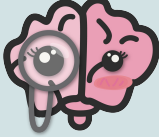




### Objectives

- ❖ Remember that happiness is something you make. It is something that comes from within you
- ❖ No objectives :)

Reviewed By



Noura Alturki  
Jehad Alorainy

Color Index:

♦ Important

♦ Doctor's Notes

♦ Extra

♦ Female slides

♦ male slides

### Team Leaders



Omar Aldosari



Shahd Alsalamh



Leena Alnassar

Done by:

Notes by:

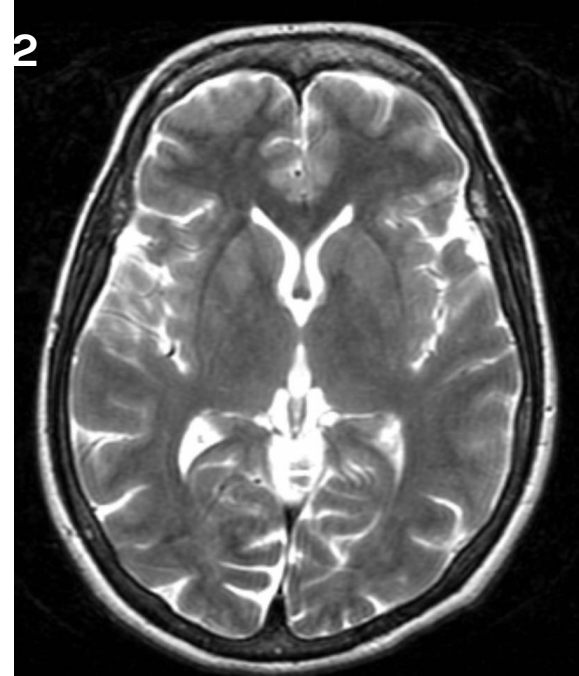
Sarah Alfarraj

# introduction



## CT

- bone is white & CS fluid is black
- White matter is darker than grey matter
- the darkest structure is the fluid in the ventricles



## MRI

bone is black

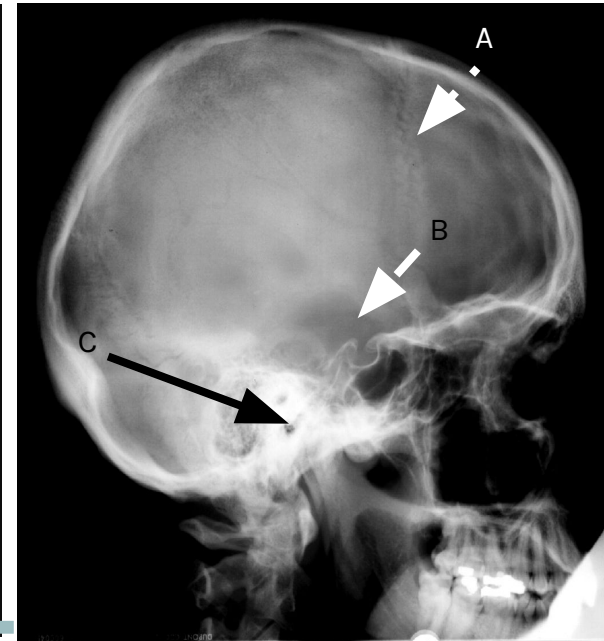
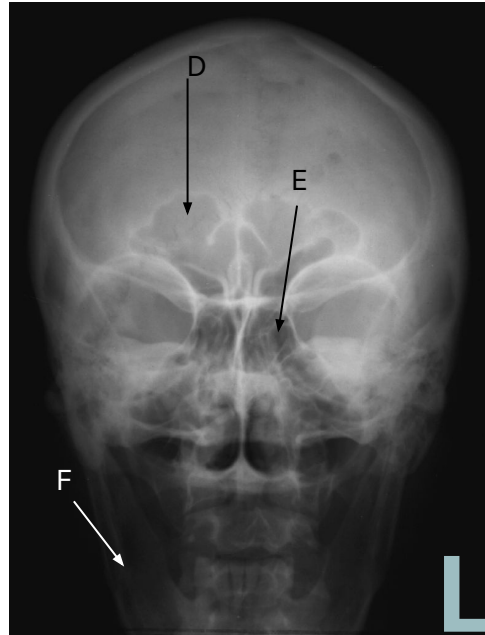
T1: fluid is dark, white matter is lighter than gray matter.

T2: fluid is bright

Flair: fluid is dark, white matter is darker than gray matter

- name the following structures ?

- A.
- B.
- C.
- D.
- E.
- F.



- name the following structures ?

**A.**coronal suture: between frontal bone and parietal bone.

**B.**sella turcica: the pituitary gland is located within (seen using CT or MRI)

**C.**external acoustic meatus

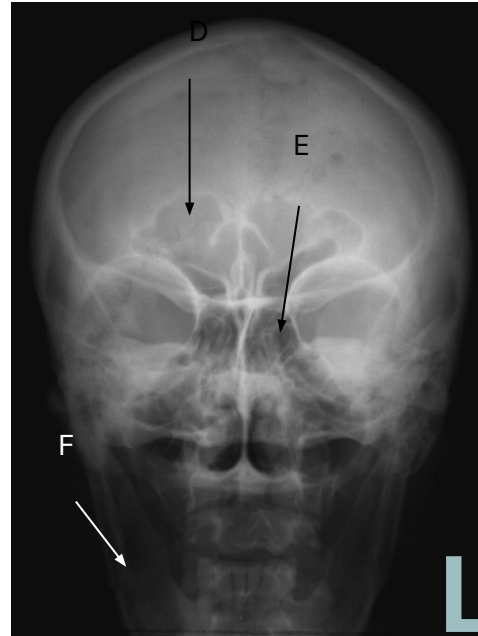
**D.**frontal sinus

**E.**ethmoidal sinus

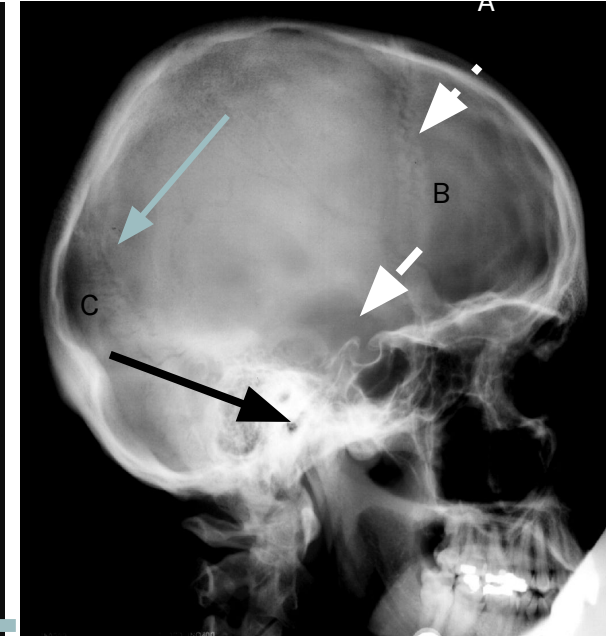
**F.**mandible

-x-rar is rarely used these days, the only indication is looking for foreign bodies & fracture  
- in the midline from anterior to posterior is the sagittal suture.

- lambdoid suture (arrow)



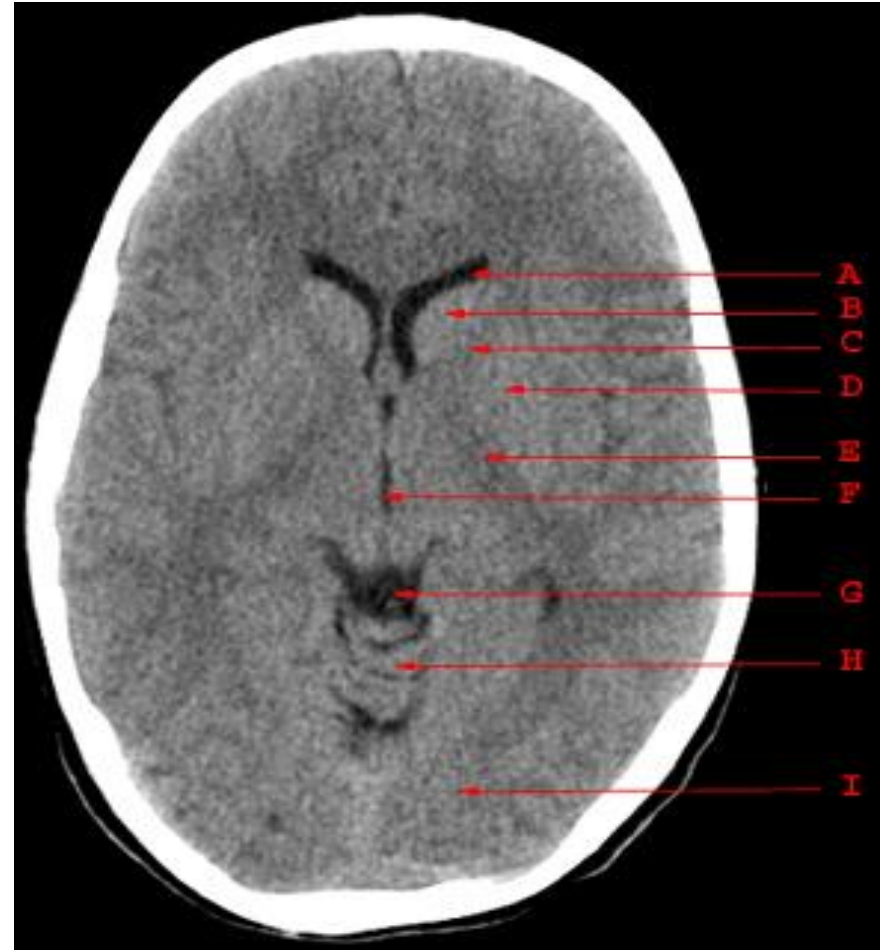
Skull PA view



Skull X-Ray Lat. View

- Label, Brain CT (Axial)

- A.
- B.
- C.
- D.
- E.
- F.
- G.
- H.
- I.



