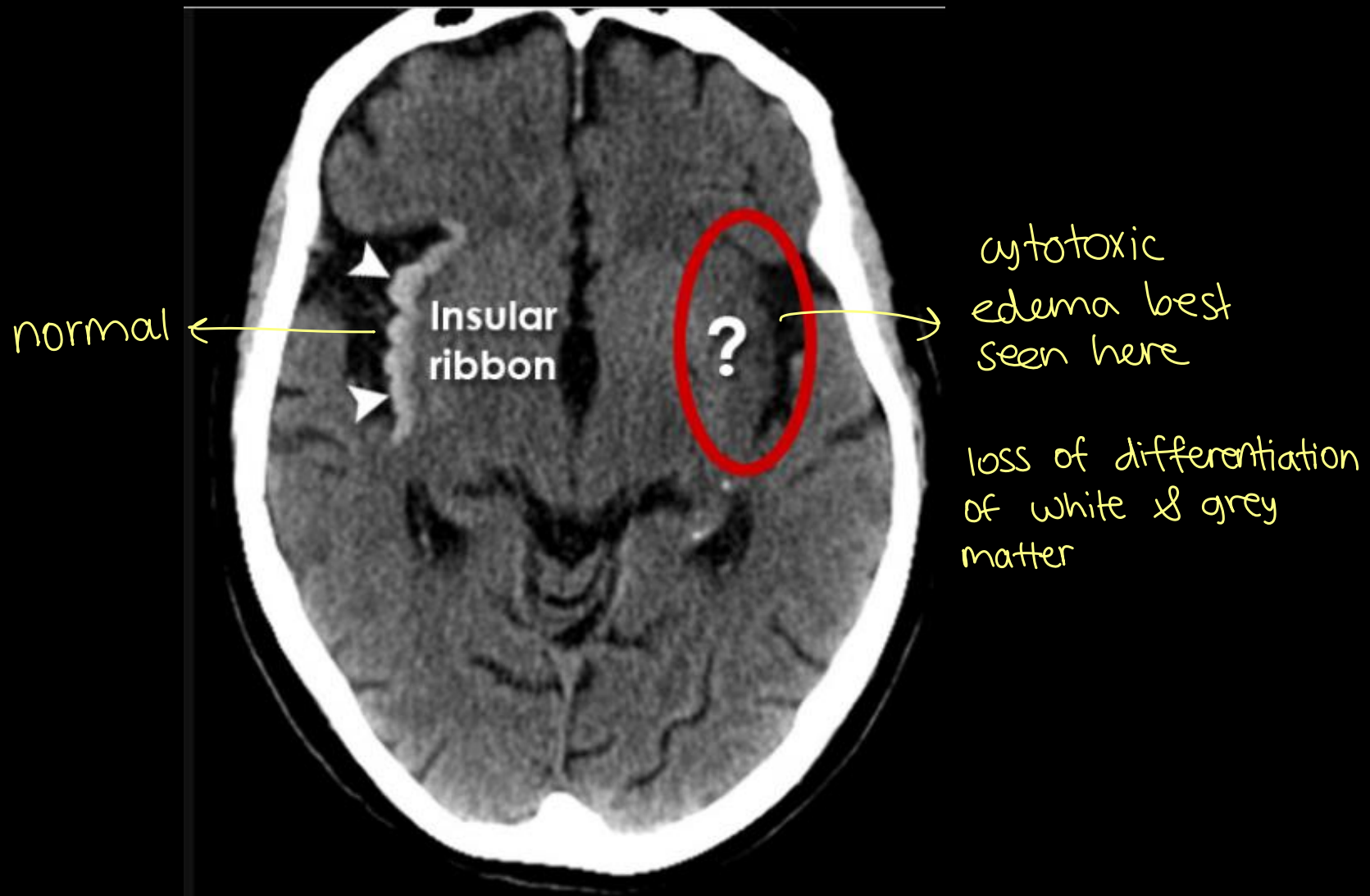
Thrombosed A.
MCA sign
Rarely seen

Hyperdense
MCA
sign



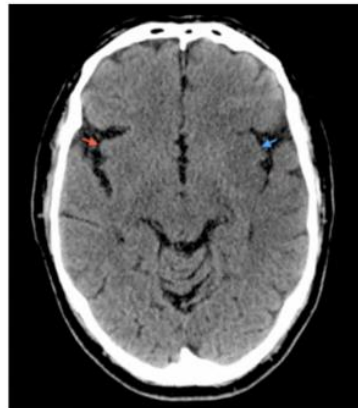
After 24
hours of
the
hyperdense
MCA



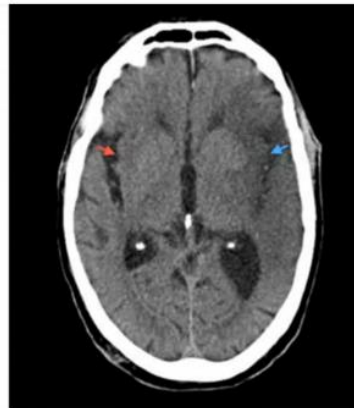


Insular Ribbon Sign on Left

- Loss of the normal insular cortex grey-white differentiation



<4 hours



>4 hours

HEAD CT W/ C
3/5/2018 12:32
218031926



75

n



DFOV:23
Compressed
IM: 81

4

BRAIN CT Without C
Head 1.0 MPF
3/5/2018 12:32
218031926/C



175

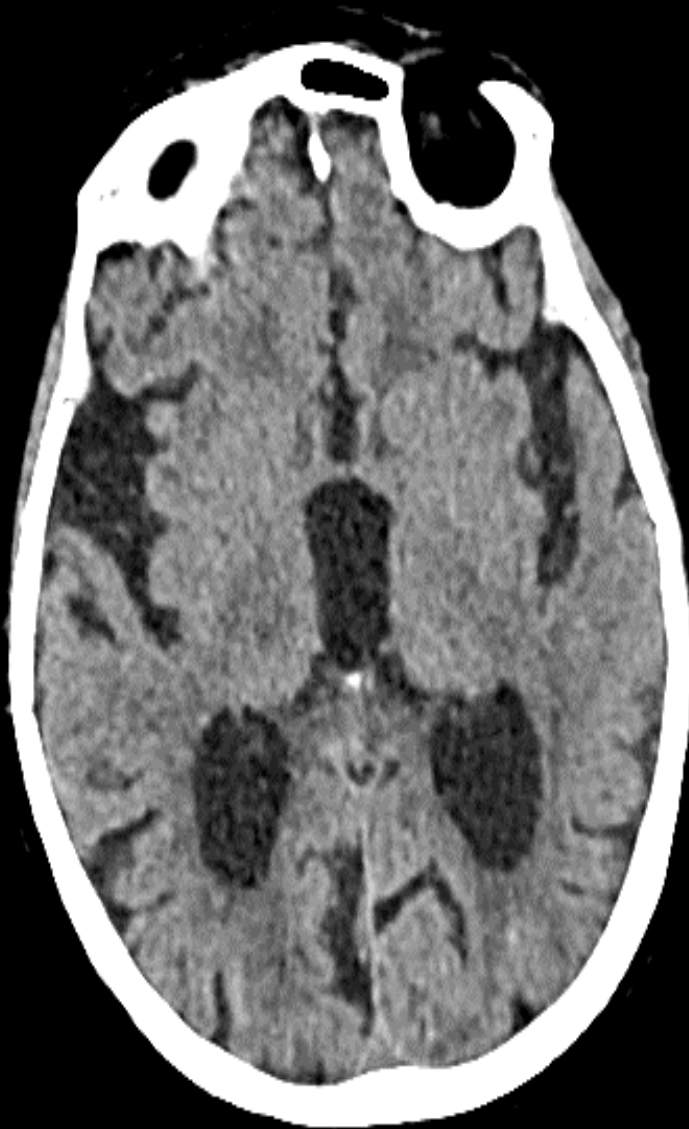
p



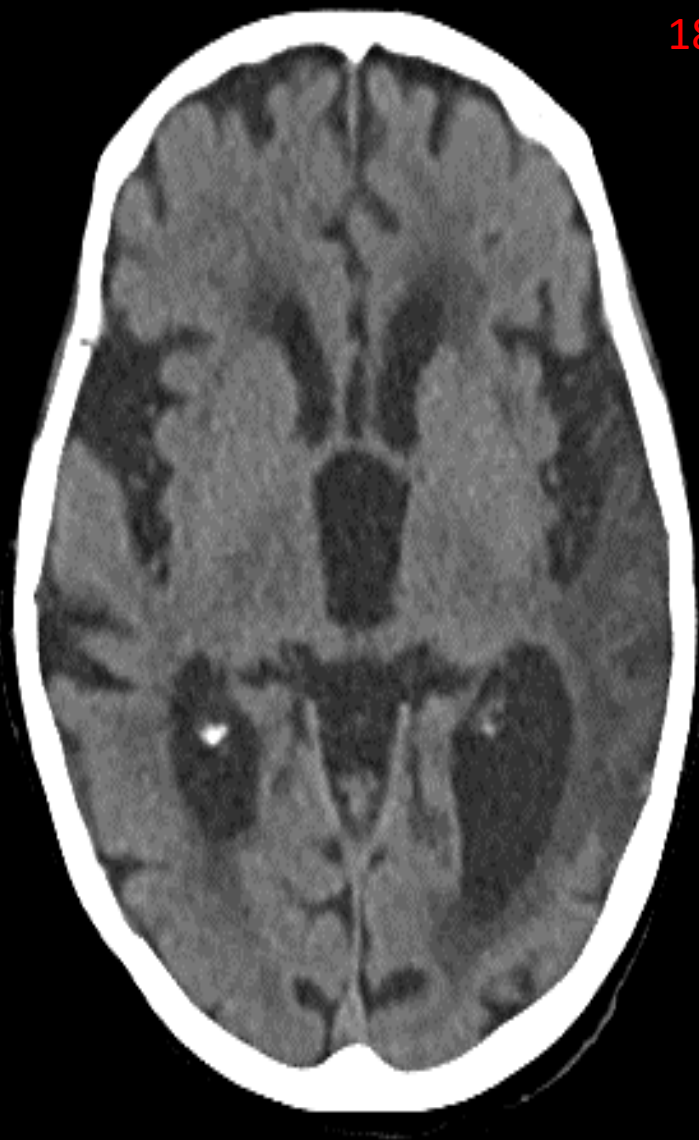
DFOV:23
Compressed
IM: 81

Insular ribbon sign

16/5



18/5



Extensive edema with midline shift



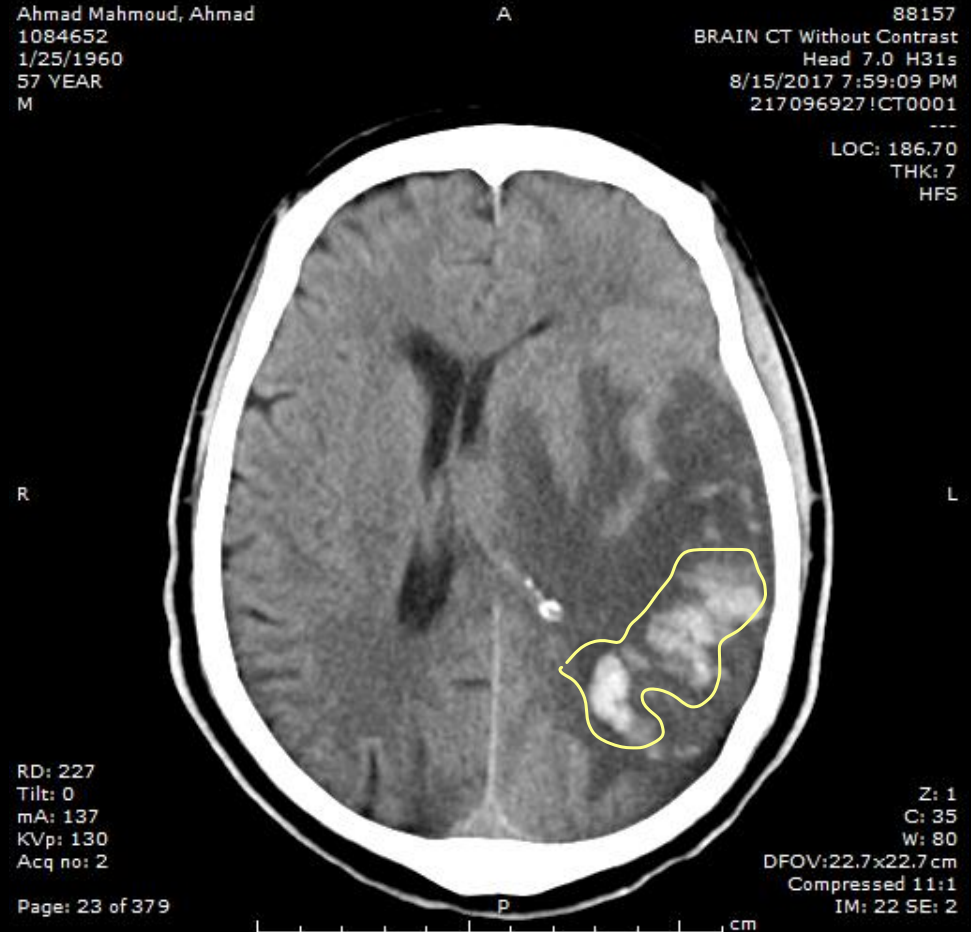
Hemorrhagic transformation

Ahmad Mahmoud, Ahmad
1084652
1/25/1960
57 YEAR
M



before

Ahmad Mahmoud, Ahmad
1084652
1/25/1960
57 YEAR
M



after

cytotoxic worse than vasogenic
toxic is always worse

Vasogenic edema

↳ tumor

↳ abscess

only white matter

Necrotic tissue: tumor v/s abscess



8-JUL-2012
8:07:27.29
MA 10
P 2
P 1275.0

