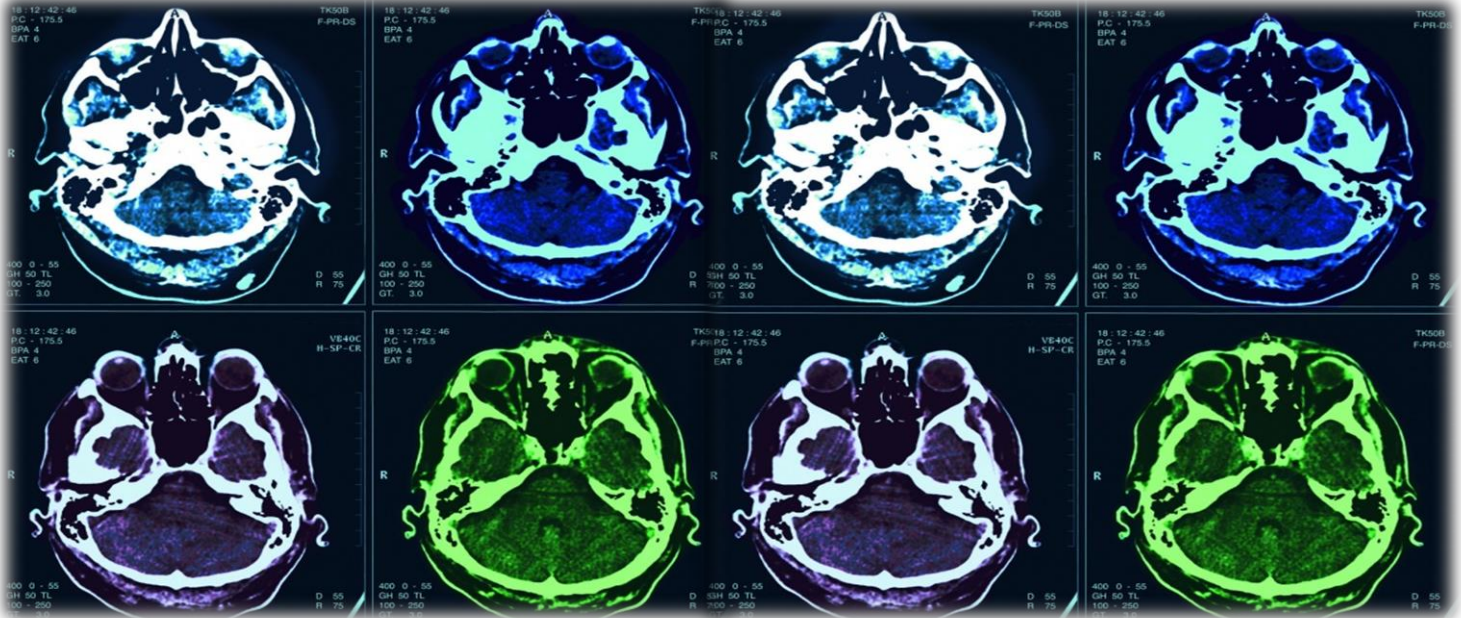




Neurosychiatry Block



RADIOLOGY OF CEREBRAL HEMISPHERE

Lecture three



Objectives:

1. Understand the imaging planes of the brain.
2. Identify the anatomical structures of the cerebral hemispheres on radiological images on different planes.
3. Identify the location of different cerebral functions (motor/sensory/language) on radiological images on different planes.
4. Select the best plane for a particular cerebral anatomical structure.

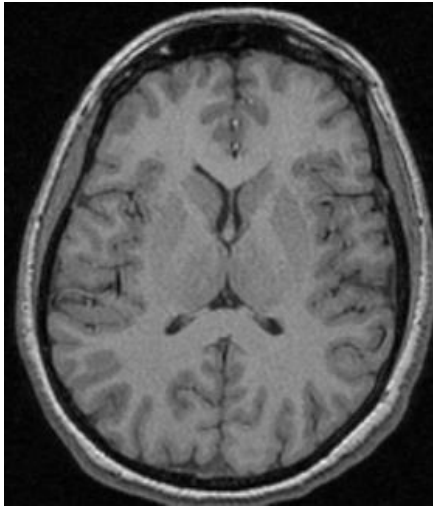
Red: important

Green: Doctor's notes

Grey: Extra

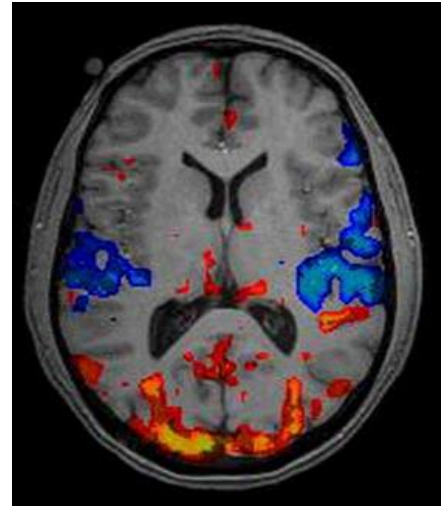
Radiology of cerebral hemisphere:

Morphology



Using: MRI, CT scan, X ray.

Function



Using: Nuclear Imaging.

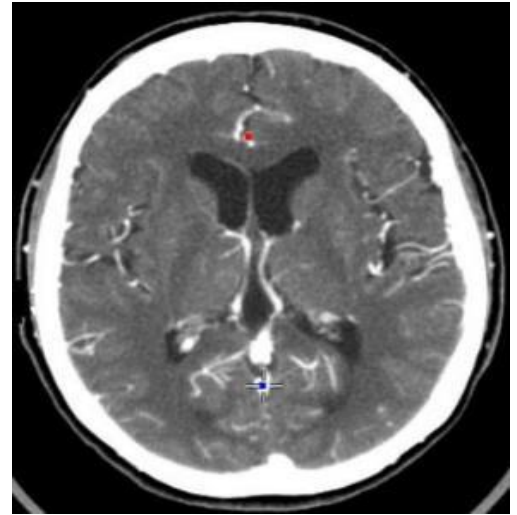
Comparison between imaging technique:

Computed Tomography (CT)	Magnetic Resonance Imaging (MRI)
Ionizing Radiation	No ionizing radiation
Quick (2-3min)	Lengthy (15-20min)
Low resolution*	High resolution
Single plane**	Multiple planes

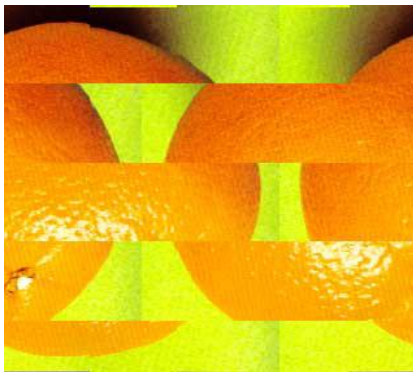
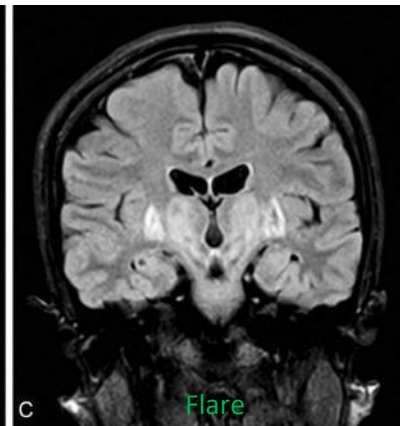
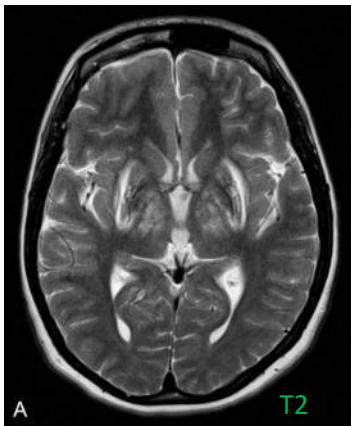
*Resolution= التباين, the clarity of black, grey and white structures.

**Multiple planes= sequences من كل الاتجاهات

CT scan:



MRI:



For your information:

T1= true (gray is gray and white is white).

T2= white is gray and gray is white, (CSF is white).

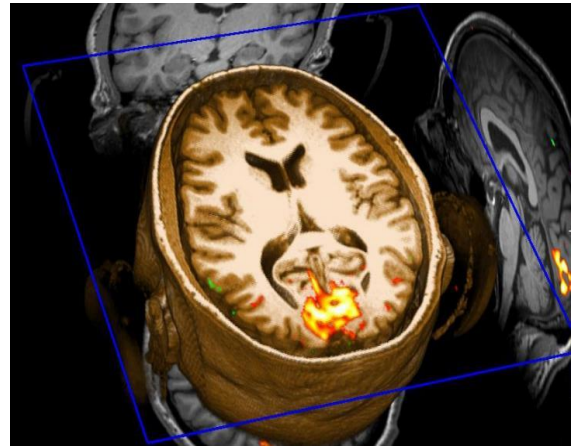
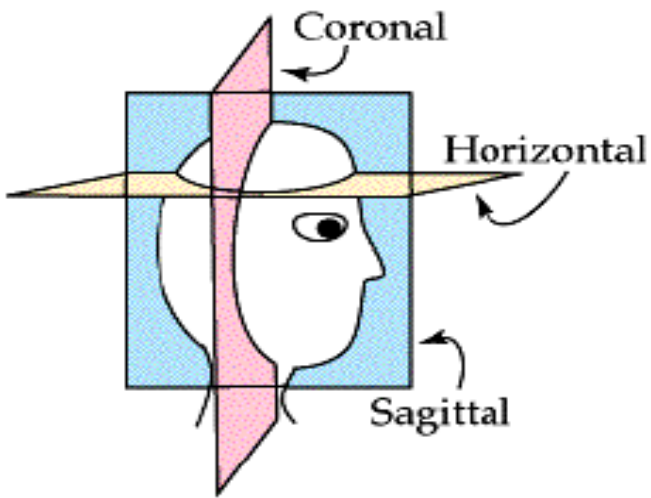
T2 Flare = the same as T2 but CSF is black.