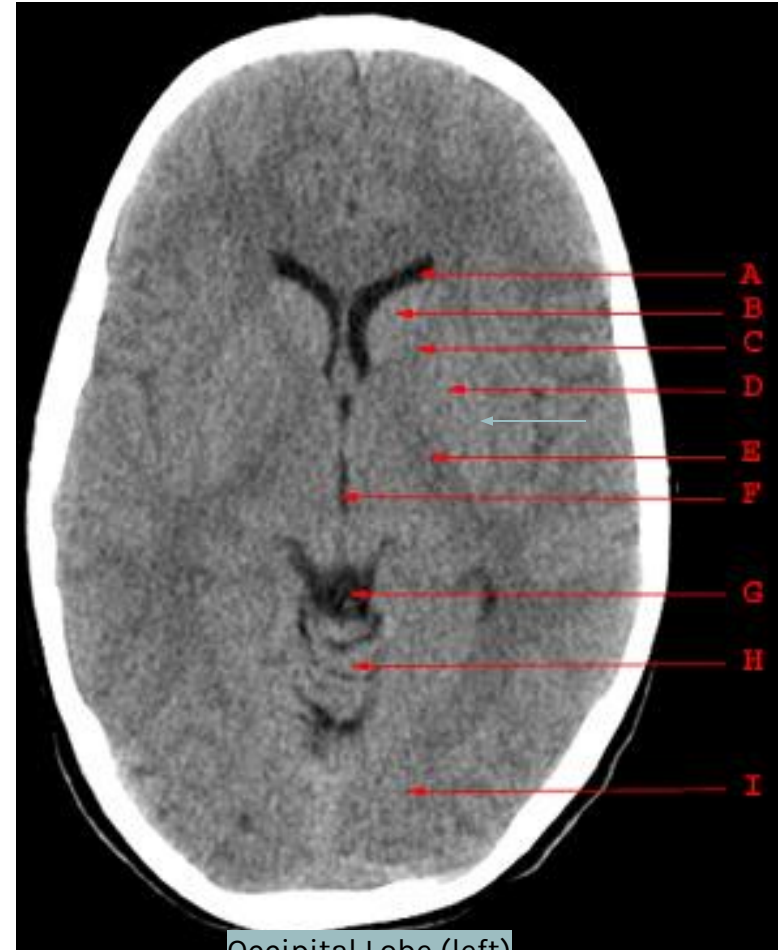
- **Label, Brain CT (Axial)**

- A. Frontal horns of lateral ventricle
- B. Caudate head ( **زي حبة اللوز** )
- C. Anterior Limb of the Internal Capsule
- D. Globus Pallidus (lentiform nucleus)
- E. Posterior Limb of the Internal Capsule
- F. 3rd Ventricle
- G. Quadrigeminal Plate Cistern
- H. Cerebellar Vermis
- I. Occipital lobe..

- Brain edema on CT shows loss of differentiation between grey and white matter

- Caudate head part of the basal ganglia

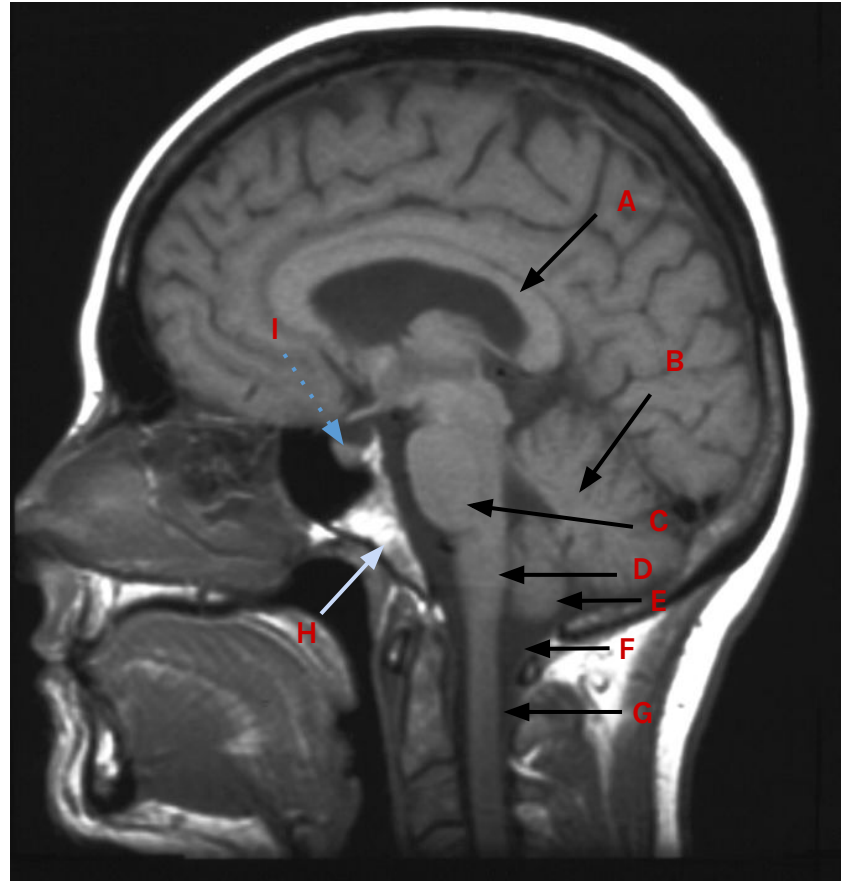
- Lentiform nucleus is consisted of two part medially is globus pallidus, laterally is **putamen** (arrow).



Occipital Lobe (left)

- Name of the structures?

- A.
- B.
- C.
- D.
- E.
- F.
- G.
- H.
- I.



- Name of the structures?

A. Corpus callosum (body)

B. Superior vermis of cerebellum

C. Pons

D. Medulla

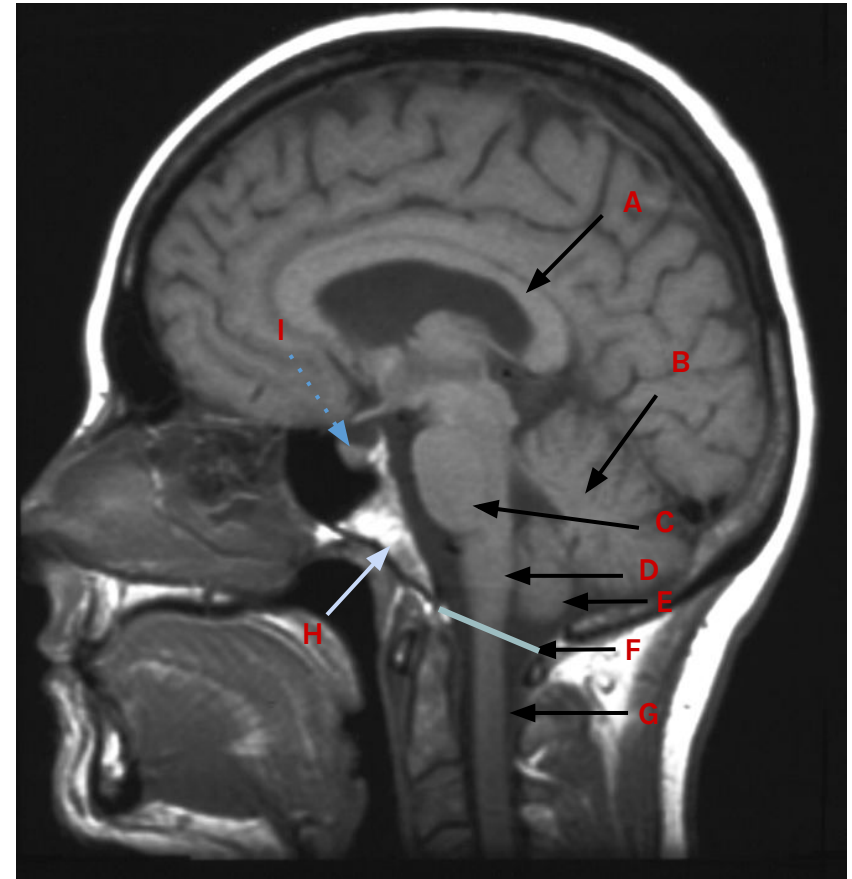
E. Cerebellar tonsils

F. 4th ventricle

G. Spinal cord

H. Clivus

I. Pituitary



-There could be congenital absence of Corpus callosum. it's formed of rostrum genu, body and splenium.  
- Cerebellar tonsils is normally above **this line**, above(foramen magnum).