HMP

SID_FF_00000008



KV 120
eff. mAs 410
TI 1.0
SL 7 C/4C X0.6/SC 55
WL 3074 WW: 1192

6/10/2017 1:01:01 AM

8-JUL-2012
8:07:36.74
MA 19
P 2
P 1330.0

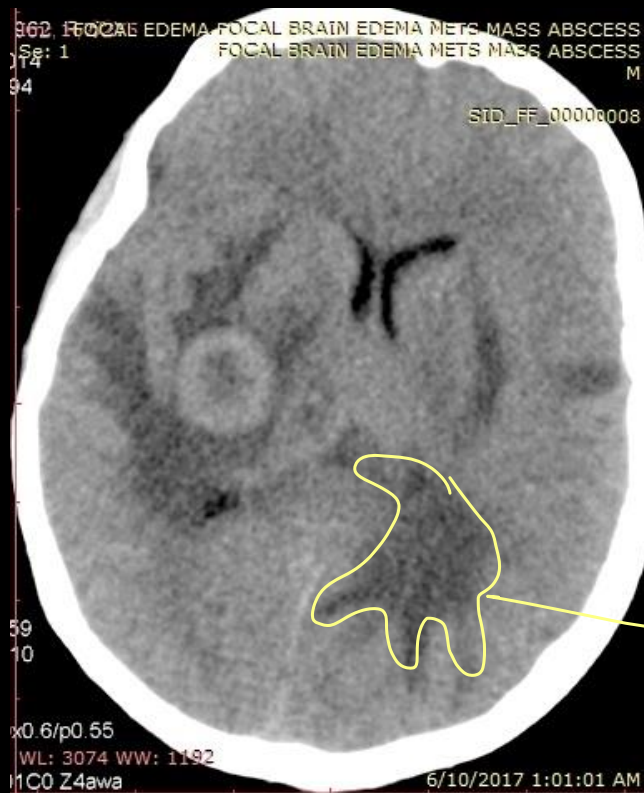
M

SID_FF_00000008



KV 120
eff. mAs 410
TI 1.0
SL 7 C/4C X0.6/SC 55
WL 3074 WW: 1192
P27 0/10

6/10/2017 1:01:01 AM



hand shaped edema



SID_FF_00000008

6/p0 554 WW: 1192

6/10/2017 1:01:01 AM



361 M FOCAL EDEMA FOCAL BRAIN EDEMA METS MASS ABSCESS
Se: 1 FOCAL BRAIN EDEMA METS MASS ABSCESS M

SID_FF_00000008

6/p0 55
WL: 3074 WW: 1192

60 74awa

LV CONTRAST 6/10/2017 1:01:01 AM

qadomi
361 M FOCAL EDEMA FOCAL BRAIN EDEMA METS MASS ABSCESS
Se: 1 FOCAL BRAIN EDEMA METS MASS ABSCESS M
F. 32Y

SID_FF_00000008



6/p0 5674 WW: 1192

6/10/2017 1:01:01 AM

THK: 1
HFS

R

L

RD: 231
Tilt: 0
mA: 163
KVp: 130
Acq no: 2

Page: 49 of 165

Z: 1
C: 35
W: 80
DFOV: 23.1x23.1cm
Compressed 11:1
IM: 50 SE: 5

p
cm





1959, M, 701

2015

1.36

3

3

FOCAL BRAIN ED

F

ep-2015

3.54.91

4.13

2

60.9

FOCAL BRAIN EDEMA

336

410

20

As 390

As 410