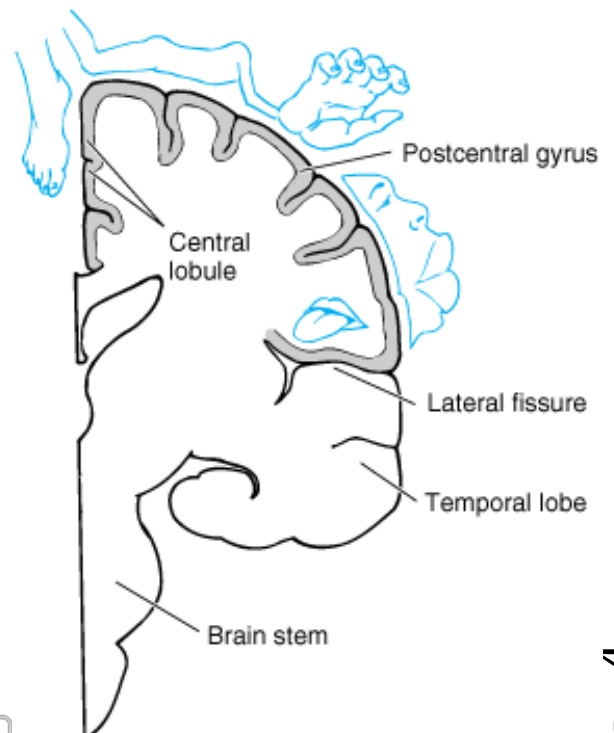
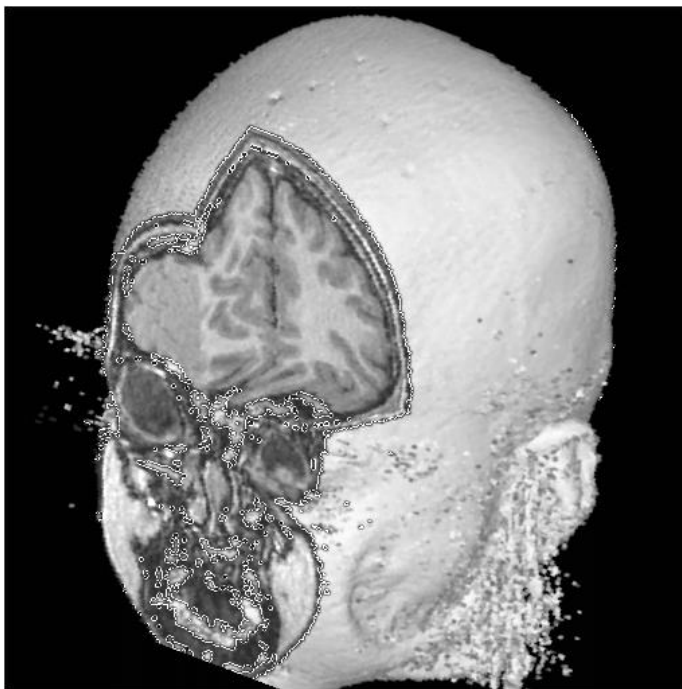
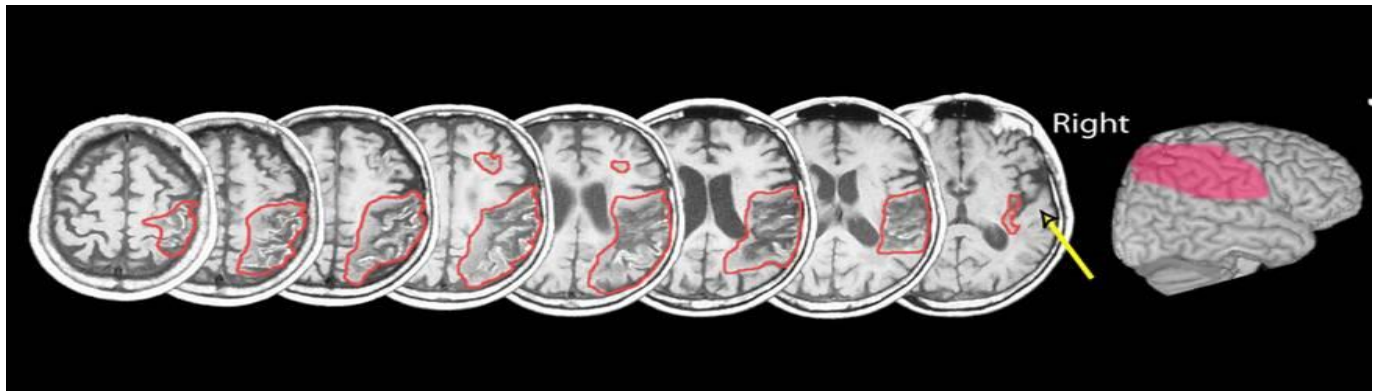
Radiology
Team 436

* This pictures only to show what we mean by multiple planes.

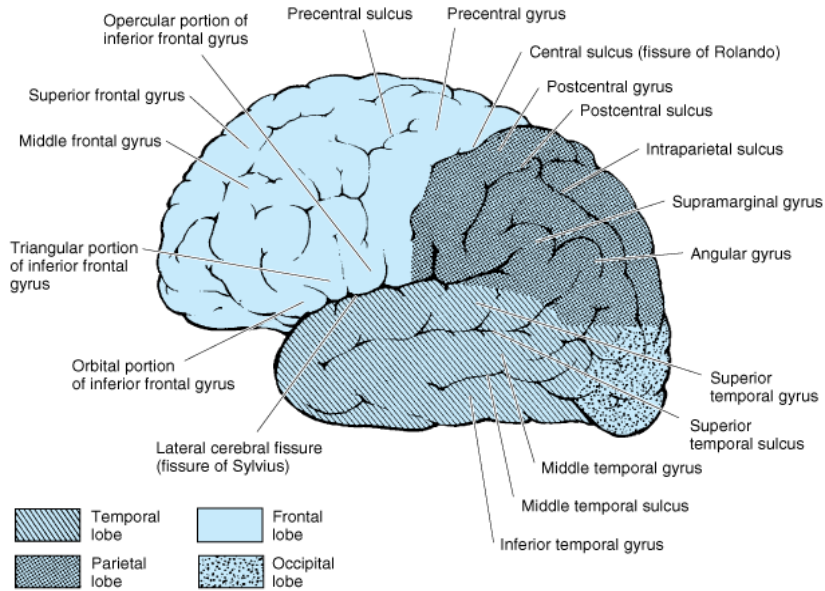
Different body planes:



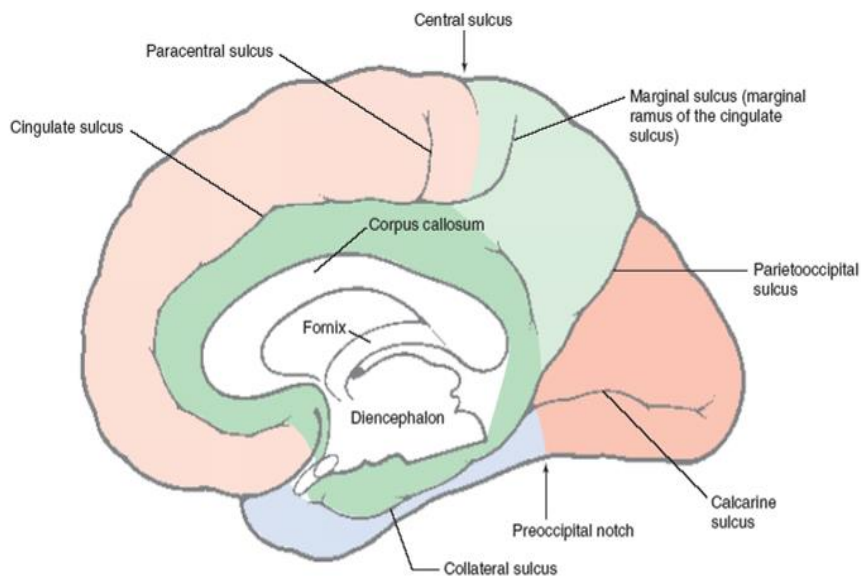
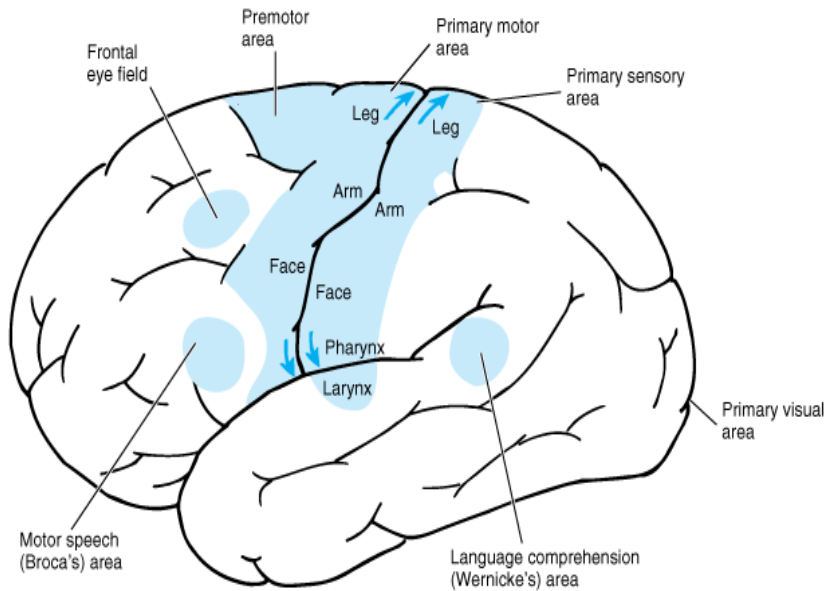
This picture is animated in the original slides.



Functions of the brain parts: the more medial into the hemisphere the more it is for the lower limbs (the most medial is for the legs and the most lateral is for the face).

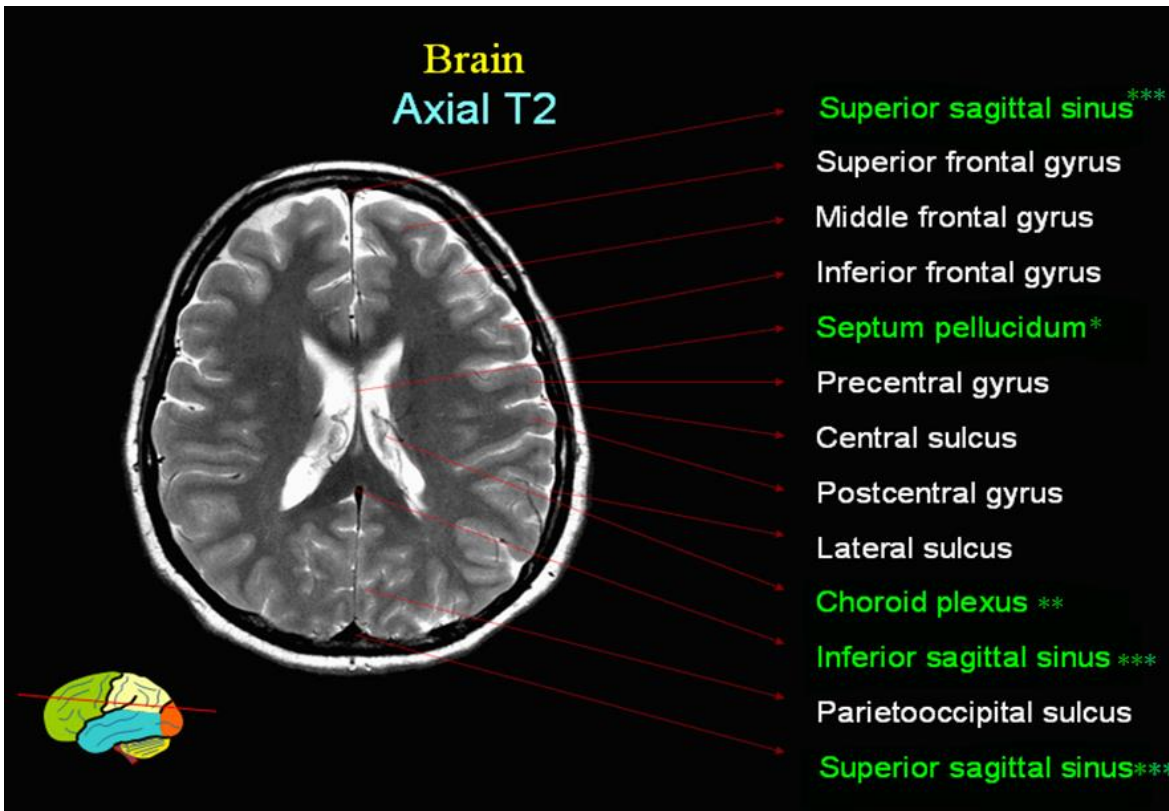
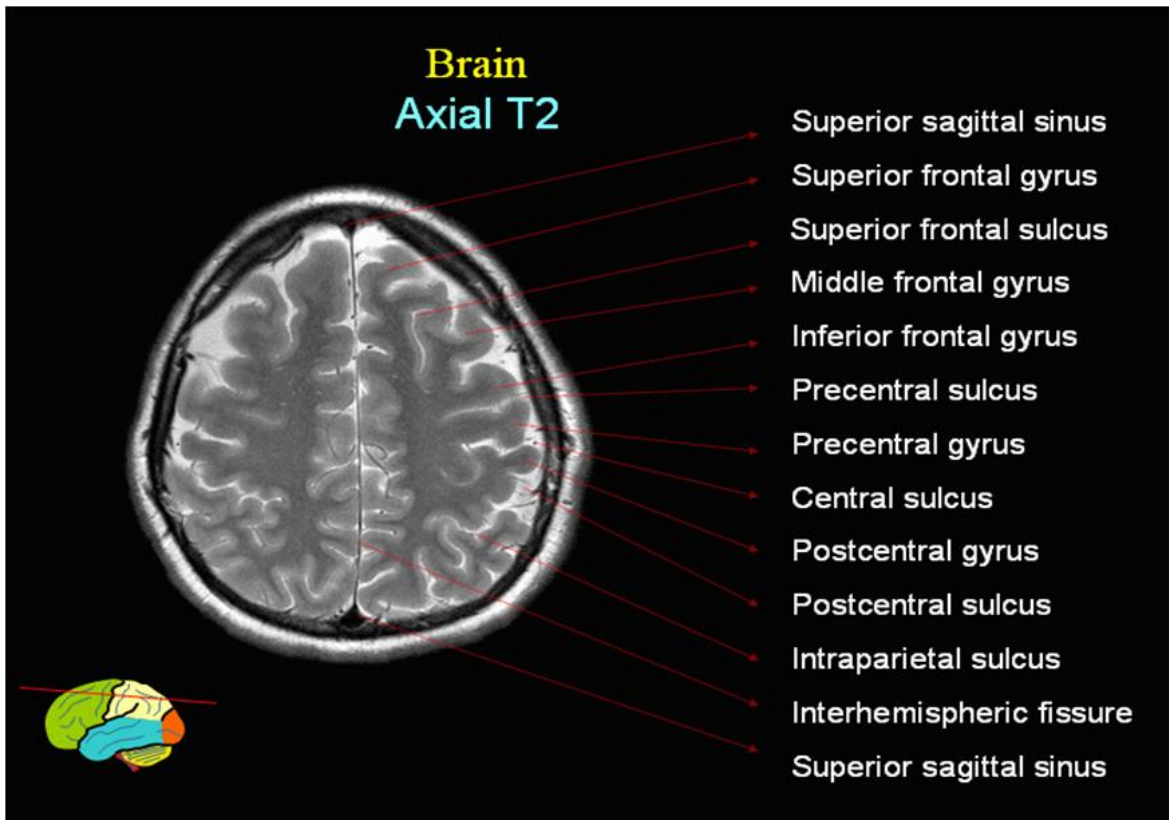