Q1. which is true about CT ?

a) Bone is black

(false, the bone color in CT is white)

b) CSF is black

(true)

c) Gray matter is darker than white matter

(false,, the opposite is true “ there is more fluids in white matter )

d) Gray and white matter cannot be differentiated

(no, we can not differentiate in one condition: brain edema either generalized or localized)

ans: b

Q2. MRI diffusion (DWI) is particularly helpful in assessment of all of the following except :

a) Brain infarction

mostly useful in brain infarction, can show early infarction “from 7-10 days”. all the other sequences can be normal.

b) Brain abscess

(helpful)

c) Brain tumors

(in some types of tumors)

d) Hydrocephalus

(not helpful) no fluid restriction like the 3 above choices

ans: d

Q3.contraindication of MRI include all the following EXCEPT ?

a)cardiac pacemaker

b)cochlear implants

c)metal close to the eye

absolute contraindication (some metal are not ferromagnetic)

d)neurostimulators

CI due to overstimulation

e)pregnancy (3rd trimester).

it's safe to do MRI in 2nd and 3rd trimester, for 1st trimester you could do MRI if it's absolute emergency, or postpone it to 2 or 3rd trimester. Generally it can be done in first trimester but it's safer during 2 or 3rd. but MRI with contrast is contraindication

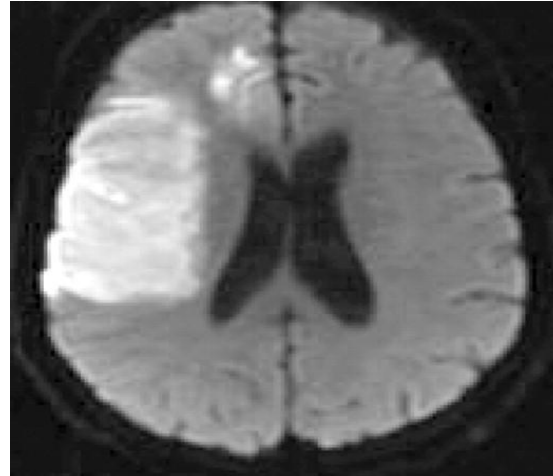
These days there are some devices which are MRI compatible

ans: e

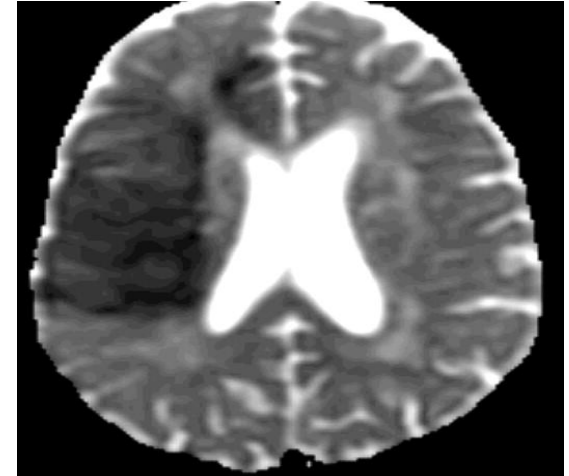
- very helpful in assessment of:

- Early brain infarction.
- Brain abscess. you see a ring enhancing lesion with central diffusion restriction on DWI
- Certain types of brain tumor. particularly highly cellular tumors

it can't assess the detailed anatomy of the brain. it assess if there is diffusion restriction or not.  
-If you order MRI diffusion sequence you got two images, what i mean by diffusion restriction is if you have a high signal intensity in DWI and a low signal intensity in ADC map, it's a diffusion restrain



DWI



ADC map

- Q4. Which of the following is true?

- A. This is CTA study
- B. This is MRA study
- C. This can only be done with contrast
- D. This is good to diagnose cerebral venous thrombosis



- Q4. Which of the following is true?

A. This is CTA study (bone is black)

**B. This is MRA study**

C. This can only be done with contrast (MRA can be done without contrast just depend on the flow)

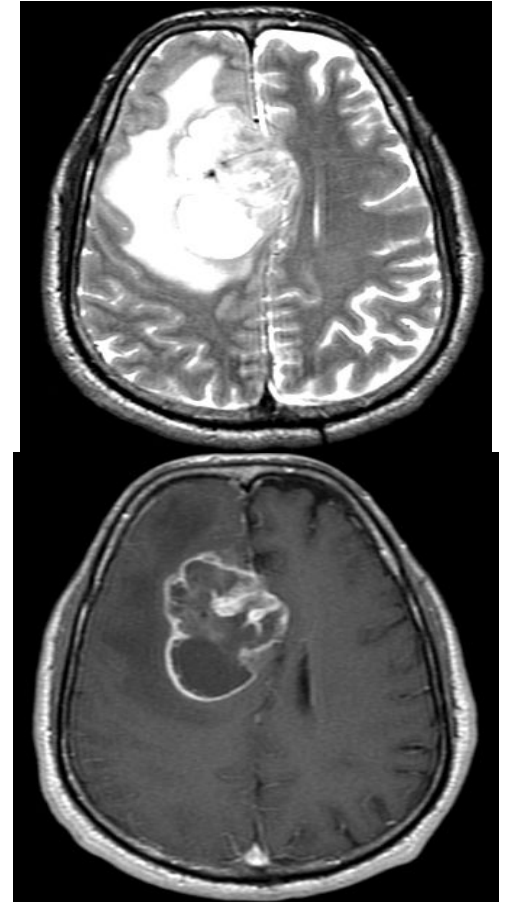
D. This is good to diagnose cerebral venous thrombosis (this is not venography, you can just differentiate between the MRA & MRV by anatomy only).



- **This lesion is most likely?**

An MRI showed intra-axial lesion that is necrotic, irregular, strongly enhancing, and crossing midline.

1. Meningioma
2. Infarction
3. Multiple sclerosis
4. Glioblastoma multiforme (GBM)

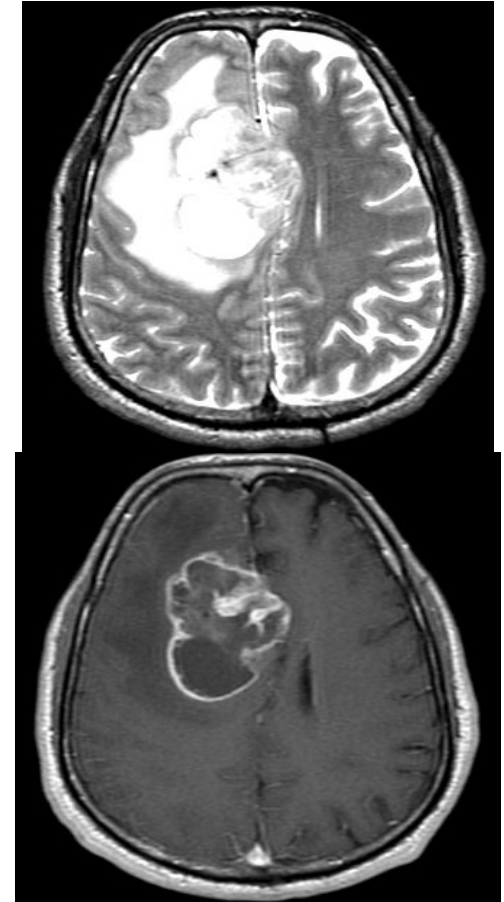


- **This lesion is most likely?**

An MRI showed intra-axial lesion that is necrotic, irregular, strongly enhancing, and crossing midline. (intra-axial: in the brain not in the meninges, from the description we know that is malignant lesion)