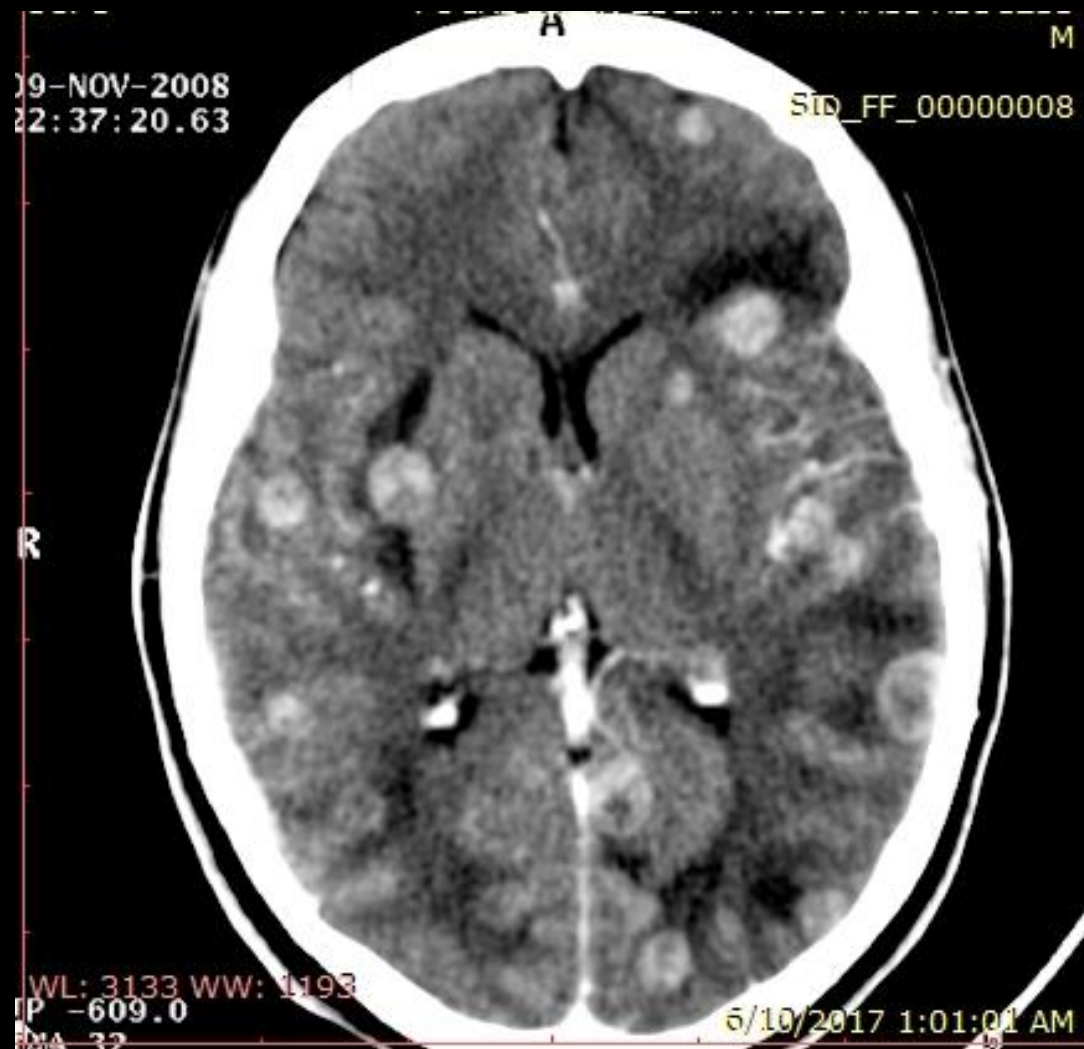
0

1.0

0/40x0.6/p0.55

0/20

3



Heamorrhagic metastasis



178
0
183
186



27-DEC-2010
13:04:11.86
TP -67.5
IMA 13
SEQ 13

R

kV 140
mA 200
TI 1.5
GT 0.0
SL 8.0
213 -18/-50



WL: 2639 WW: 1268

SID_F

32.52
5.5
31
31

40
06
.5
.0
.0
-27/-53
LO



6/10/2017 1:01:01 AM

contrast in infarct → neurotoxic

Diffuse brain edema

Signs of diffuse brain edema due to medical causes :

Diffuse brain hypodensity

Diffuse loss of grey white matter differentiation

Effacement of sulci

Small ventricles

Effacement of basal cistern

Pseudo SA sign

subarachnoid

Diffuse brain edema

- increase brain hypodensity
- loss of gray white matter differentiation
- Effacement of the sulci
- Effacement of basal cisterns

NO CSF



219159316!CT

LOC: -107
TI

3
2

DFOV:20.9x20
Compressed

OBA JEHAD HERZALLA
 66693
 29-Jul-2009 F 5Y
 9-Jul-2014
 9 36 35 75
 IMA 15
 PI 2
 P 1355 0

A

JORDAN UNIVERSITY HOS

DIFFUSE
 De
 CT
 H:

Im: 9/108
 Se: 1

SI



kV 120
 eff mAs 378
 ref mAs 410
 TI 1.0

6/10/2017 WL: 3496 WW: 1960 [D]