Lateral view of the brain



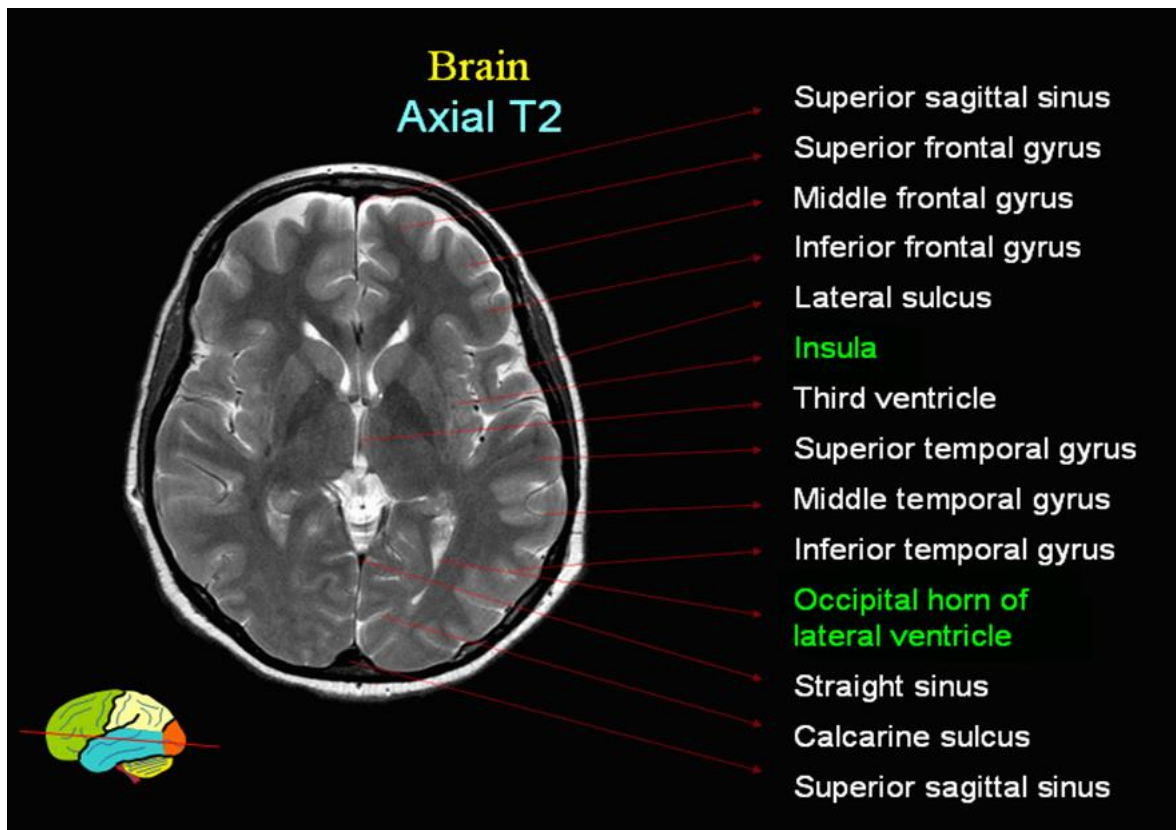
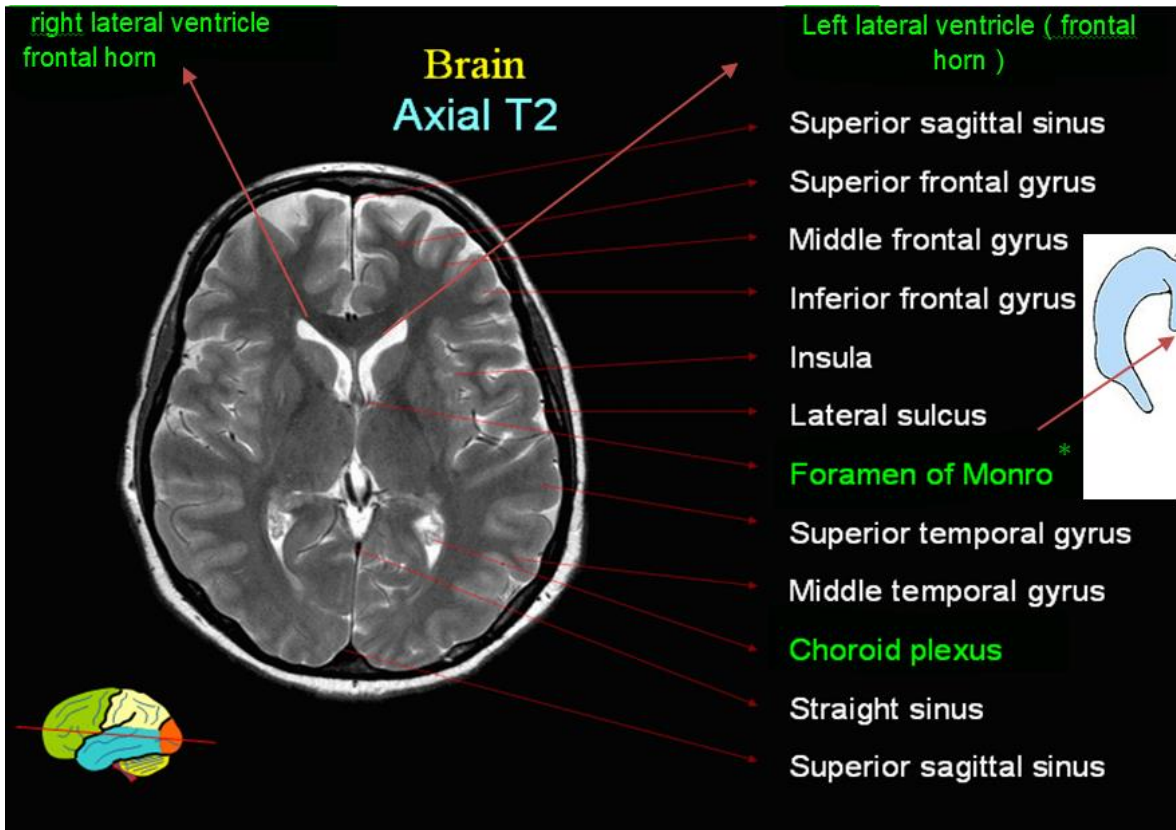
Medial view of the brain

Starting from this page, every structure that the doctor mention is highlighted in green, otherwise any other structures are unimportant details.



* Between the two lateral ventricles (covers the medial surface of each lateral ventricle).
 ** Generates CSF.
 *** Important sinuses are: 1-superior sagittal sinus. 2- Inferior sagittal sinus. 3- Transverse sinus. And all of them drain into the internal jugular vein.

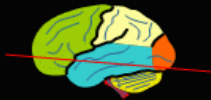
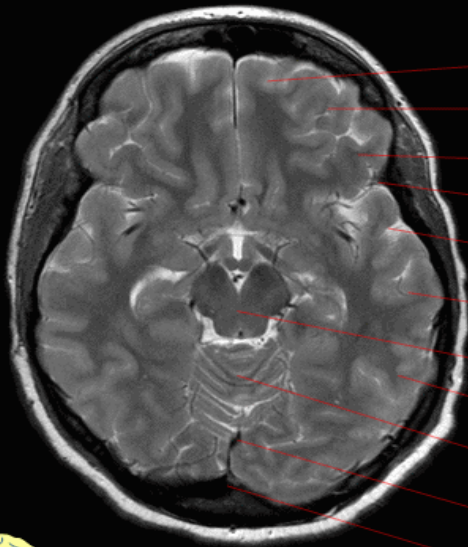




*opening (canal) between lateral and 3rd ventricles
 نتعرف على الصورة كأنه نسلم عليها

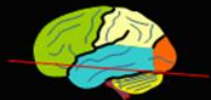
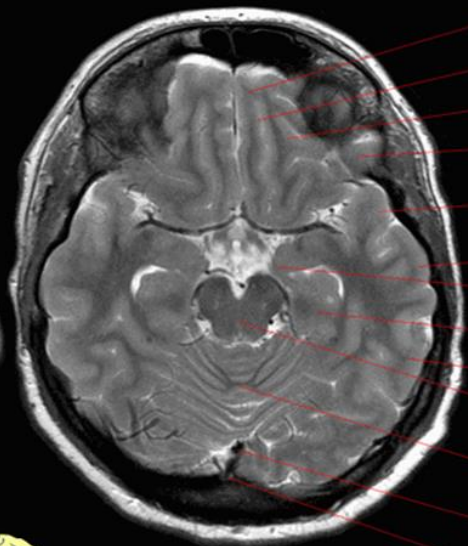
The right side on the picture is actually the left side of the patient and vice versa.

Brain
Axial T2



- Superior frontal gyrus
- Middle frontal gyrus
- Inferior frontal gyrus
- Lateral sulcus
- Superior temporal gyrus
- Middle temporal gyrus
- Midbrain
- Inferior temporal gyrus
- Vermis
- Straight sinus
- Superior sagittal sinus

Brain
Axial T2

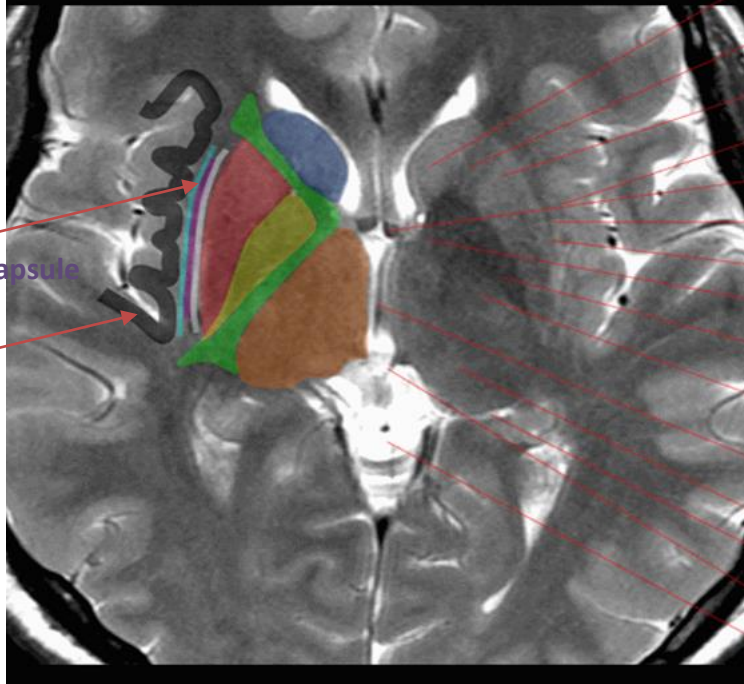


- Gyrus rectus
- Olfactory sulcus
- Orbital gyrus
- Inferior frontal gyrus
- Superior temporal gyrus
- Middle temporal gyrus
- Uncus
- Parahippocampal gyrus
- Inferior temporal gyrus
- Midbrain*
- Vermis
- Straight sinus
- Superior sagittal sinus



* The midbrain is at the level of circle of wills.