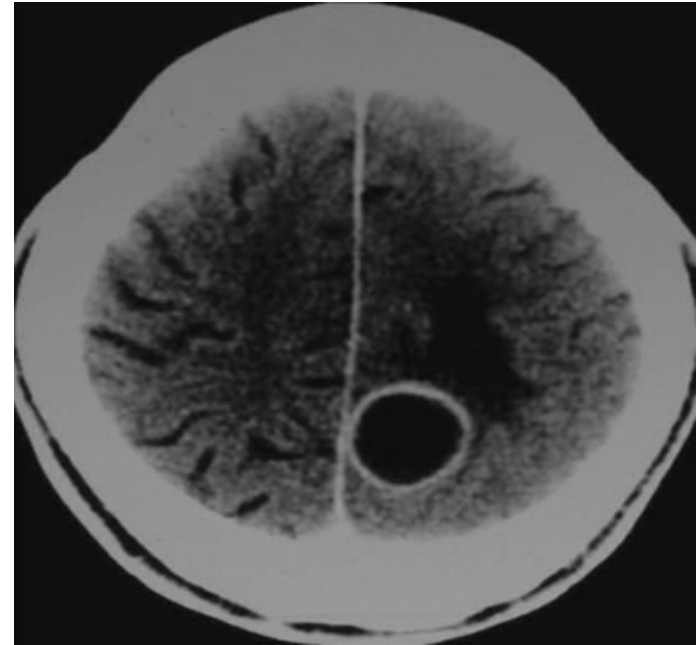
1. Meningioma (NO, extra-axial, rarely necrotic )
2. Infarction (No, infarction is hypodense) (infarction is not a mass lesion it's ischemia in brain parenchyma)
3. Multiple sclerosis (NO should be multiple lesions - they do not cross midline - hypodense)
4. **Glioblastoma multiforme (GBM)** it cause significant edema surround it.

- In the picture above what is the type of the edema ?  
white matter edema which usually comes with tumors is a vasogenic edema because of leakiness of the blood vessels so fluid is not restricted in the cell but it is free in the interstitium (will not be seen in the DWI)



- The lesion on this CT is :

1. Meningioma
2. Abscess
3. Multiple sclerosis
4. Glioblastoma multiforme

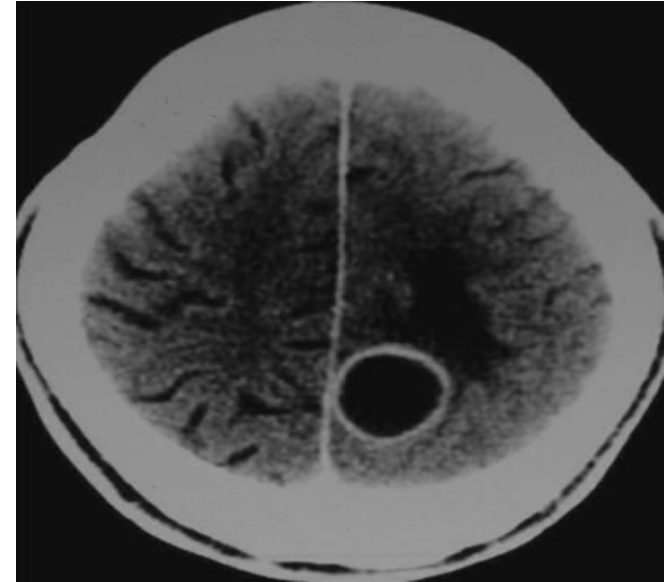




- The lesion on this CT is :

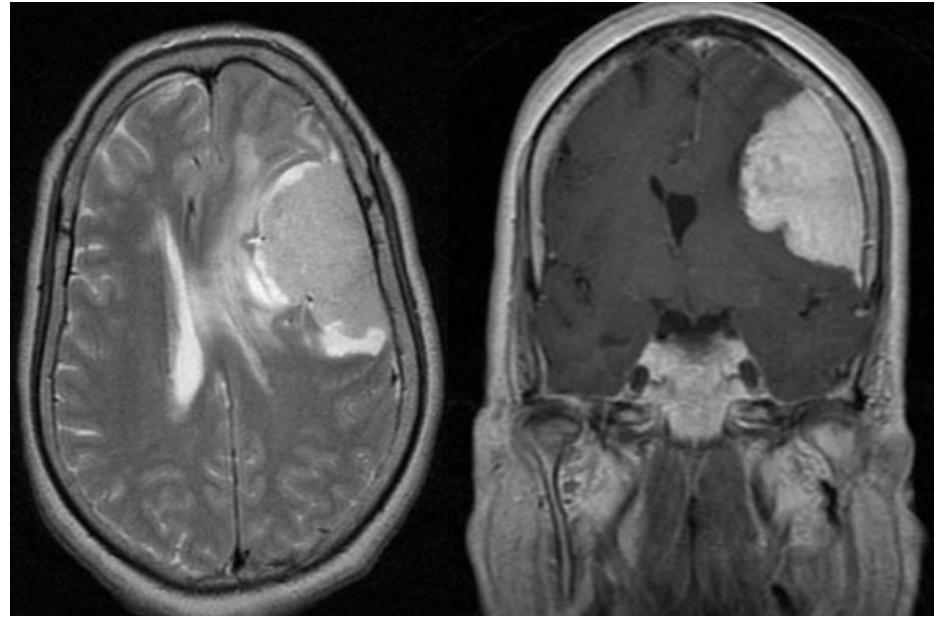
intra-axial, regular, necrotic cavity and there is edema around it (Typical abscess )

1. Meningioma (no this is an intra axial lesion ) (show Homogenous enhancement)
2. **Abscess** (ring enhancement) (peripheral smooth enhancement)
3. Multiple sclerosis (No, MS enhancement is incomplete ring and there is no edema around it and there is no multiple lesions)
4. Glioblastoma multiforme (does not fit the previous description)



- The lesion on this MRI is?

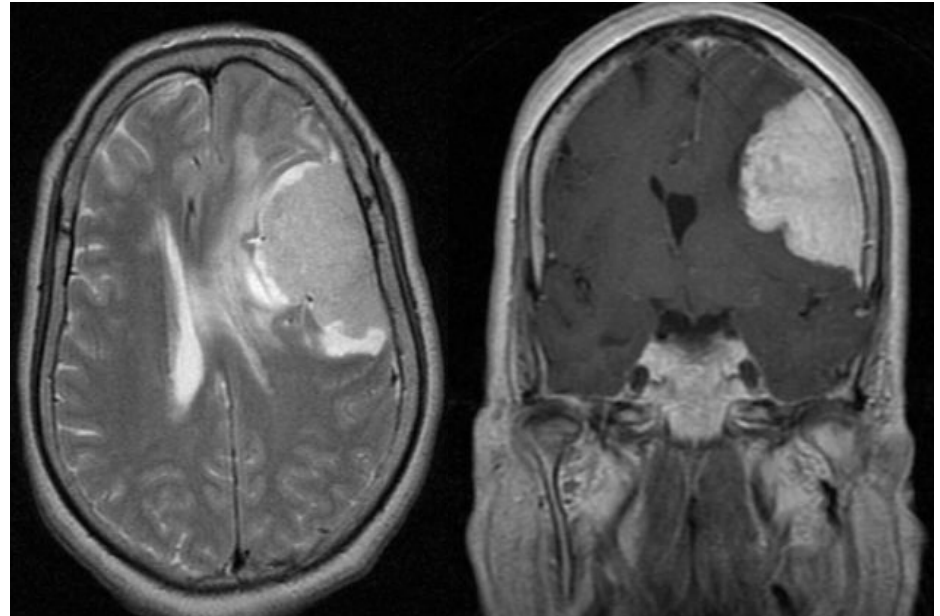
1. Meningioma
2. Infarction
3. Metastasis
4. Abscess



- The lesion on this MRI is?

1. **Meningioma**
2. Infarction (Won't enhance as in this pattern)
3. Metastasis (very rare to reach that size solitary)
4. Abscess (no necrotic cavity)

Extra axial (attached to dura), pushing the white and grey matter, non necrotic, CSF cleft sign (fluid in between it and the brain), solid enhancement (Homogenous enhancement)