OBA JEHAD HERZALLA
 66693
 29-Jul-2009 F 5Y
 9-Jul-2014
 9 36 31 39
 IMA 11
 PI 2
 P 1327 0

A

JORDAN UNIVERSITY HOS

Def
 CT 2
 H-S

DIFFUSE BRAIN EDEMA
 DIFFUSE BRAIN EDEMA
 M

SID_D_00000006



V 120
 ff mAs 425
 ef mAs 410
 TI 1.0

6/10/2017 1:01:01 AM

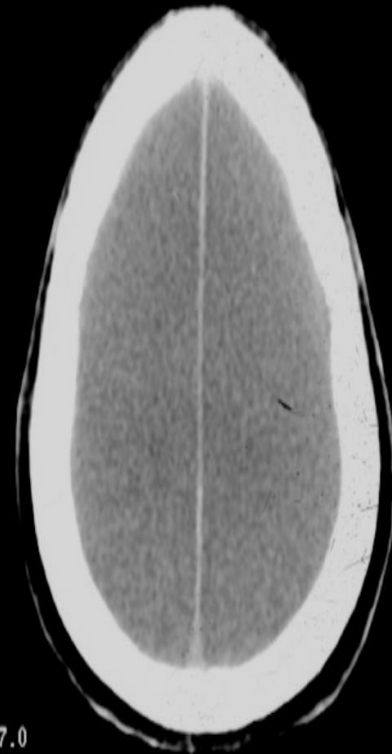
-SEP-2009
:14:44.30



SID_D_0

M

-SEP-2009
:14:56.30



SID_D_00000006

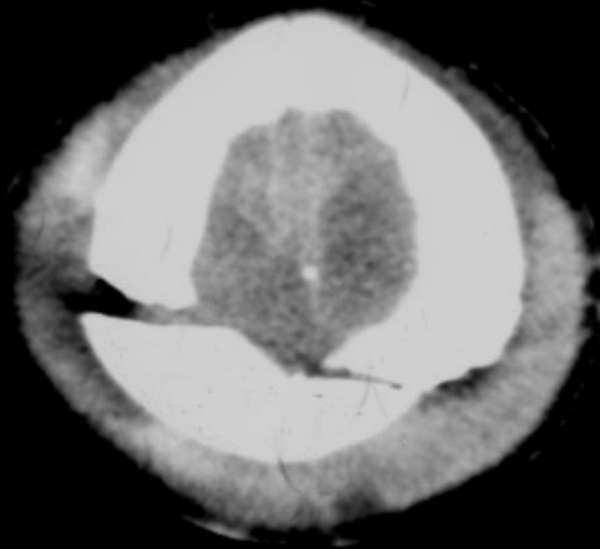
WL: 3285 WW: 1684 [D]
-59.0
A 13

6/10/2017 1:01

WL: 3285 WW: 1684 [D]
-27.0
A 17
0 17

6/10/2017 1:01:01 AM

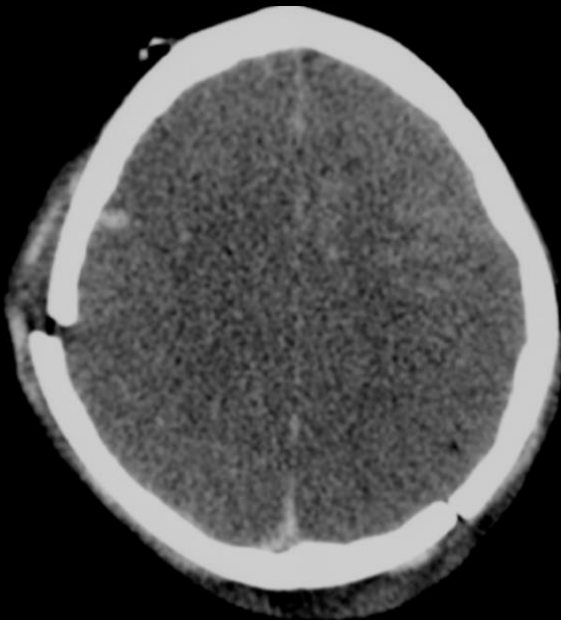
Pseudo subarachnoid sign
↳ cannot apply on trauma pts



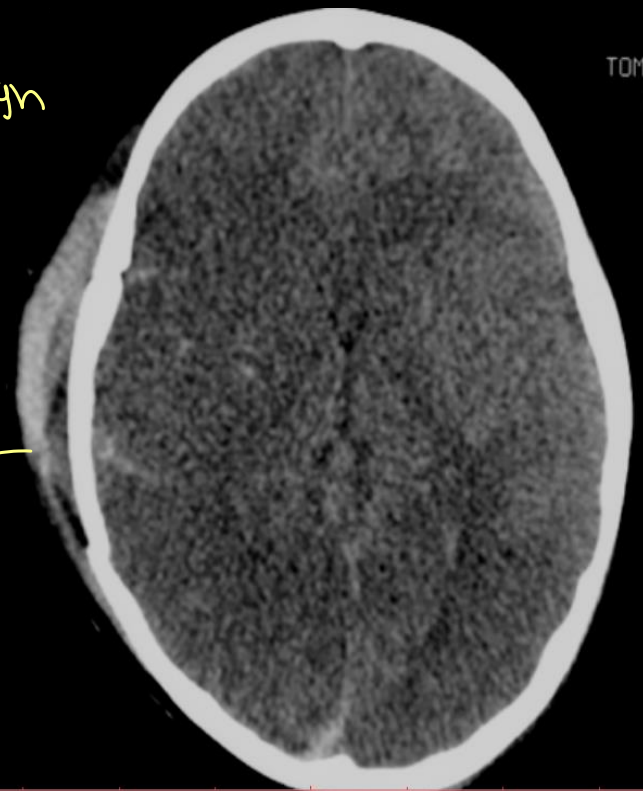
Post-traumatic
↳ signs of trauma (fracture)