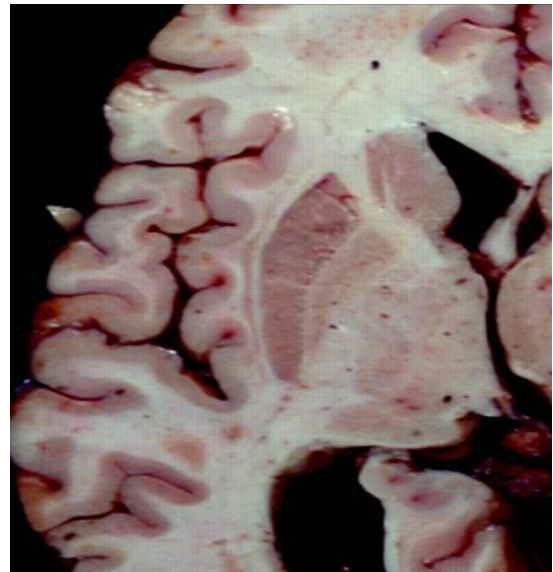
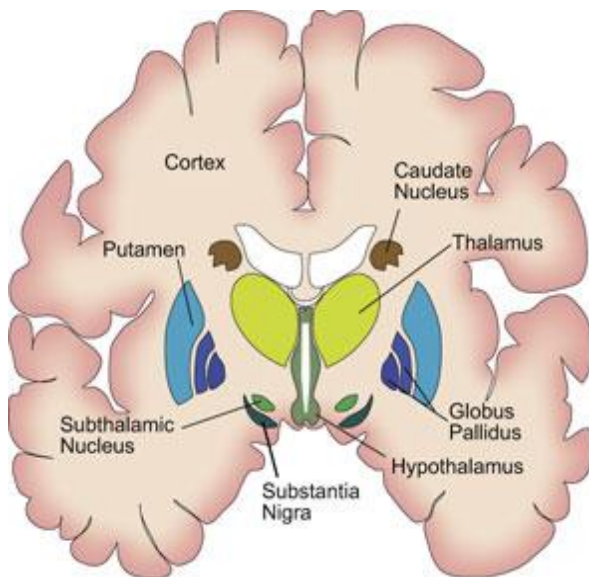
Brain Axial T2



External Capsule

Insula

- Caudate nucleus
- Internal capsule (anterior limb)
- Putamen
- Extreme capsule
- Column of fornix
- Clastrum
- External capsule
- Internal capsule (genu)
- Globus pallidus
- Internal capsule (posterior limb)
- Third ventricle
- Thalamus
- Retropulvinar cistern
- Posterior commissure
- Quadrigeminal cistern



Basal ganglia contains: Lentiform nucleus & Caudate nucleus.

Lentiform nucleus: contains Putamen & Globus pallidus.

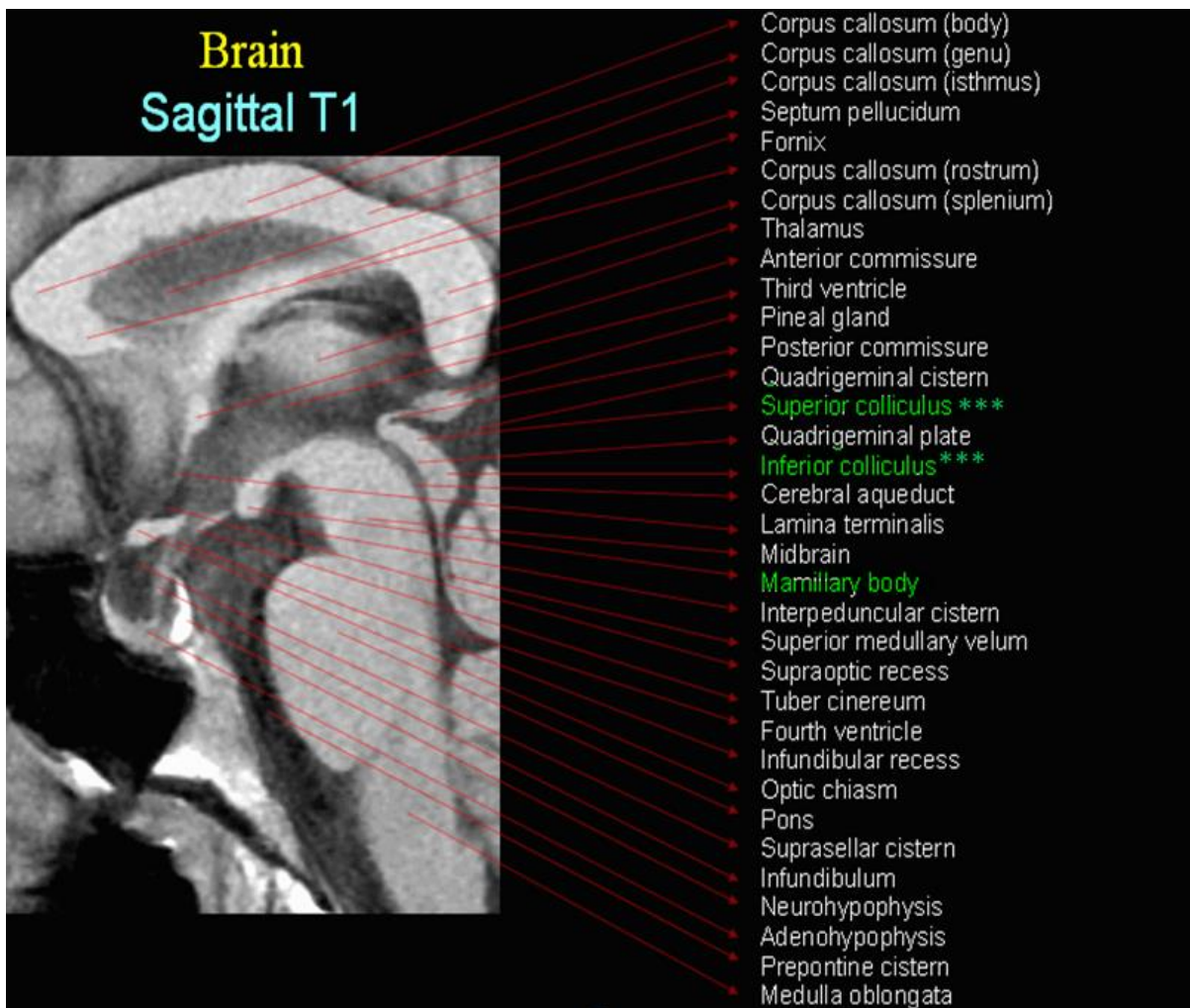
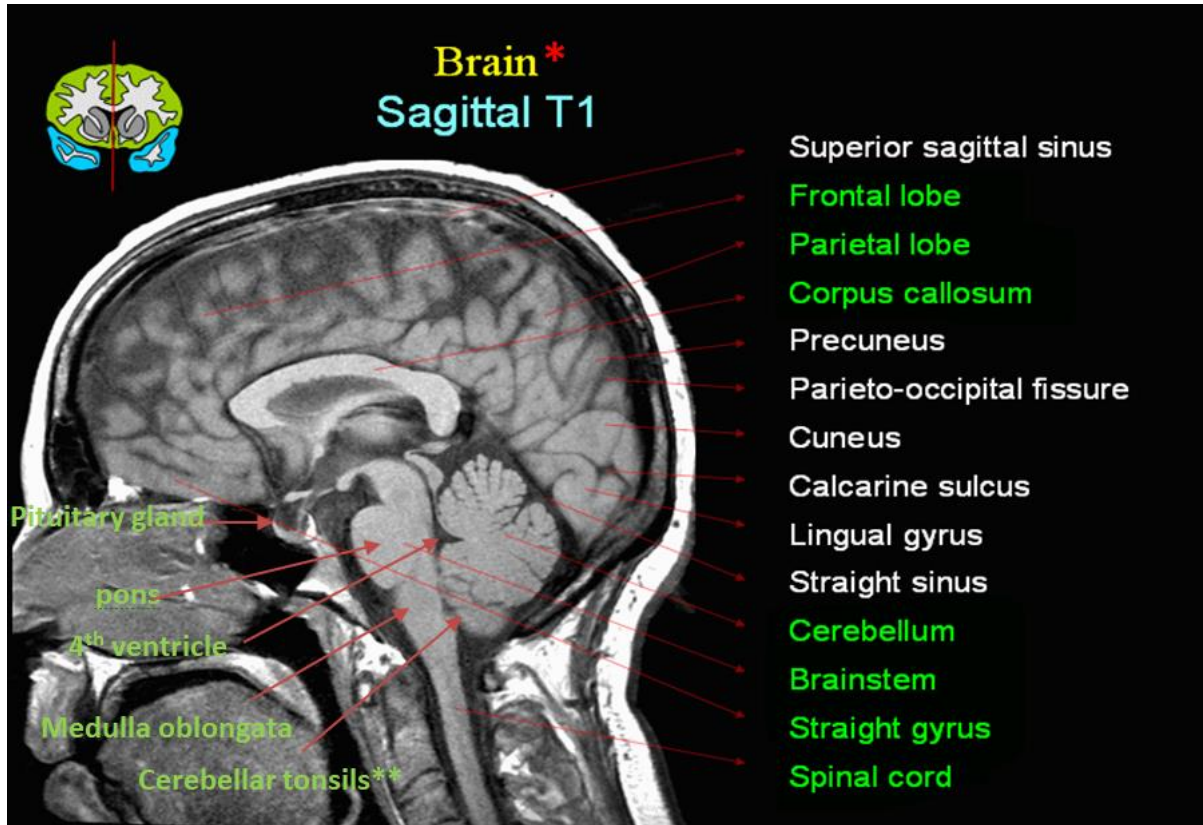
Caudate nucleus: make up the dorsal striatum.

We can see also the internal and external capsules, (Internal capsule have an anterior limb and a posterior limb).

External capsule is found between the insula and the putamen, the internal capsule lies between the caudate and the thalamus and the putamen.

Beside the insula we see the lateral fissure which contains the MCA.