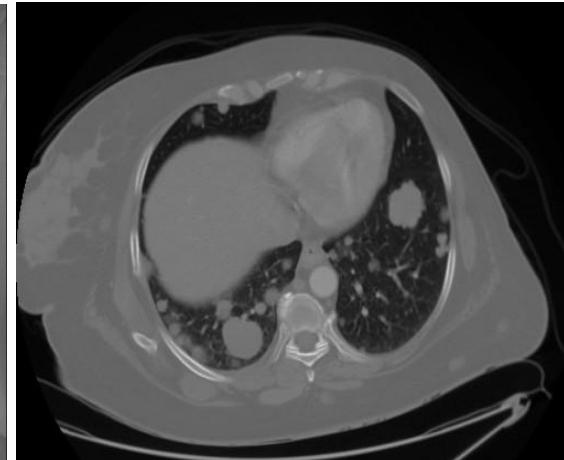
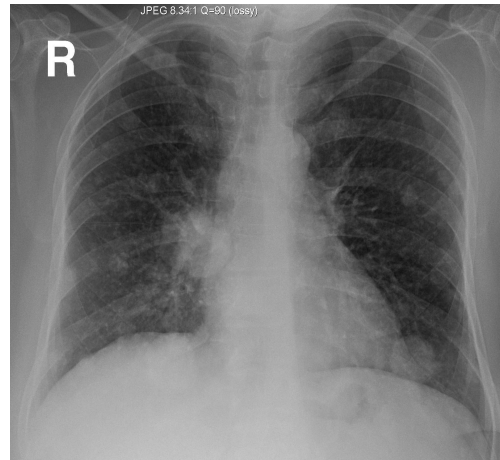
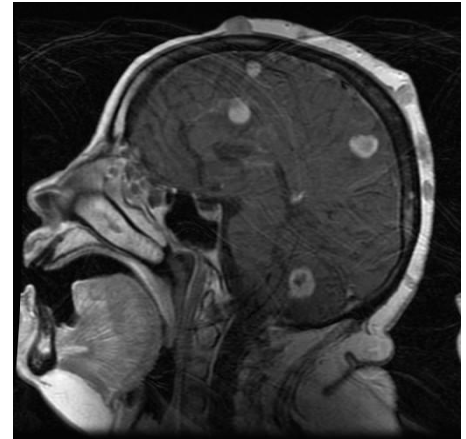
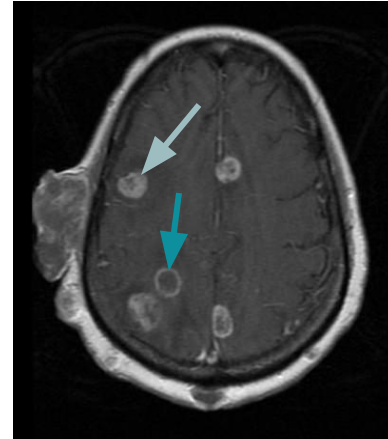
# Case 7

This is metastasis brain tumor that came from breast cancer.

- multiple, intra-axial, love gray-white matter junction. They could have solid enhancement or peripheral enhancement (arrows)

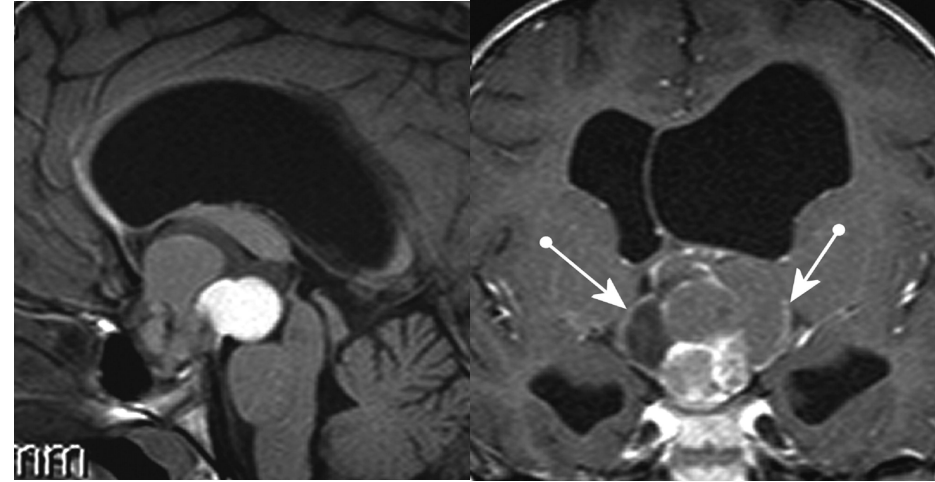
- cutaneous metastasis

- multiple metastasis in the lung.



- The lesion on this MRI is?

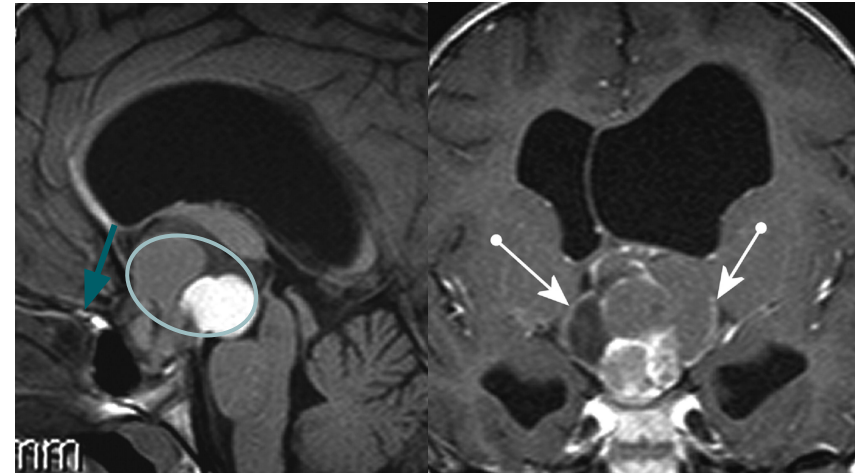
- A. Pituitary adenoma
- B. Craniopharyngioma
- C. Meningioma
- D. Glioblastoma multiforme



## ● The lesion on this MRI is?

- A. Pituitary adenoma (supposed to have single cyst unless if not treated) (usually homogenous)
- B. **Craniopharyngioma**
  - Multicystic present in children and elderly, hyperintense heterogeneous. (circle)
  - If we do CT, and there is a calcification then it's most likely Craniopharyngioma as calcification seen in 90%.
- C. Meningioma (no it must be solid enhancement not cystic) (it could be sellar lesion but usually start from → plane of sphenoidale) (arrow)
- D. Glioblastoma multiforme (intra-axial so not from the differentials of suprasellar lesions)

Partially enhancing  
most of this mass is cavities of different content. Here look to the context of the question

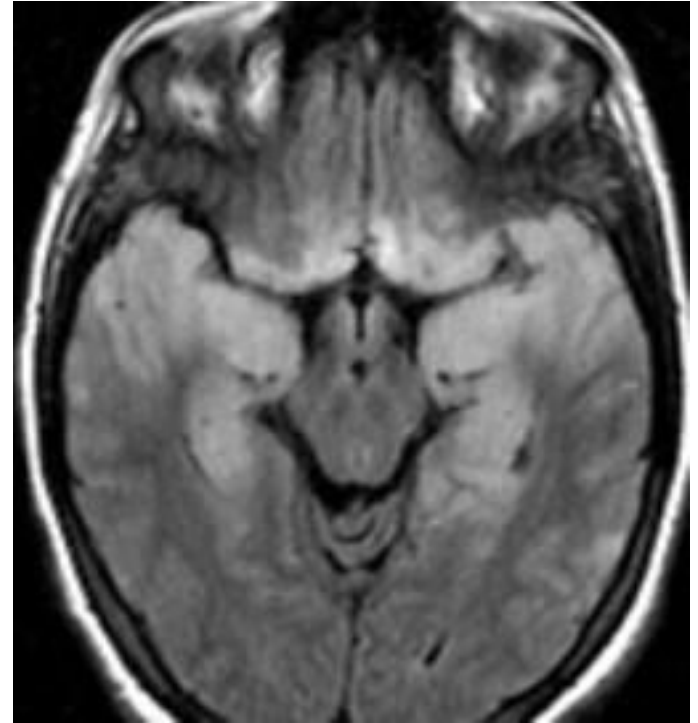


How patients with craniopharyngioma can present?

- Headache
- Vision disturbance
- Pituitary dysfunction (ex. hypogonadism, growth retardation)

- The abnormalities on this MRI are due to?

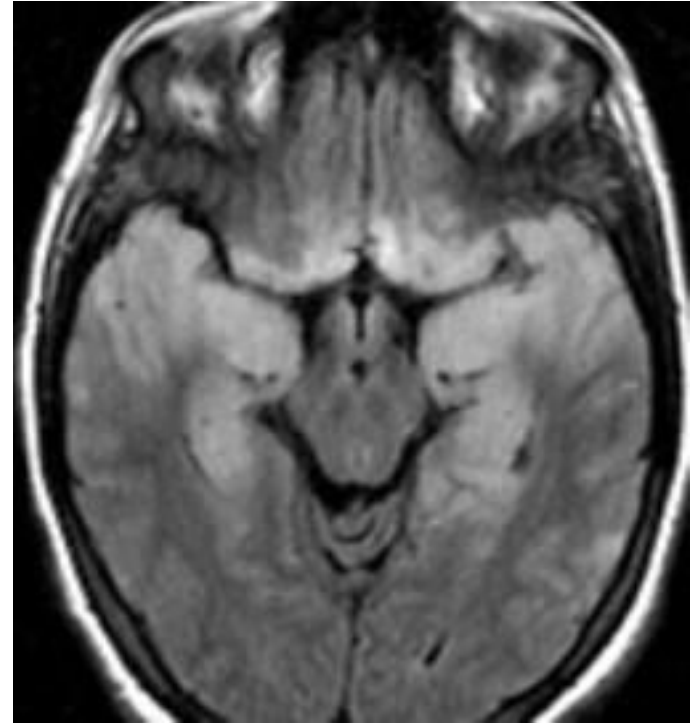
- A. Multiple sclerosis
- B. Meningitis
- C. Brain tumor
- D. Encephalitis



- The abnormalities on this MRI are due to?