asymmetrical loss of
white & grey matter

*cannot apply SA sign



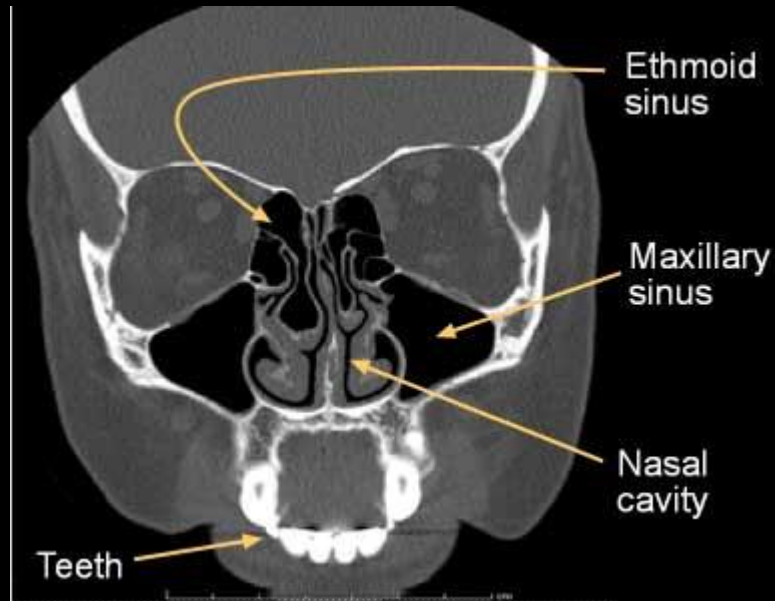
cephalo- ←
hematoma



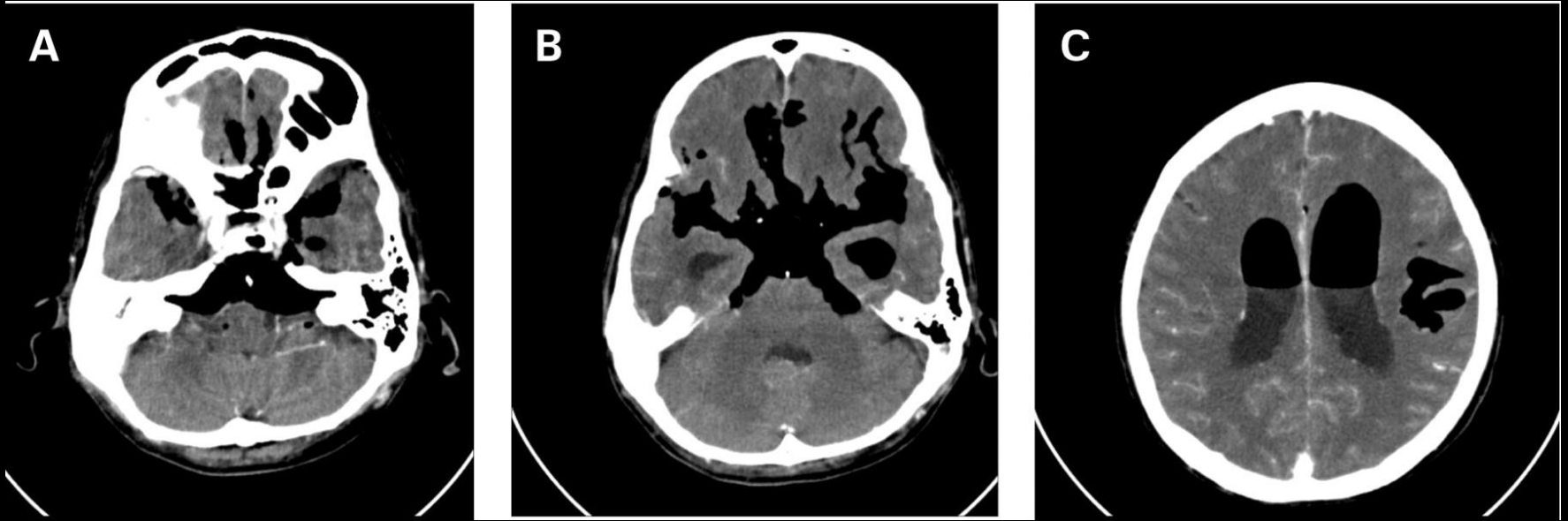
Hypodense Lesions:

Air:

Normal : sinuses



Abnormal: Pneumocephalus (post Sx ^{surgical} or post trauma)





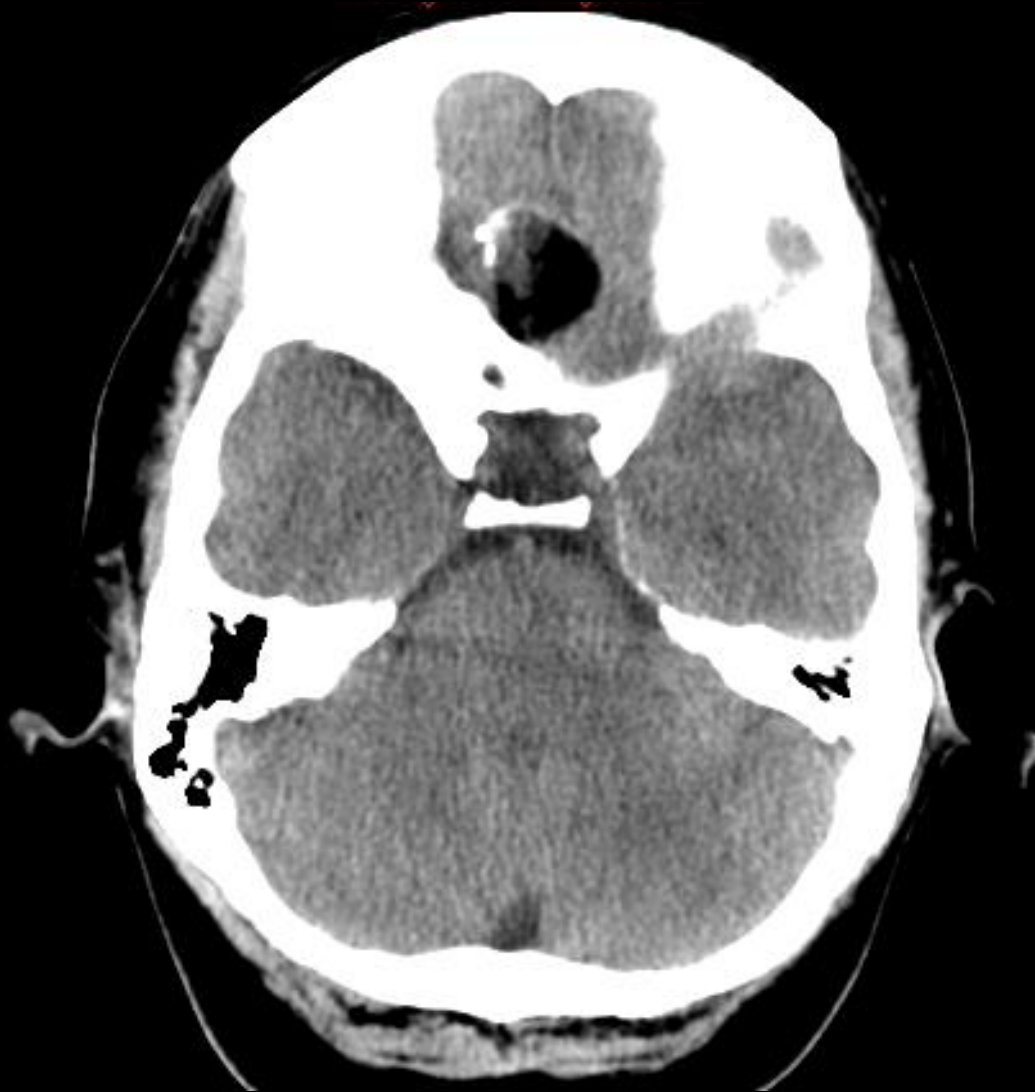


Hypodense Lesions:

Fat:

Lipoma, dermoid cyst

Dermoid Cyst



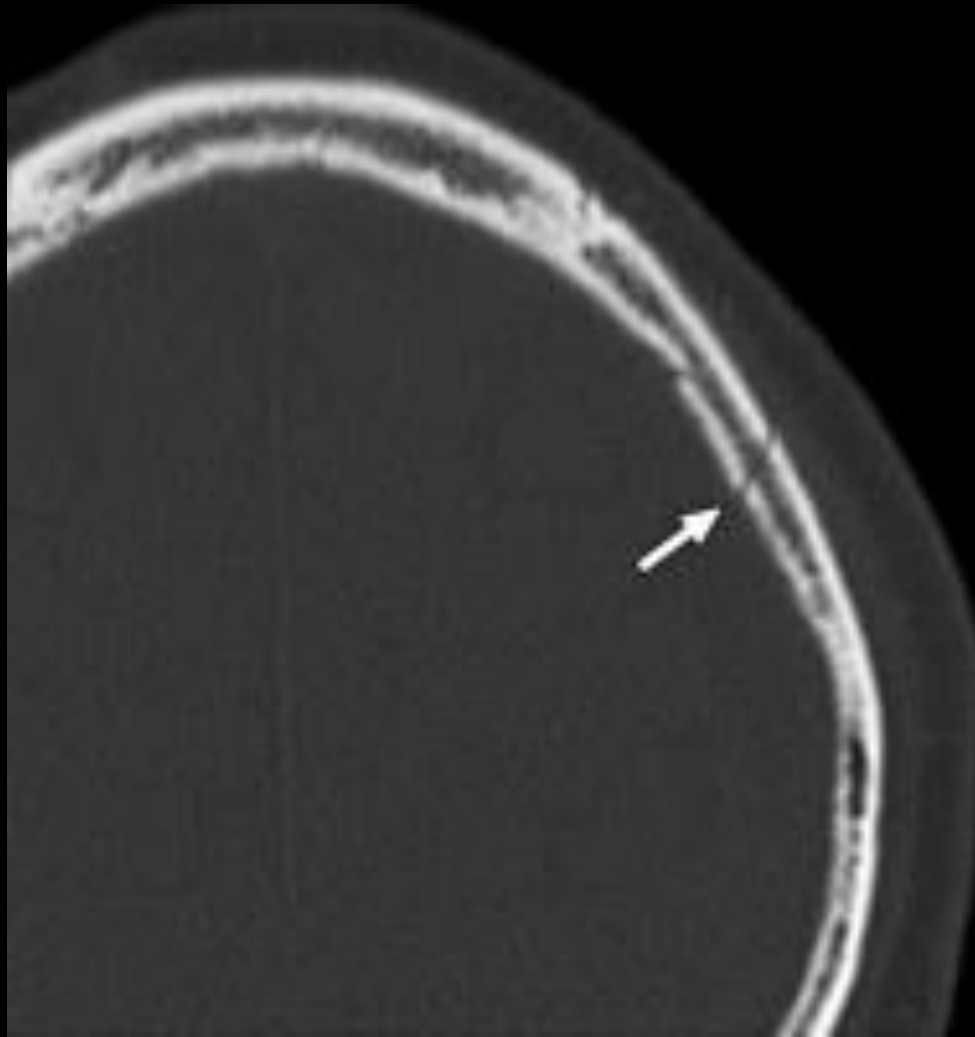
Skull Fractures

Linear

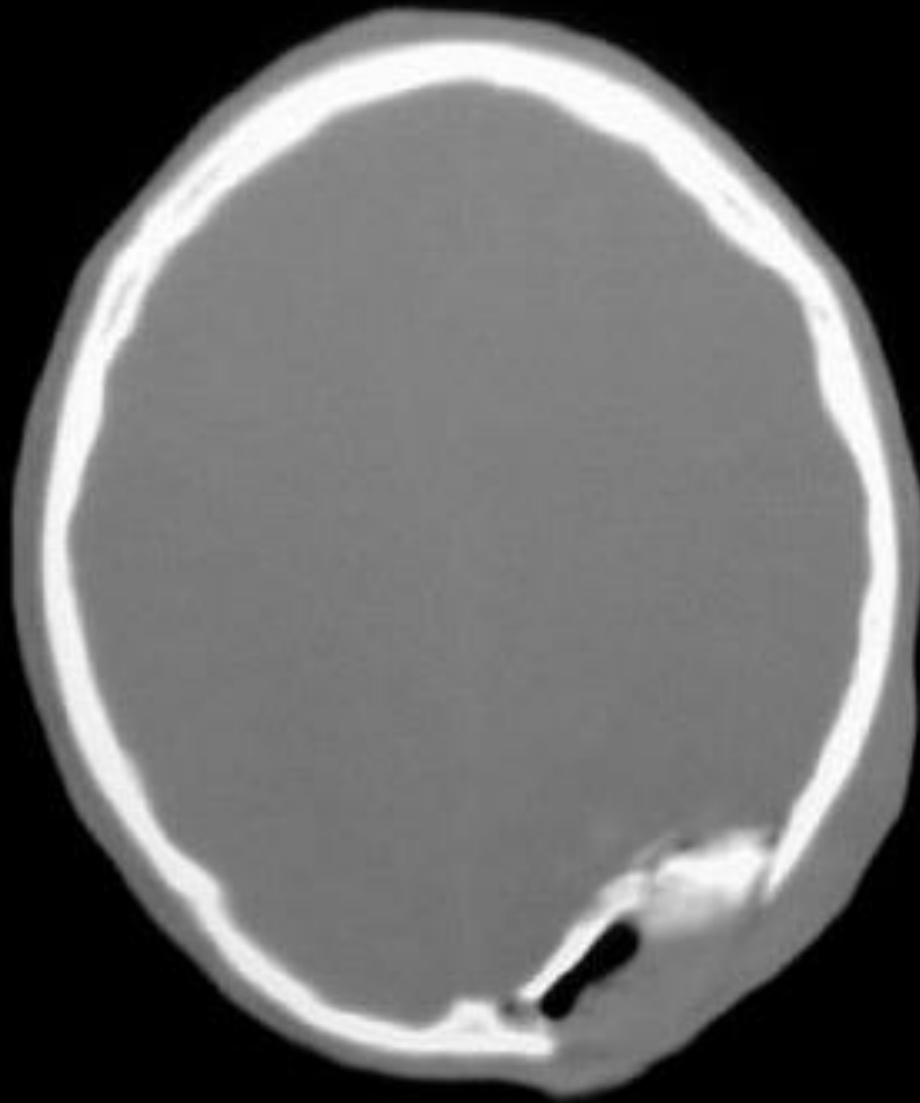
Depressed

Growing Fracture

Linear Fracture



Depressed Fracture



Growing Fracture

Peds

linear $\rightarrow$ transforms





46 55 73
MA 9
0 2

M

SID_SS_00000019



120
410
0
00

WL: 3550 WW: 2000 [D]