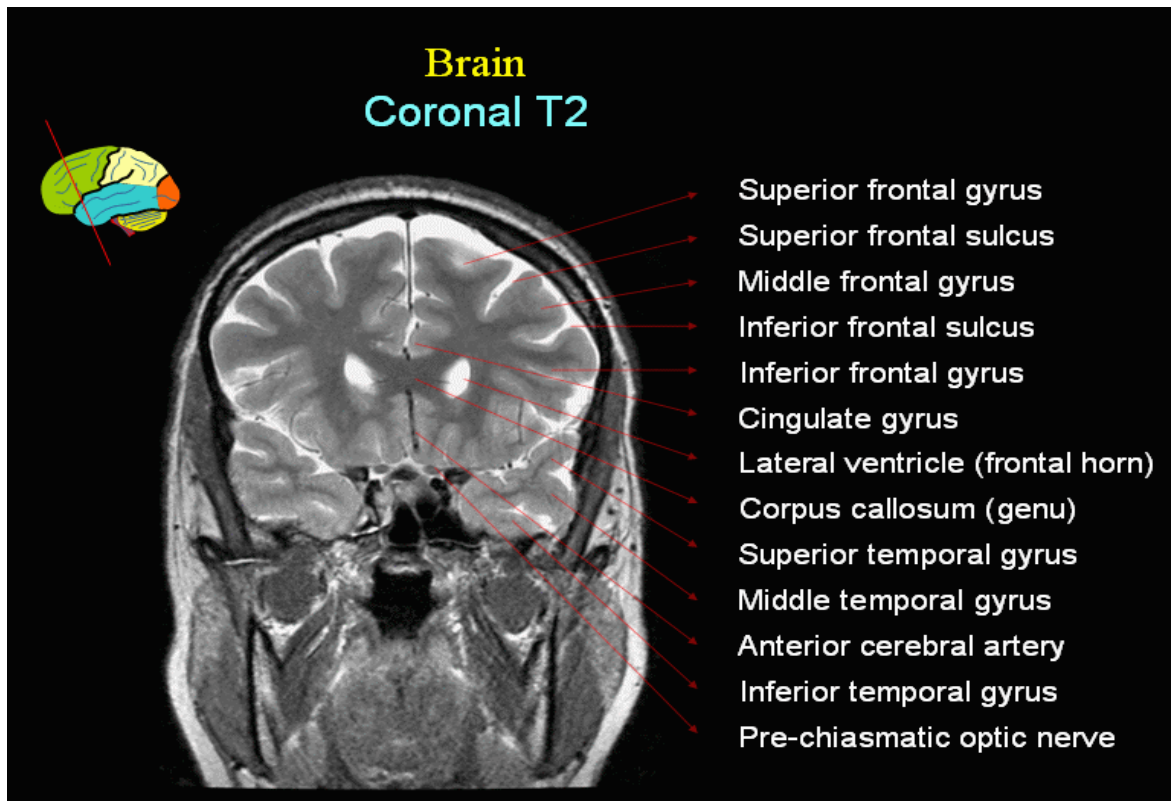
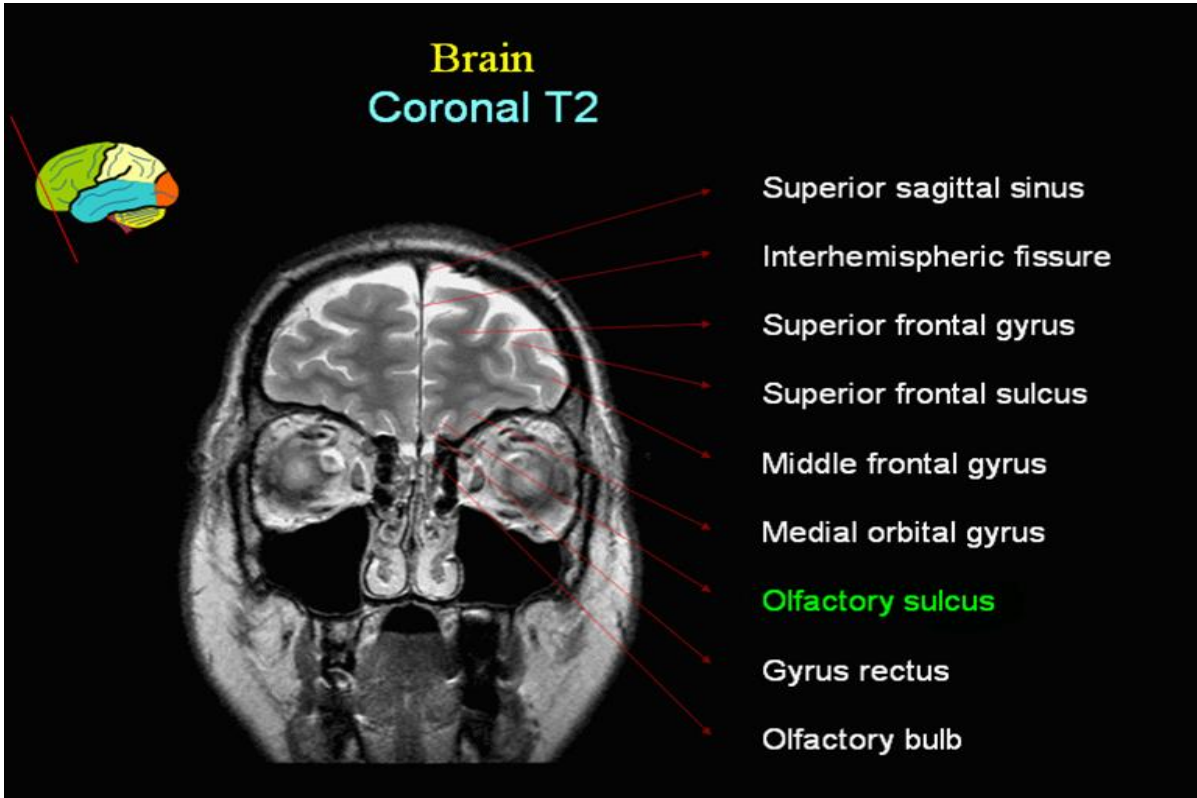




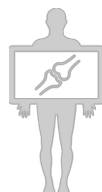
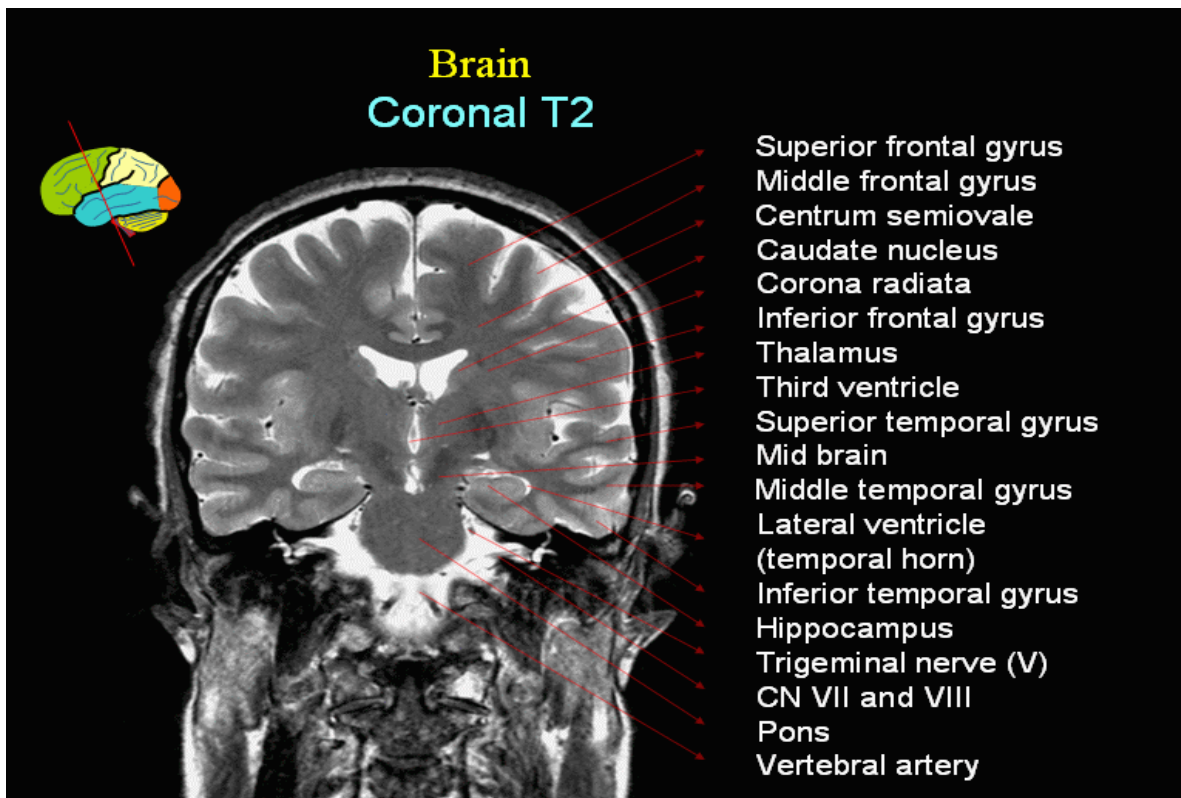
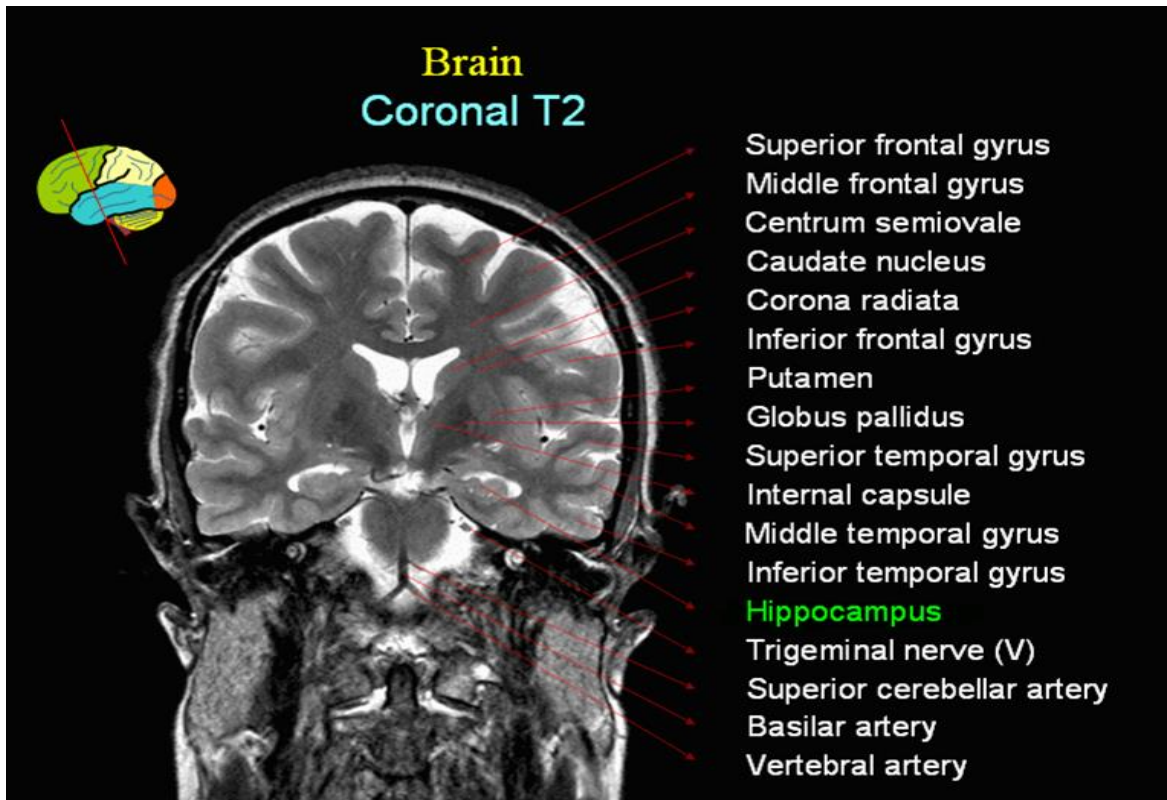
* This picture and its structures are very important!!!!

** Very important for early identification of brain herniation, because in such situation the tonsil will be shifted down which may block the CSF pathway.

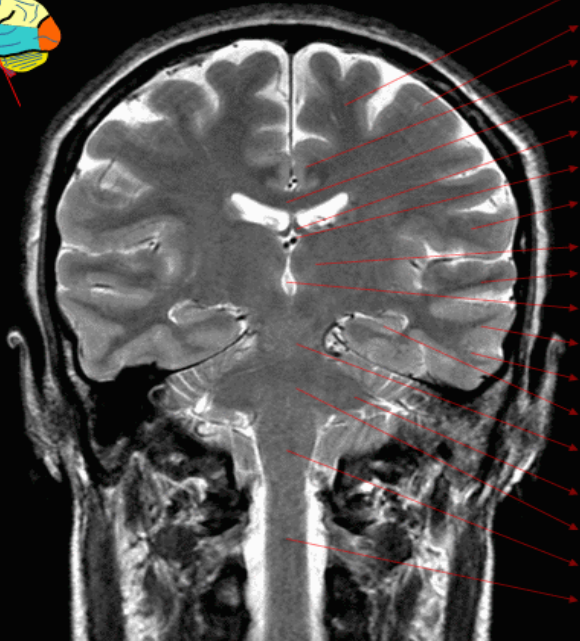
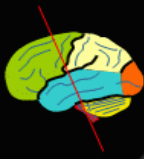
*** These structures are very important.



The coronal view is Important for seizures and pituitary gland.
Focus on the sagittal and axial views more than the coronal).