- A. Multiple sclerosis (disease of white matter and here gray matter is affected)
  - B. Meningitis (show as normal MRI or hydrocephalus, you should use contrast for meningitis)
  - C. Brain tumor
  - D. **Encephalitis** herpetic encephalitis the most important here is the pattern: bilateral and symmetrical increased intensity of the temporal lobe
- it's FLAIR sequence.

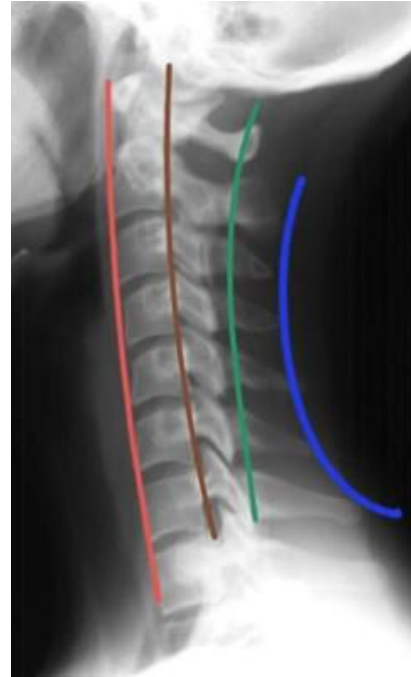
Description: show **bilateral almost symmetric** high signed intensity located in the temporal and inferior frontal lobe.





## Case 10 (Very important)

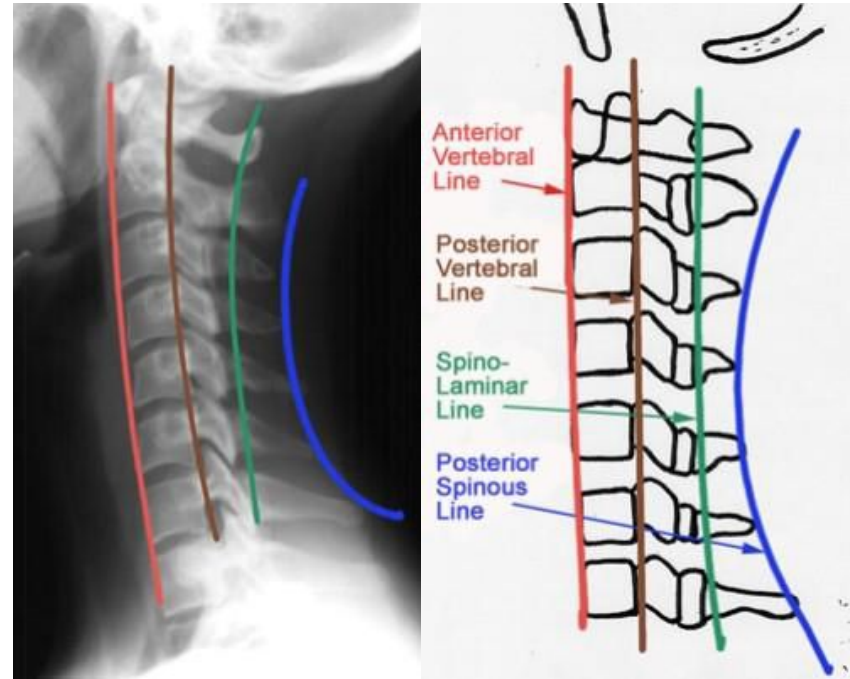
- Which of the following is true about the lines of the cervical spine?
  - A. Red is intervertebral line
  - B. Brown is posterior spinous line
  - C. Green is spinolaminar line
  - D. Blue is posterior vertebral line



# Case 10 (Very important)

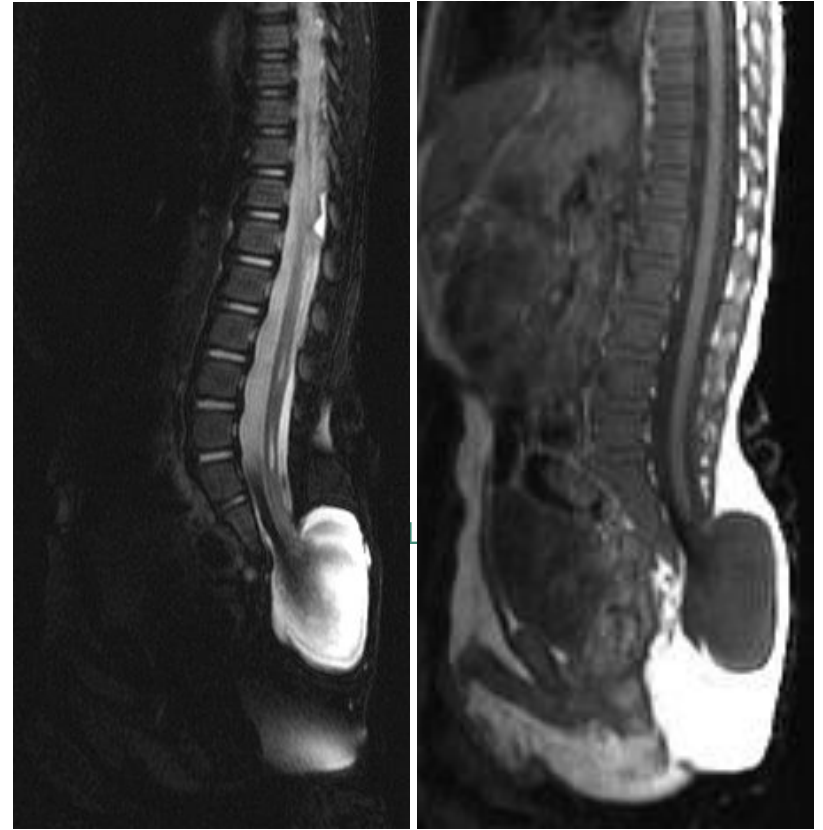
- Which of the following is true about the lines of the cervical spine?
  - A. Red is intervertebral line
  - B. Brown is posterior spinous line
  - C. Green is spinolaminar line**
  - D. Blue is posterior vertebral line

The lines are important in fractures and dislocation



- MRI of the spine shows?

1. Meningocele
2. Extradural tumor
3. Discitis
4. Vertebral fusion

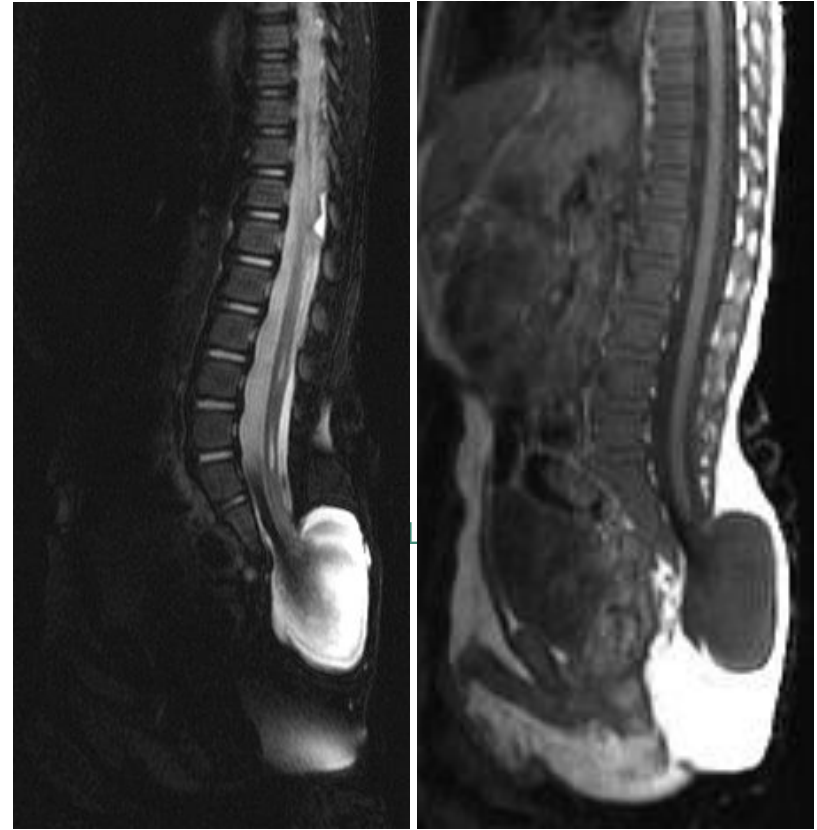


- MRI of the spine shows?