6/10/2016 1:01:01 AM

PO 2

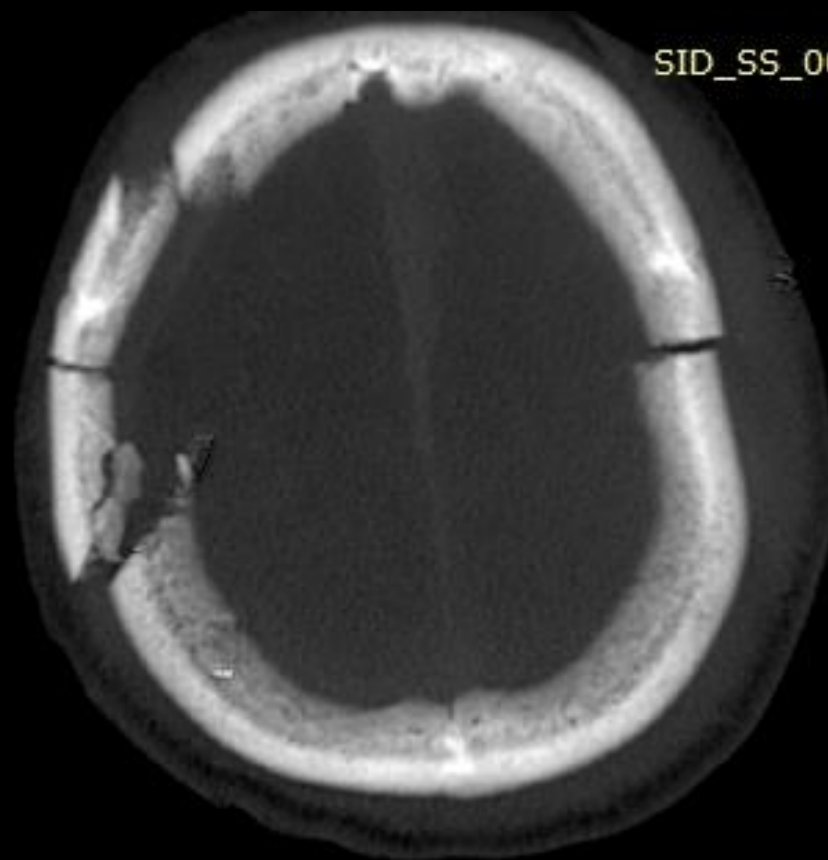
SID_SS_00000019

RP

W 120
nAs 410
T 1.0
ST 0.0
SL 7.0

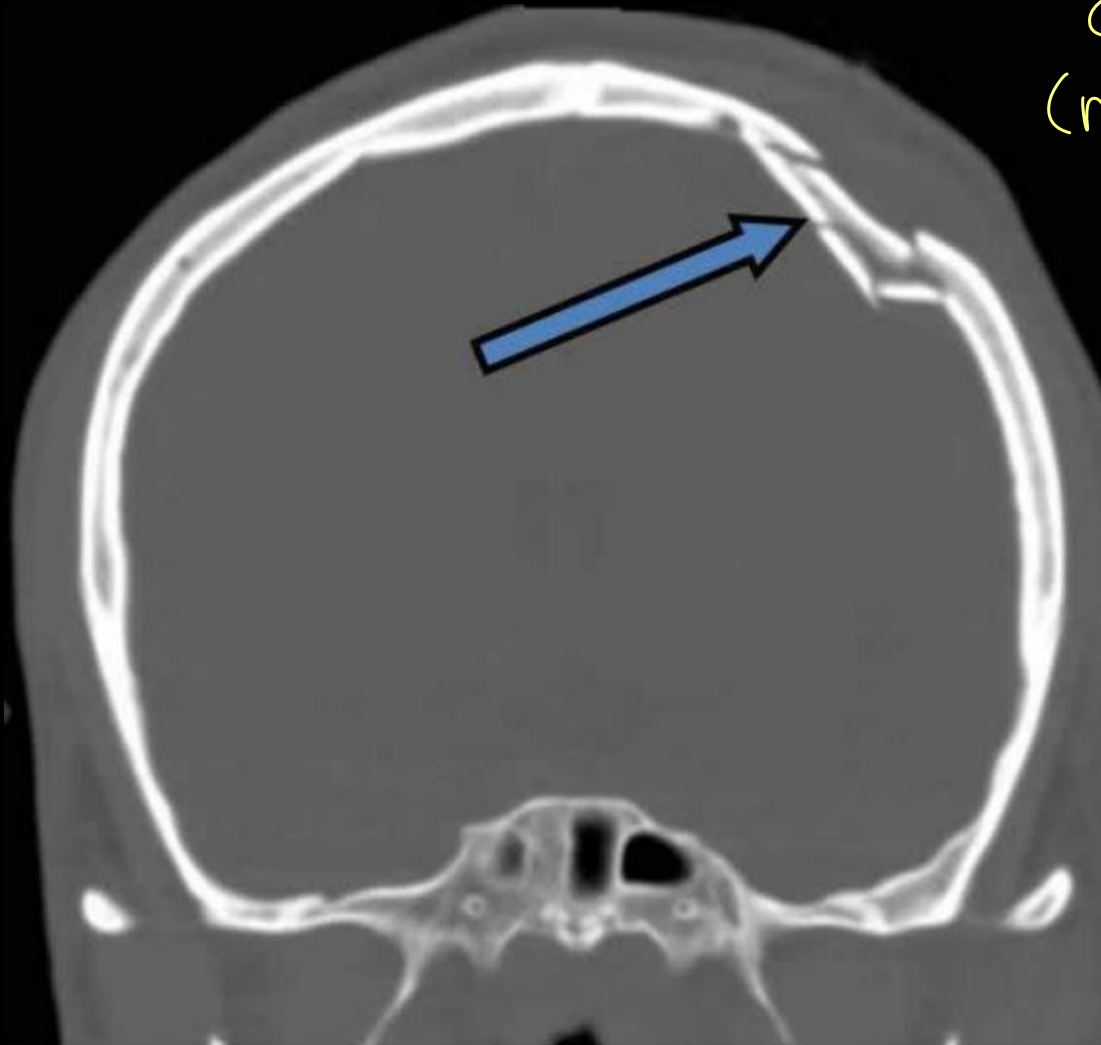
AWL: 2822 WW: 1719 [D]

60s SGC0 4awc



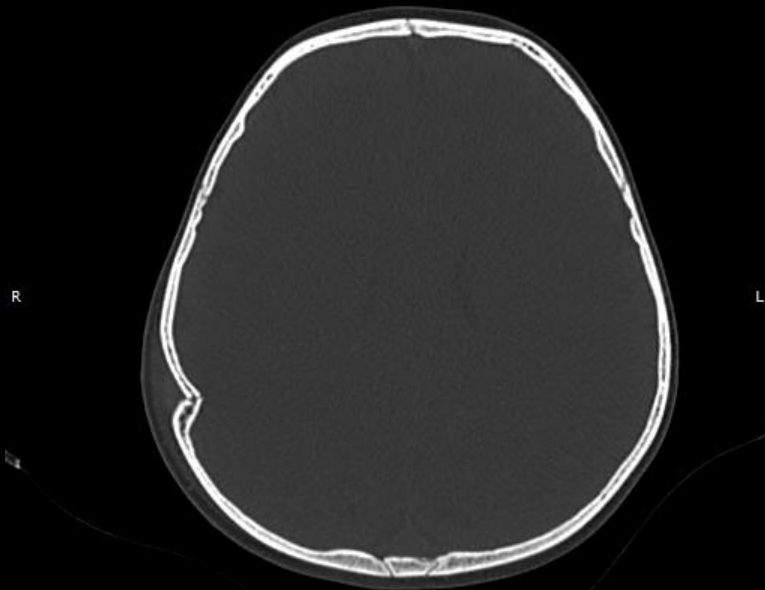
6/10/2016 1:01:01 AM

depressed
(motor area)



depressed

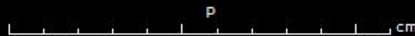
THK: 1
HFS



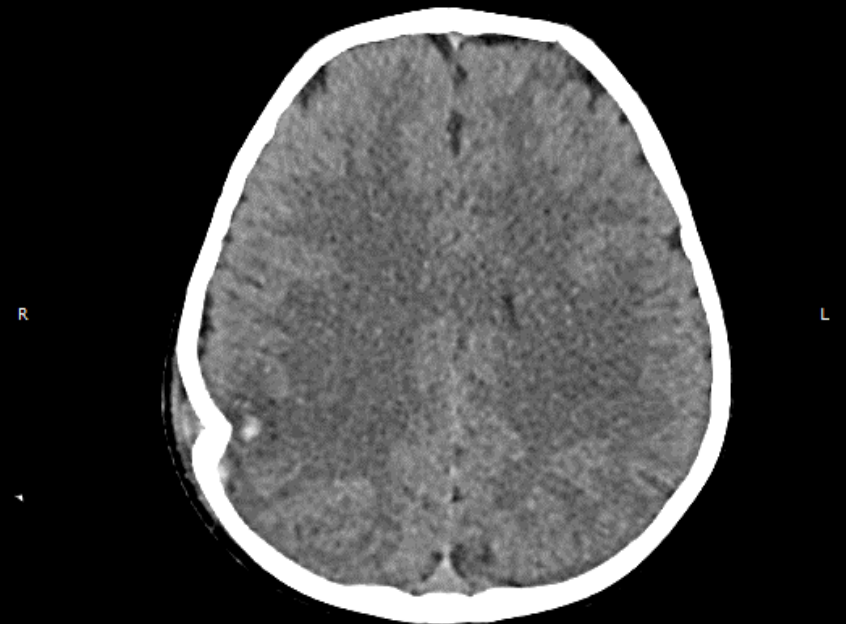
RD: 222
Tilt: 0
mA: 143
KVp: 130
Acq no: 3