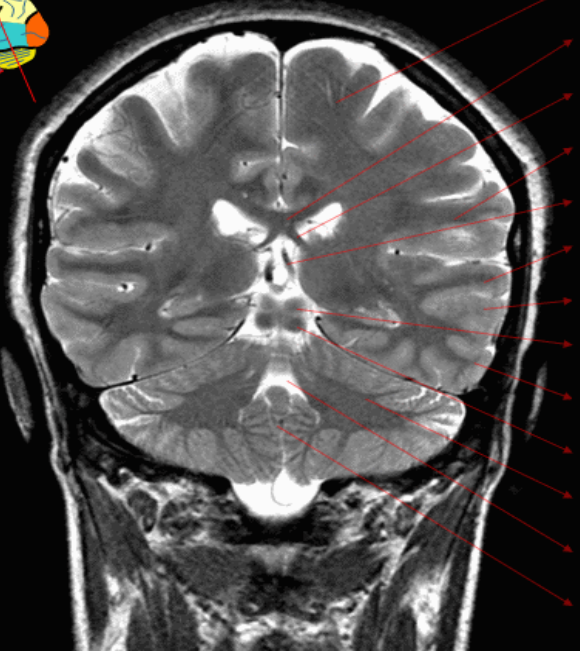
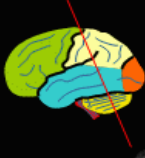


Brain
Coronal T2

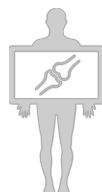


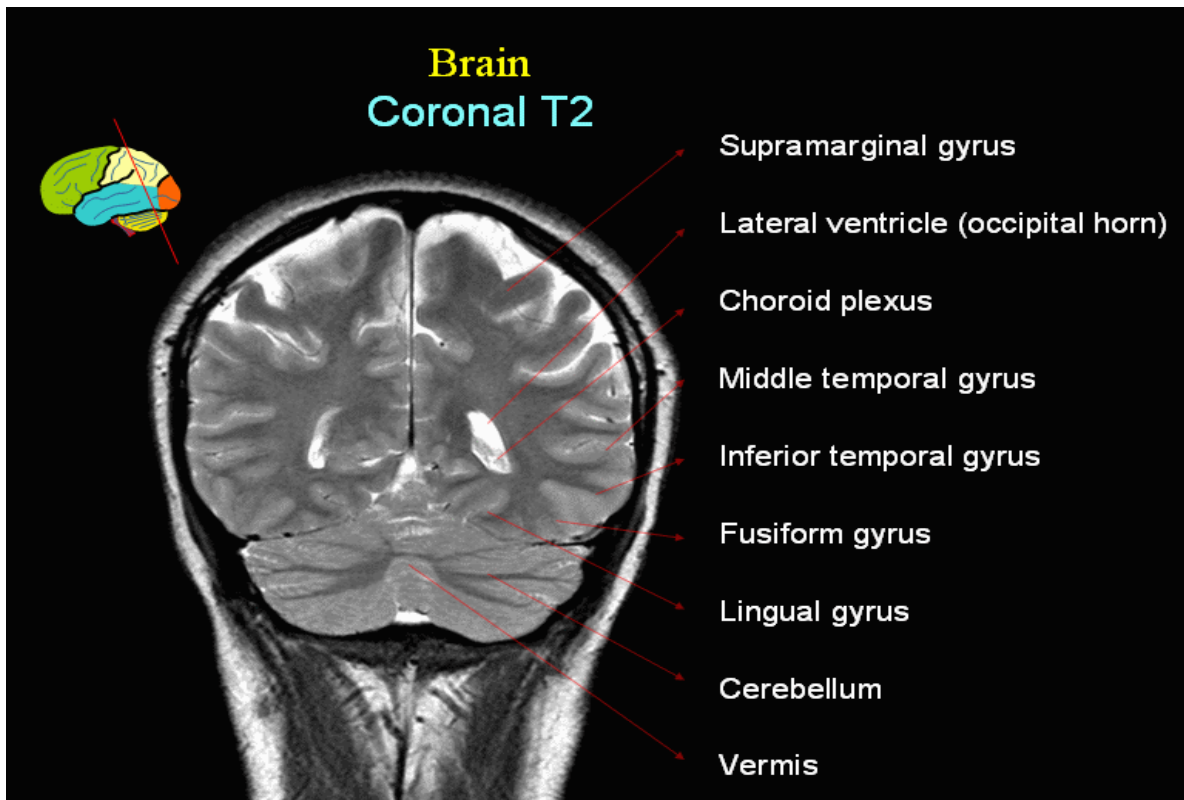
- Superior frontal gyrus
- Middle frontal gyrus
- Cingulate gyrus
- Corpus callosum (body)
- Fornix
- Internal cerebral vein
- Precentral gyrus
- Thalamus
- Superior temporal gyrus
- Third ventricle
- Middle temporal gyrus
- Inferior temporal gyrus
- Hippocampus
- Mid brain
- Middle cerebellar peduncle
- Pons
- Medulla oblongata
- Spinal cord

Brain
Coronal T2



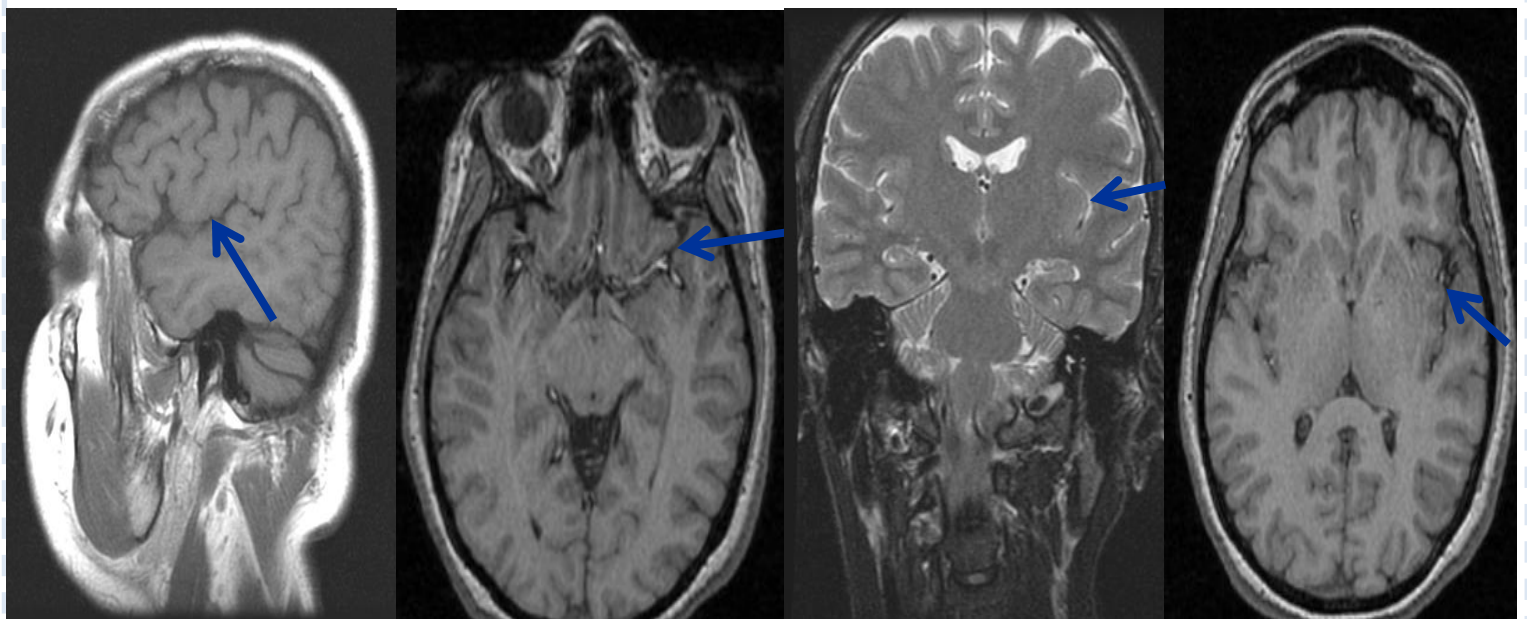
- Postcentral gyrus
- Corpus callosum (body)
- Fornix
- Supramarginal gyrus
- Internal cerebral vein
- Superior temporal gyrus
- Middle temporal gyrus
- Superior colliculus
- Inferior temporal gyrus
- Inferior colliculus
- Cerebellum
- Fourth ventricle
- Vermis





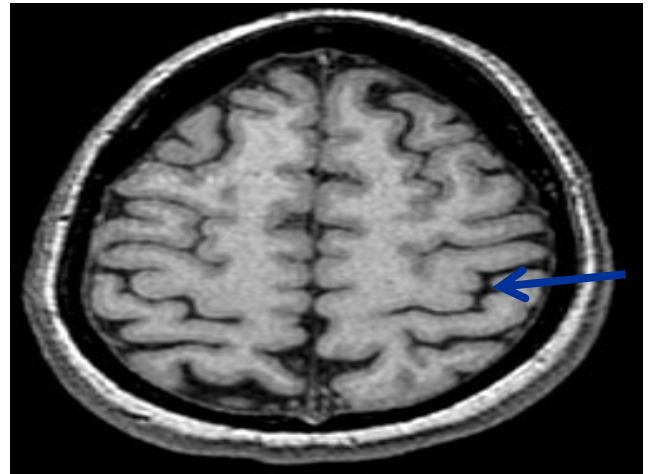
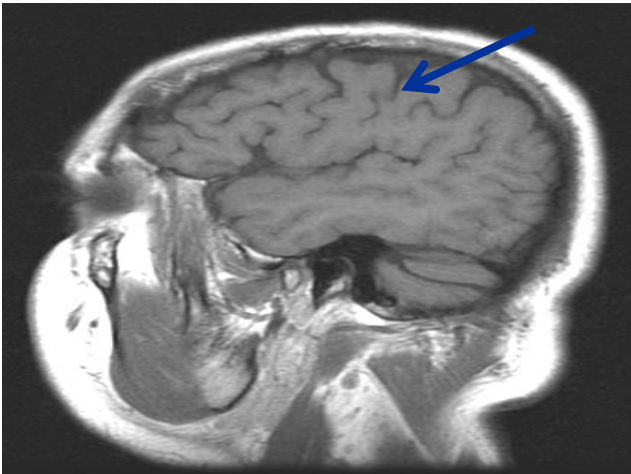
Multiplane correlation:

Sylvian fissure*

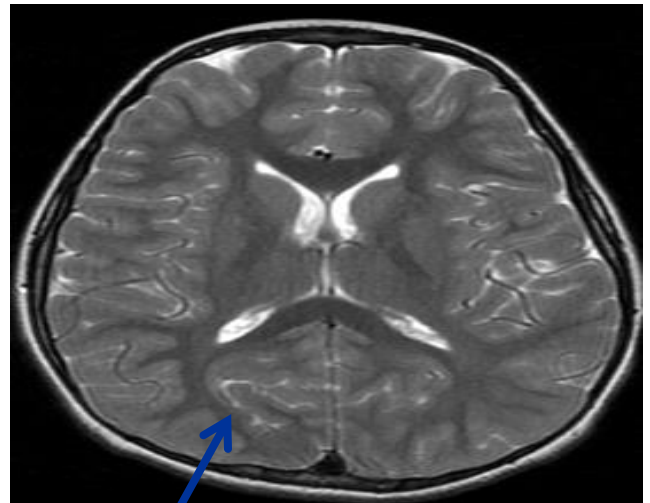
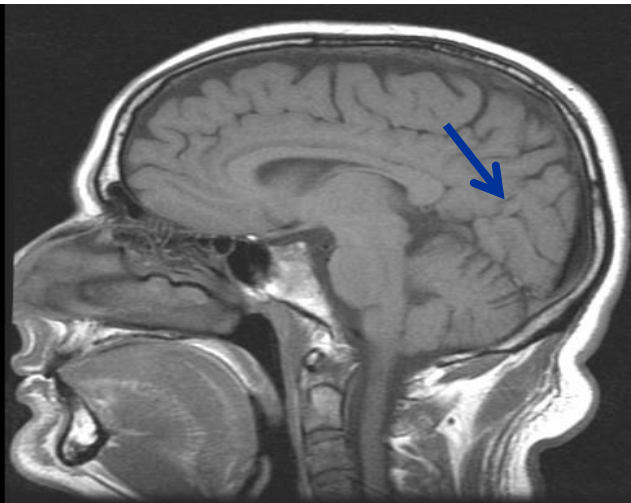


*Important: the lateral (Sylvian) sulcus separates the temporal and the frontal lobe and contains medial cerebral artery MCA (important for infarctions).
When we have an acute infarction in the MCA territory we can see adaptive changes in the insula and hyper-dense MCA.