herniation of a sac filled with CSF

1. **Meningocele**
2. Extradural tumor (no mass compressing the spinal cord)
3. Discitis (you'll see destruction of intervertebral disc)
4. Vertebral fusion

-spinal cord normally ends around L2  
-but here it's Tethered until S2-3



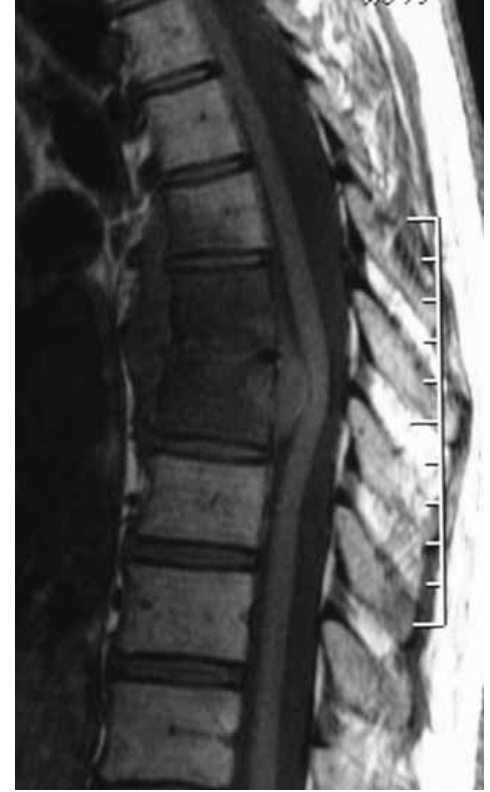
# Intraspinal masses



Patient A

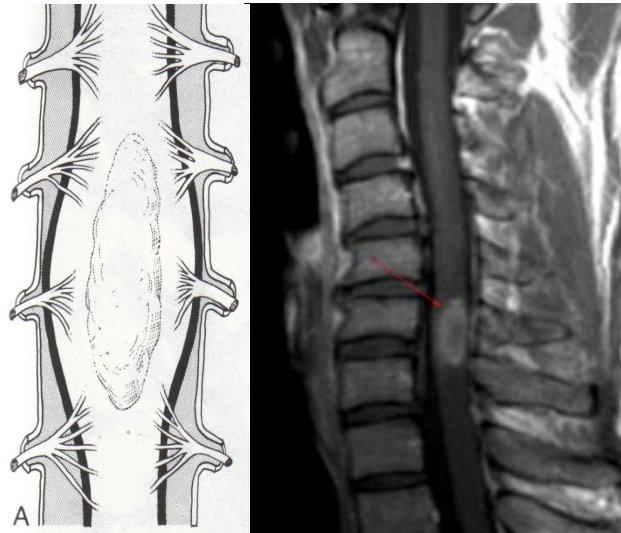


Patient B



Patient C

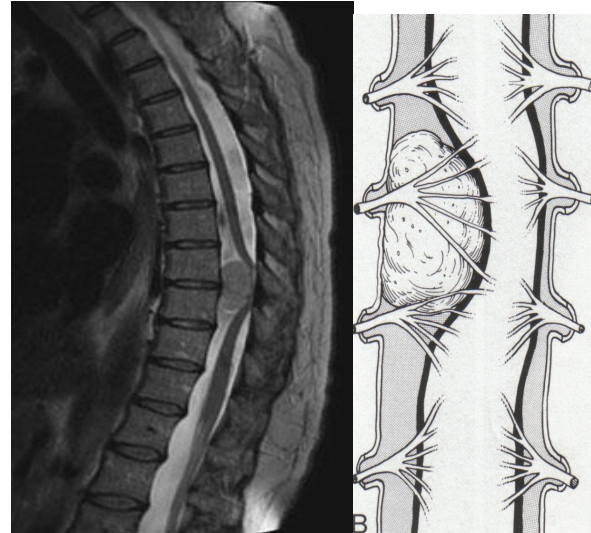
# Intraspinal masses



**Patient A**

A: Intradural intramedullary lesion (Inside the spinal cord)

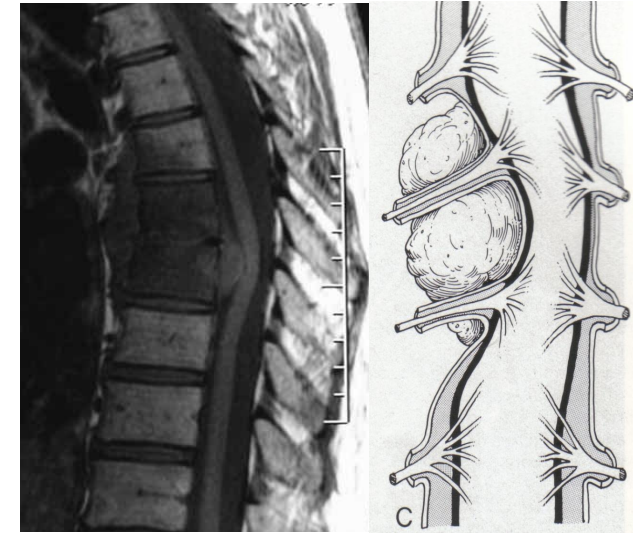
DDx: spinal cord tumor, multiple sclerosis, lymphoma



**Patient B**

B: Intradural extramedullary (outside the spinal cord)

DDx: meningioma, nerve sheath tumor (neuroma, fibroma)  
-Spinal cord compression + CSF space widened



**Patient C**

C: extradural (Epidural)extramedullary  
DDx: disk herniation, infections, abscess formation  
-compress CSF and spinal cord.

## Case 12

- what is the difference between the two images?



Normal

Patient

- what is the difference between the two images?

- normal: This is how an image of cervical spinal should look like, show 7 cervical vertebrae.

- patient: the 7th vertebrae is not seen hidden by the **shoulders**, so its not adequate this image should be repeated. the pateint shows signs of osteoarthritis



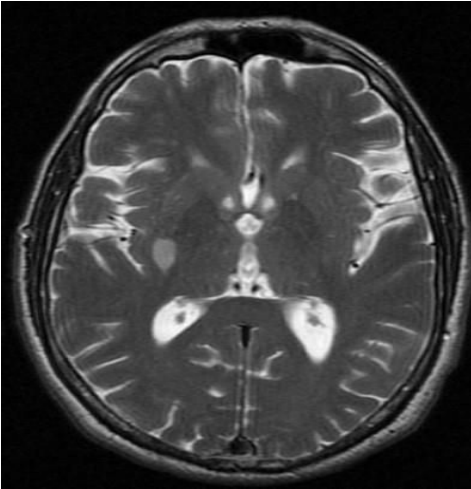
Normal

Patient

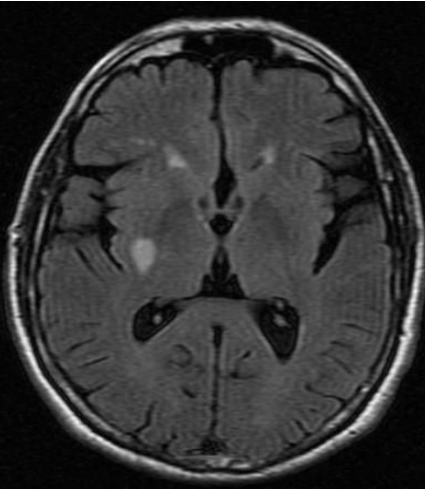


# Case 13

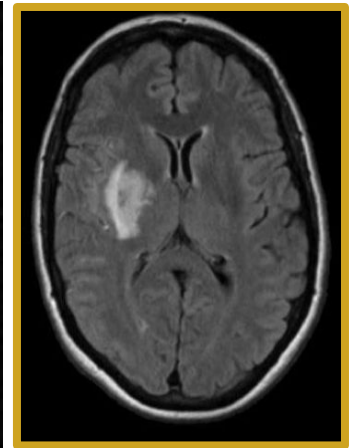
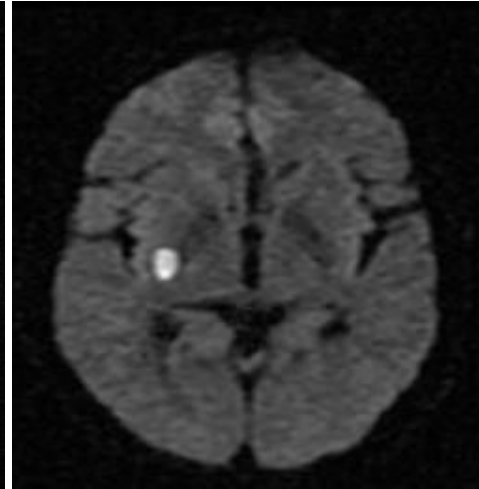
T2WI



FLAIR



DWI



- This MRI shows an infarction in the right basal ganglia.