Page: 68 of 211

Z: 1
C: 450
W: 1500
DFOV: 22.2x26.3cm
Compressed 11:1
IM: 69 SE: 3



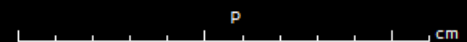
HFS



RD: 222
Tilt: 0
mA: 143
KVp: 130
Acq no: 3

Page: 66 of 211

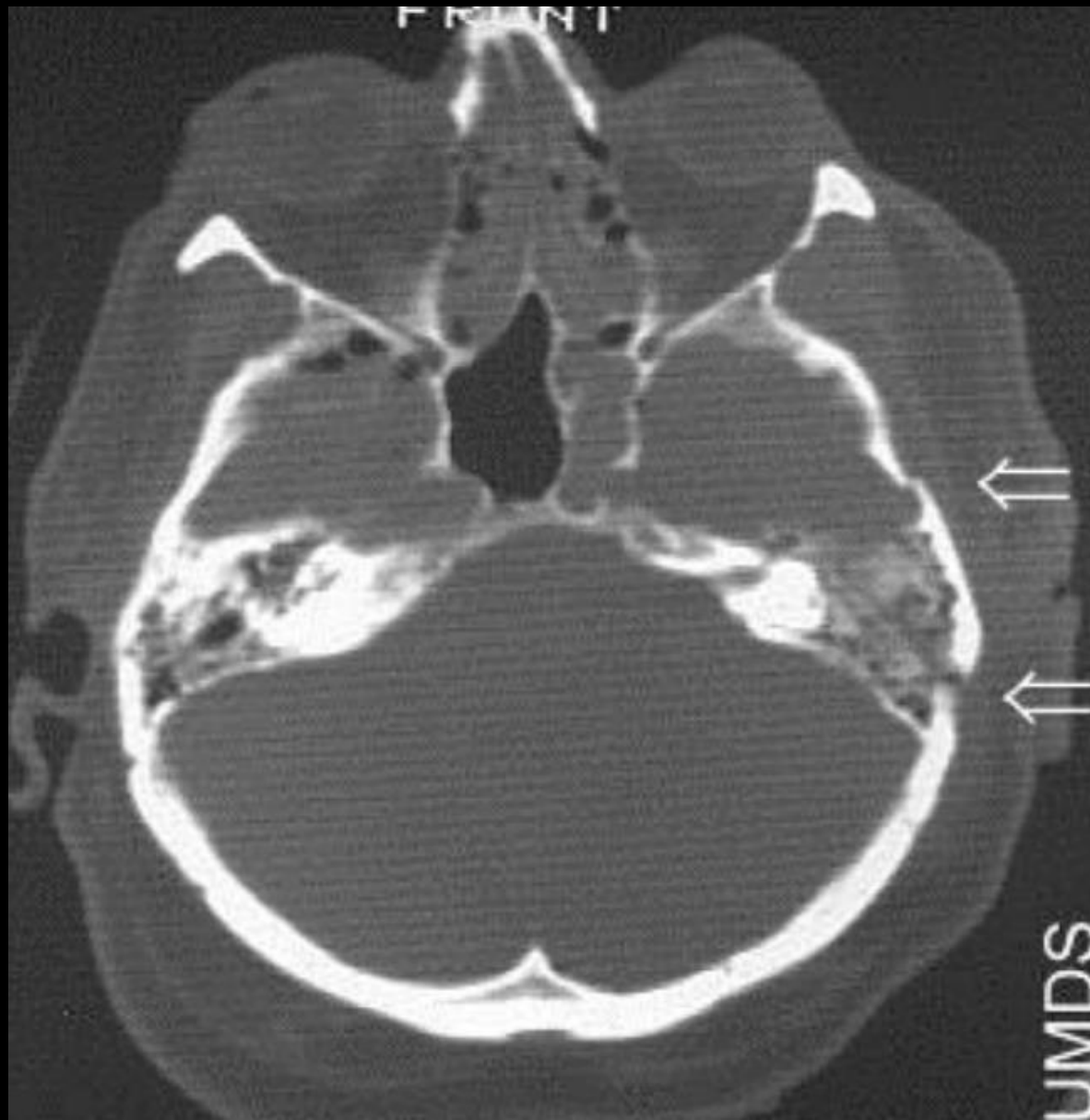
Z: 1
C: 35
W: 80
DFOV: 22.2x26.3cm
Compressed 11:1
IM: 67 SE: 2



depressed

Sup. sagittal sinus





Skull base fracture



(a)



(b)

5

Head 1.0 MPR
6/15/2018 8:0
218081475



of 179

P

DFOV:
Compres
IM:

5

Head 1.0 MPR
6/15/2018 8:0
218081475!



of 179

P

DFOV:2
Compres:
IM:

Fatoom Riad, Fayyad
1084263
1/1/1954
63 YEAR
F

A

88157
BRAIN CT Without Contrast
Head 1.0 MPR ax
8/3/2017 10:25:27 PM
217091763!CT0001

THK: 1
HFDR

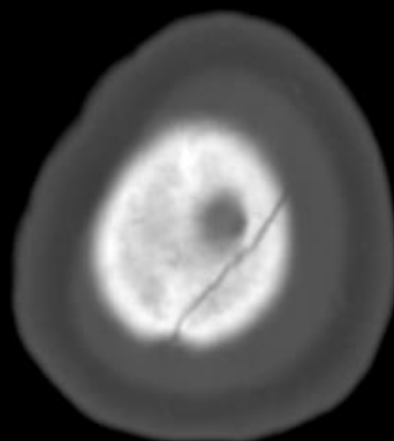
Fayyad

A

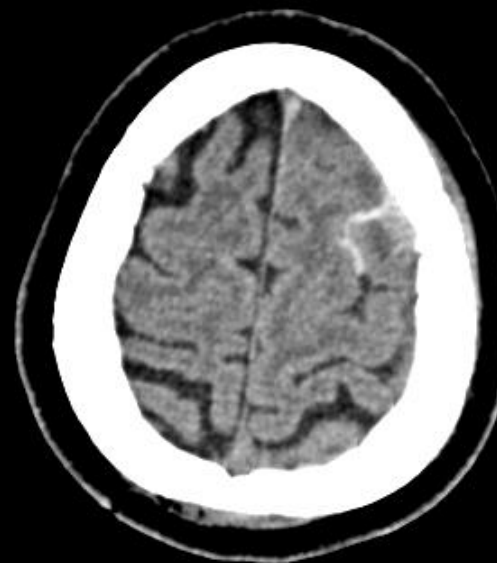
88157
BRAIN CT Without Contrast
Head 1.0 MPR ax
8/3/2017 10:25:23 PM
217091763!CT0001

THK: 1
HFDR

R



L



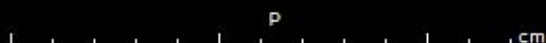
SAH

L

RD: 254
Tilt: 0
mA: 205
KVp: 130
Acq no: 2

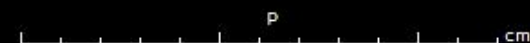
Z: 1
C: 400
W: 2000
DFOV: 25.4x23.3cm

IM: 7 SE: 3



Z: 1
C: 35
W: 80
DFOV: 25.4x23.3cm

IM: 27 SE: 3



THANK YOU