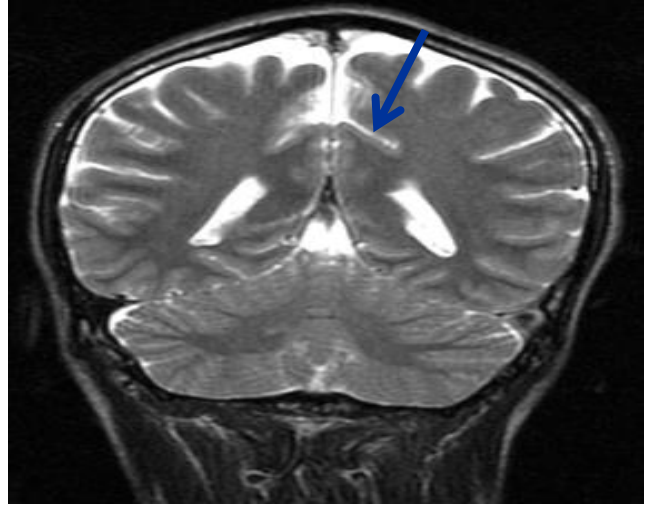
Central (Rolandic) fissure *



Parieto-occipital fissure**

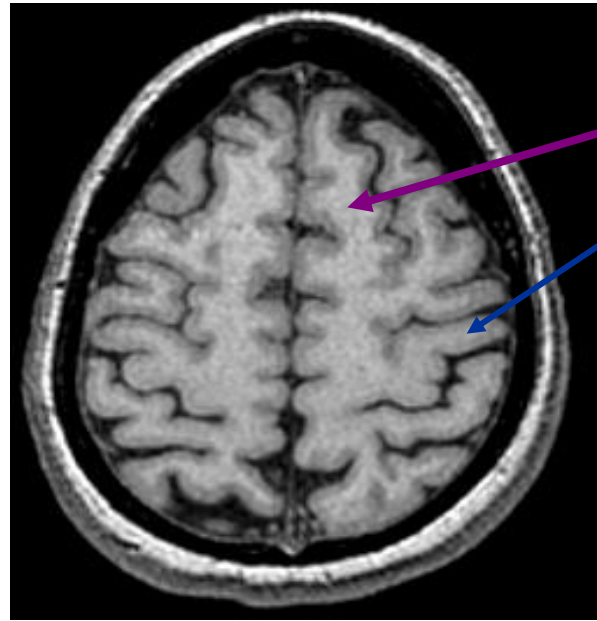
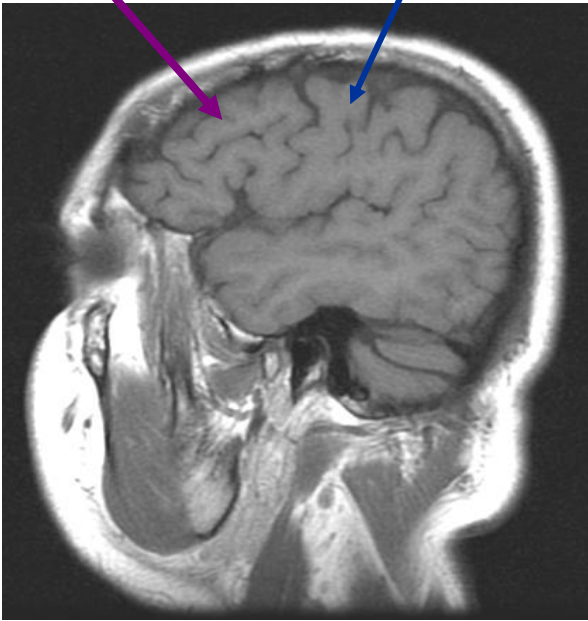


Cingulate Sulcus***

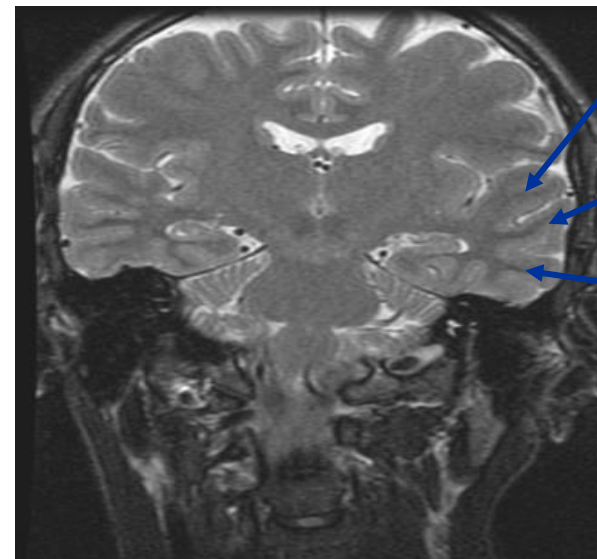
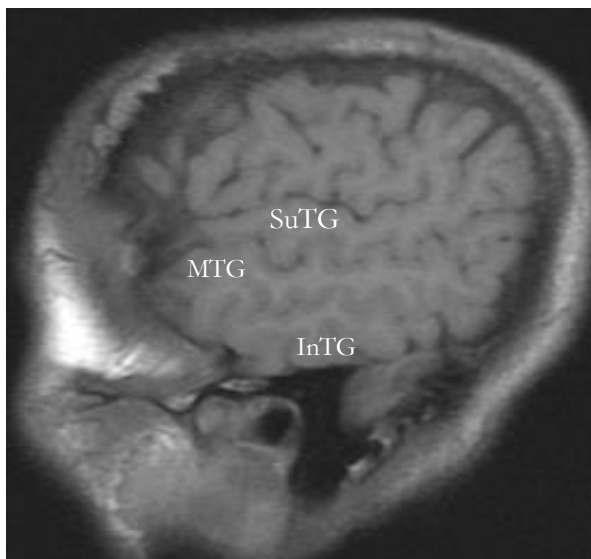
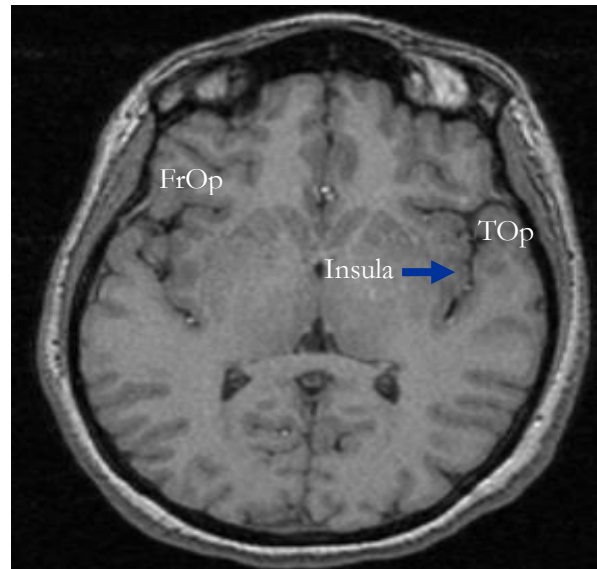
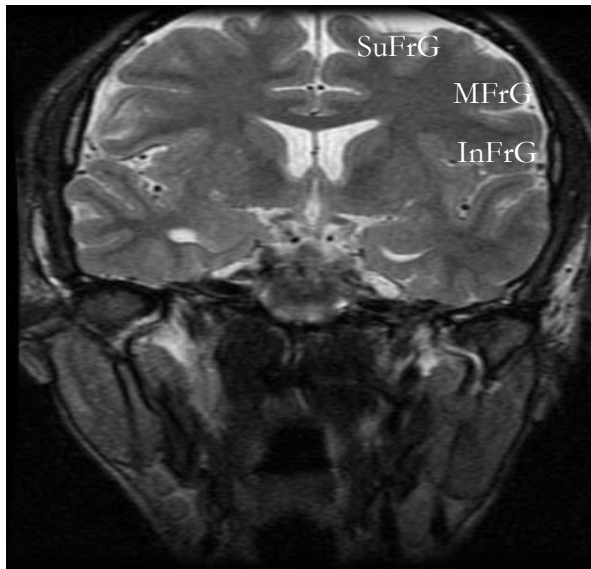


* The parietal lobe and the frontal lobe are separated by the central sulcus.
** separates the parietal lobe from the occipital lobe.
***The Cingulate sulcus is seen in the medial aspect of the hemisphere.

SuFrG (superior frontal gyrus) PrCG (Precentral gyrus)



SuFrG
PrCG

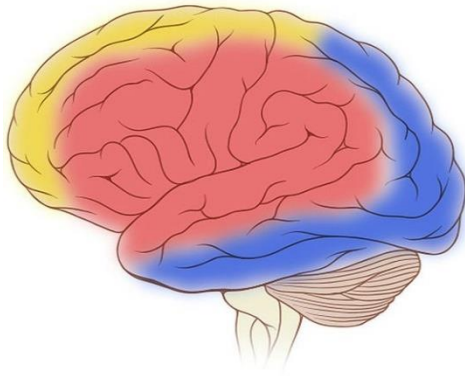


SuTG (Superior temporal gyrus)
MTG (Middle temporal gyrus)
InTG (Inferior temporal gyrus)

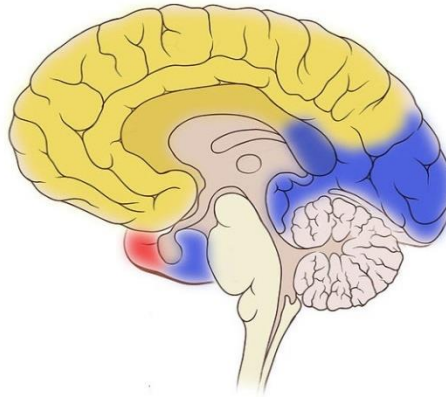


Important: focus on the main anatomical structures in the axial and sagittal images
(Also focus on the blood supply to the brain and fissures)

Lateral Brain



Medial Brain

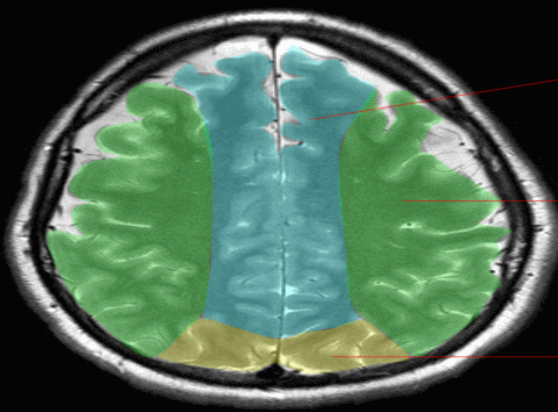


- Anterior Cerebral Artery
- Middle Cerebral Artery
- Posterior Cerebral Artery

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The #1 Applied Human Anatomy Site on the Web.