**A. The infarction is:**

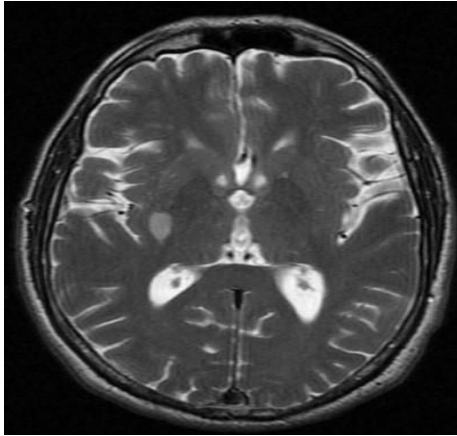
1. Acute (recent)
2. Chronic (old)
3. Hemorrhagic
4. In PCA territory

**B. This patient is most likely to have :**

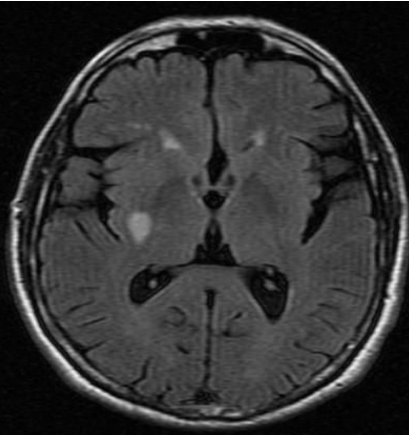
1. Left monoplegia
2. Left hemiplegia
3. Diplegia
4. No symptoms

# Case 13

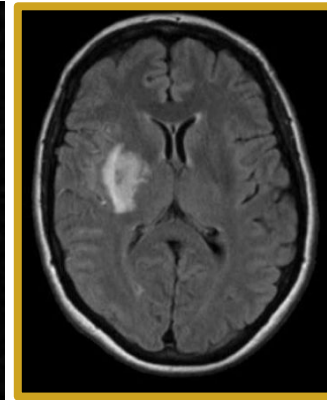
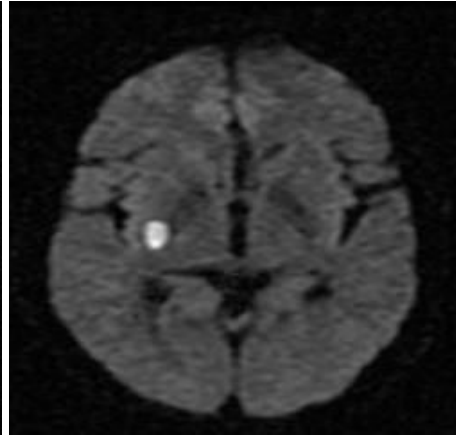
T2WI



FLAIR



DWI



- This MRI shows an infarction in the right basal ganglia.

## A. The infarction is:

1. **Acute** (recent)(appeared in DWI) show as diffuse restriction.
2. Chronic (old)
3. Hemorrhagic. (you should do susceptibility weighted sequence)
4. In PCA territory. It's MCA territory

## B. This patient is most likely to have :

1. Left monoplegia (caused by ACA)
2. **Left hemiplegia**
3. Diplegia (upper limbs paralysis)
4. No symptoms (Dr said it is difficult in our level to have a question with this option)

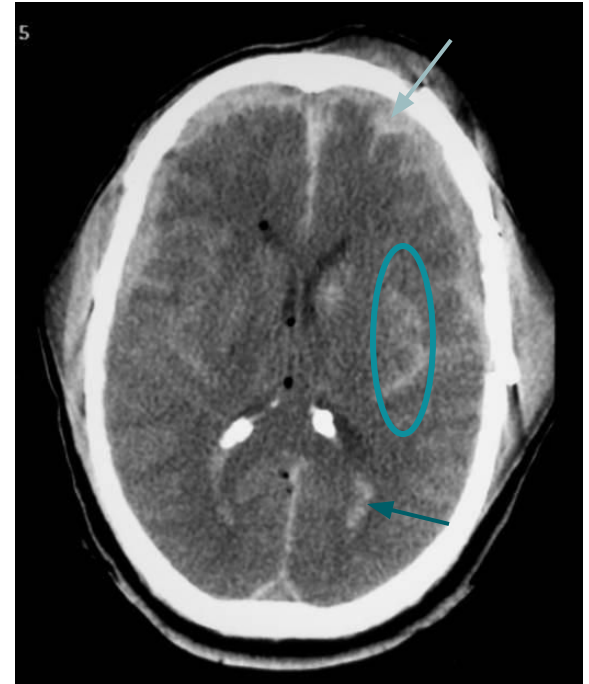
- This CT shows?

1. Subdural hematoma
2. Subarachnoid hemorrhage
3. Intraventricular hemorrhage
4. All of the above



- This CT shows?

1. Subdural hematoma, crescentic in shape, and follow dura reflections
2. Subarachnoid hemorrhage, Along sulci
3. Intraventricular hemorrhage, occipital horn of lateral Ventricle, and there's hyper-density within.
4. **All of the above**



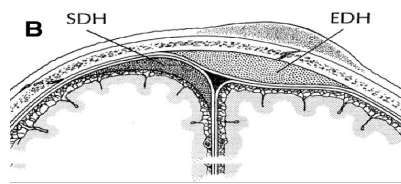
- The hematoma pointed by the arrow is?

1. Acute epidural
2. Chronic epidural
3. Acute subdural
4. Chronic subdural
5. None of the above



- The hematoma pointed by the arrow is?

1. **Acute epidural**
  - (Lentiform (Biconvex) collection between the dura and skull that crossed the midline)
2. Chronic epidural
3. Acute subdural
4. Chronic subdural
5. None of the above



(acute because it is bright)



- This CT shows?

1. Acute PCA infarct
2. Chronic ACA infarct
3. Subarachnoid bleeding
4. Meningioma
5. Abscess



## ● This CT shows?

1. **Acute PCA infarct** (circle) (in PCA territory)
  - Hypodensity of brain parenchyma with Loss of gray / white matter differentiation
2. Chronic ACA infarct
  - If chronic you will see enlarged sulcus
3. Subarachnoid bleeding
4. Meningioma
5. Abscess

(There is also intraventricular hemorrhage)

### Case scenario

A 65-year-old man with history of DM and hypertension presented to the ER with sudden visual disturbance. **CT scan showed low density** in the medial aspect of the right occipital and temporal lobes as well as in the posterior aspect of the thalamus on the same side. Which of the following is the likely diagnosis?

- A. Right posterior cerebral artery infarction
- B. Left anterior cerebral artery infarction
- C. Generalized brain edema
- D. Brain metastasis

Answer: A





# You made it

رسالة أمل في هذه الفترة الحرجة: الله يوفقك ويسهل أمرك ويسدد إجابته في كل اختبارك بآب وحياته  
ويرزقك الدرجات التي تتسناها/تتمناها/تتمنيها  
إن كنت مواصلة وانت تتأخر وقاعد تقرأ هذه الرسالة لا تنسى صلاة الوتر

Everything is going to be Daijobu :)

# شكرًا لكم

في نهاية المطاف شكرًا لكل من ساهم في مساعدة فريق الريديو هذه النتيجة لم تكن إلا بفضل الله ثم فضلكم

## The amazing team members

- Alhanouf Alhaluli
- Lama Alzamil
- Norah Almazrou
- Nouf Alhumaidhi
- Arwa Alemam
- Sarah Alarifi
- Njoud bin Dakheel
- Rana Alshamrani
- Roaa Aljohani
- Rahaf Alshuaniber
- Norah Alharbi
- Mohammed Al-Huqbani
- Ziad Aldosari
- Alwaleed Alsaleh
- Mohaned Makkawi
- Fahad Alsultan
- Abdullah Almuamar
- Mohmmmed Ajarem
- Abdullah Alassaf
- Faisal Alqifari
- Fares Aldokhayel
- Mohammed Aldajani
- Bassam AL Khuwaitir
- Abdulrahman Bedaiwi
- Hashem Bassam
- Rakan Alfaifi
- Badr Alqarni
- Salman Alagla
- Naif Alsaber
- Ibrahim Aldakhil

أقوى شكرًا للأكادمية على جهودهم فريق الريديو ما كان سيكون لولا الله ثم مساعدتكم تعبناكم معنا

- Noura Alturki
- Jehad Alorainy

## Dark Theme Night Owls

- Yasmeen Almousa
- Reem Aljabr
- L & Sh



## Note takers

- Taif Alotaibi
- Amirah Alzahrani
- Sarah Alfarraj



## Note takers

- Salman Alagla
- Badr Alqarni
- Ibrahim Aldakhil



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