Brain (Arterial territories)

Axial T2



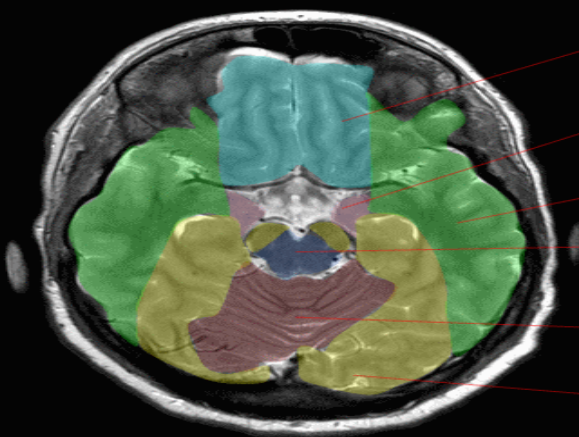
Anterior cerebral artery

Middle cerebral artery

Posterior cerebral artery

Brain (Arterial territories)

Axial T2



Anterior cerebral artery

Anterior choroidal artery

Middle cerebral artery

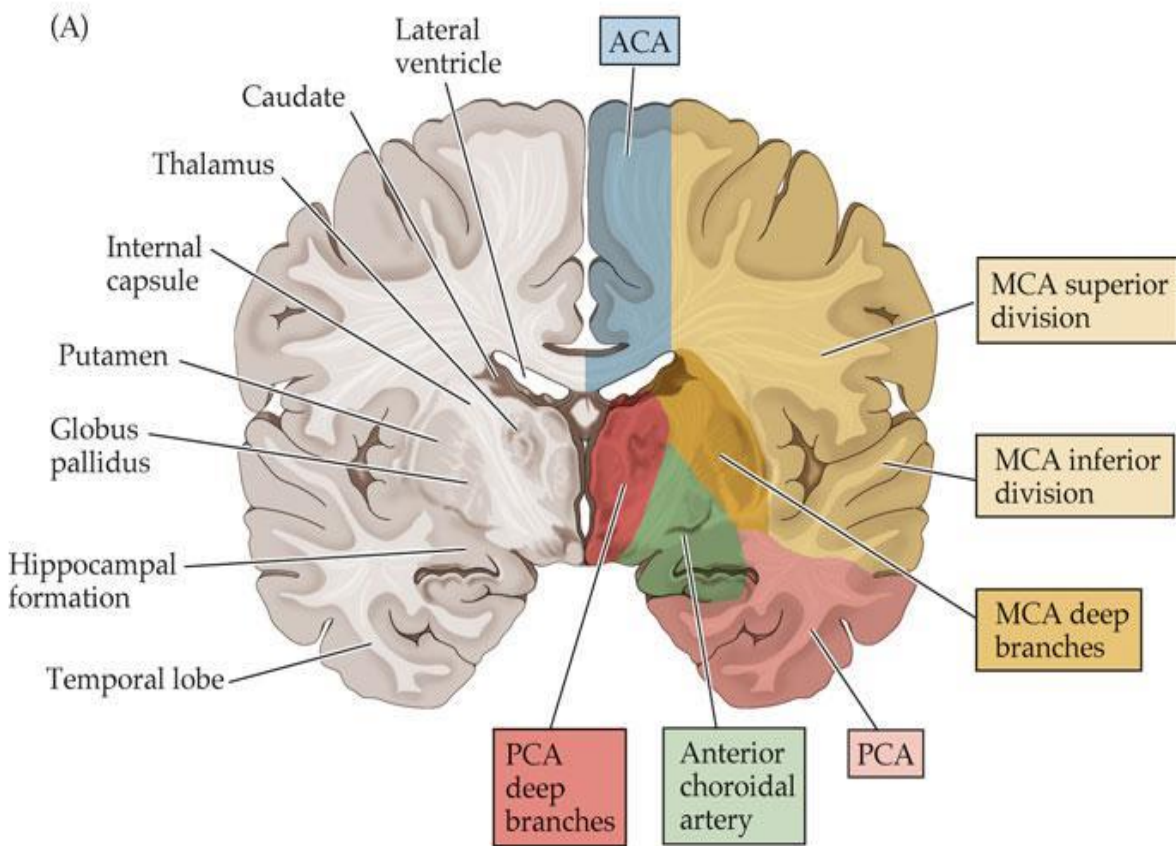
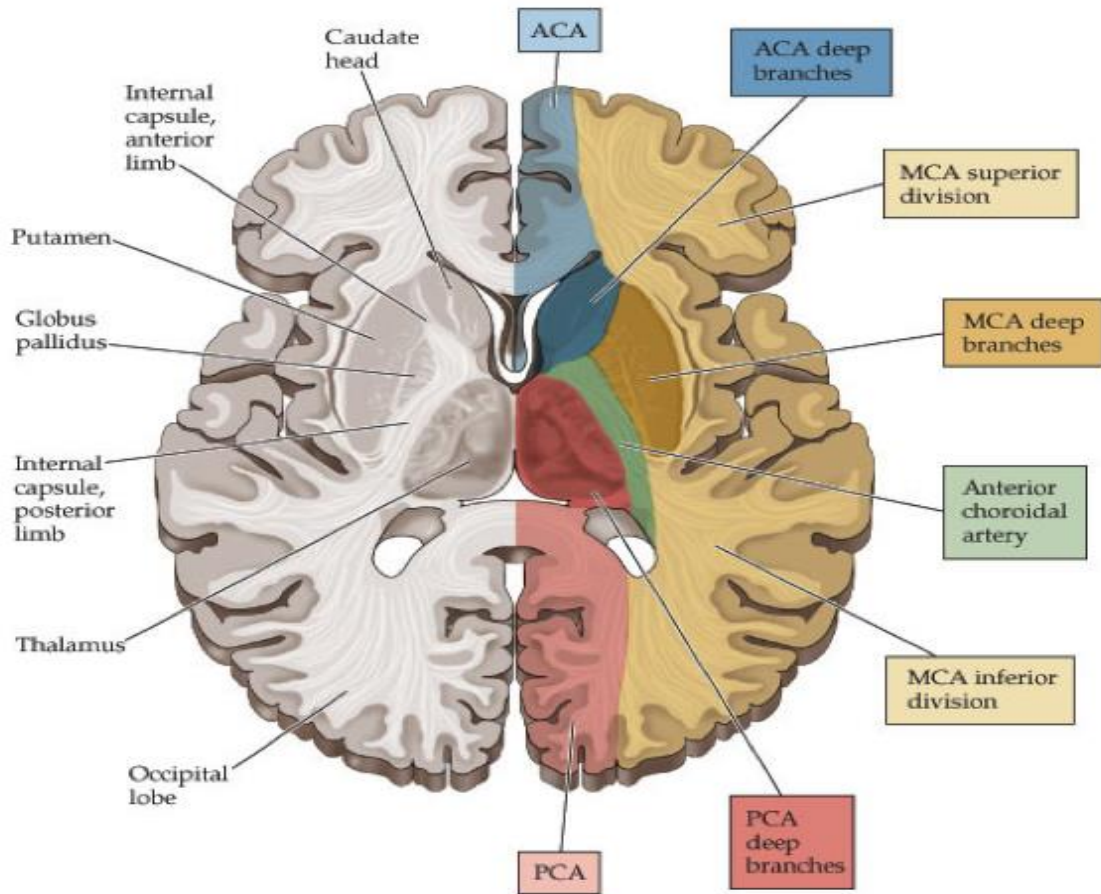
Basilar perforating arteries

Superior cerebellar artery

Posterior cerebral artery

Very important to know the blood supply to the brain

- Anterior medial side is supplied by ACA.
- lateral side is supplied by MCA.
- posterior side is supplied by PSA.
- basal ganglia is supplied by the anterior choroidal artery.



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Lesions in (this part very important!!)

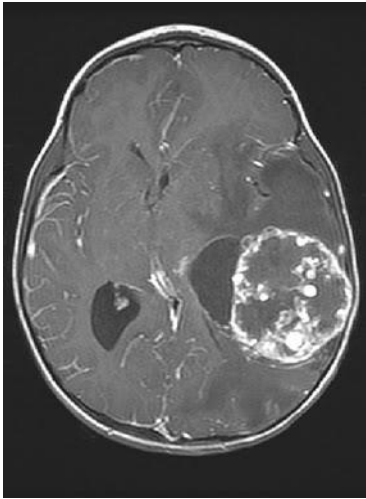
ACA: causes contralateral paralysis of the legs.

MCA: causes aphasia, hemiplegia.

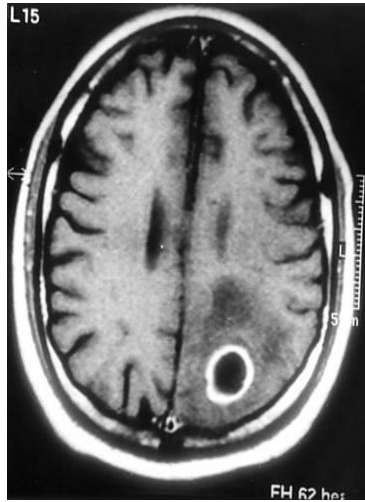
PCA: affects the vision collectively.

Anterior choroidal: impairment of the whole body.

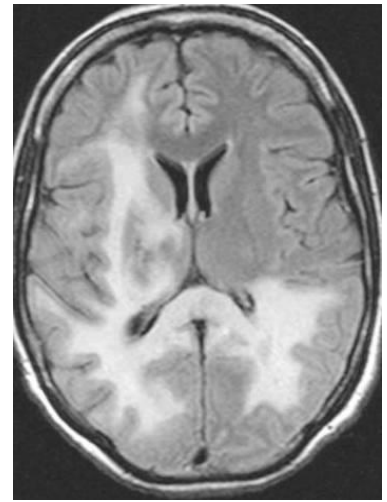
Pathological radiographs of cerebral hemispheres (beyond anatomy):



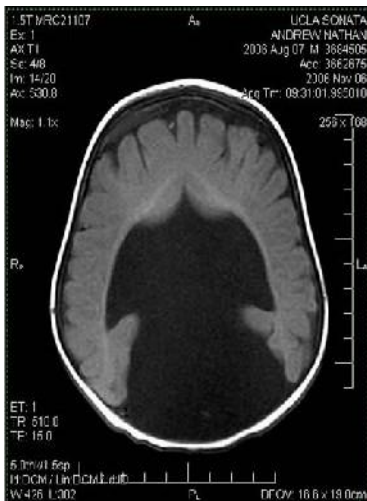
Tumor



Abscess



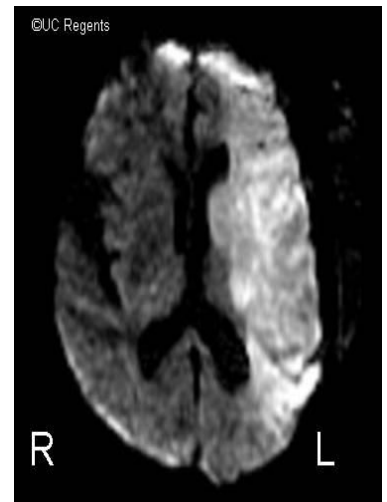
Infection



Malformation



Metastasis



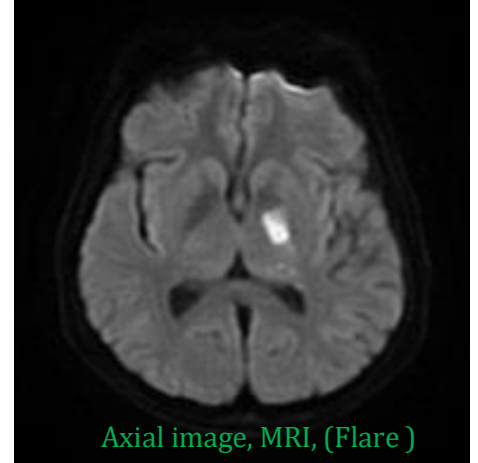
Infarction



Quiz:

This MR image shows acute infarction. What is the artery involved?

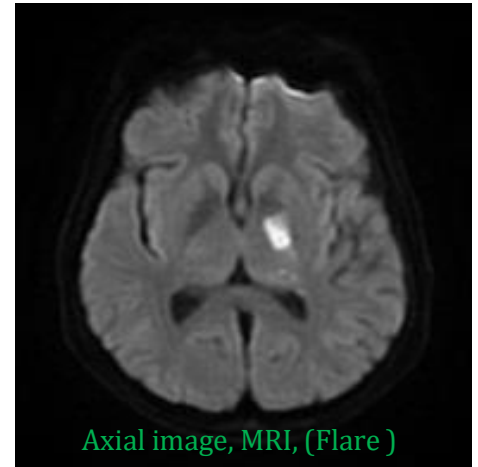
1. Anterior cerebral
2. Anterior choroidal
3. Posterior cerebral
4. Middle cerebral



This MR image shows acute infarction. What is the expected neurological deficit?

1. Right leg weakness
2. Right arm weakness
3. Right body side weakness
4. Left leg weakness

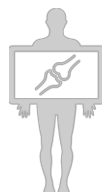
المشكلة تصوير في الجهة اليمين من الجسم لأن البيزل قانقليا توصل للجهة المقابلة من الجسم وبناء على إن الصورة في الراديوجراف تصوير العكس راح يكون 3 هو الجواب الصحيح



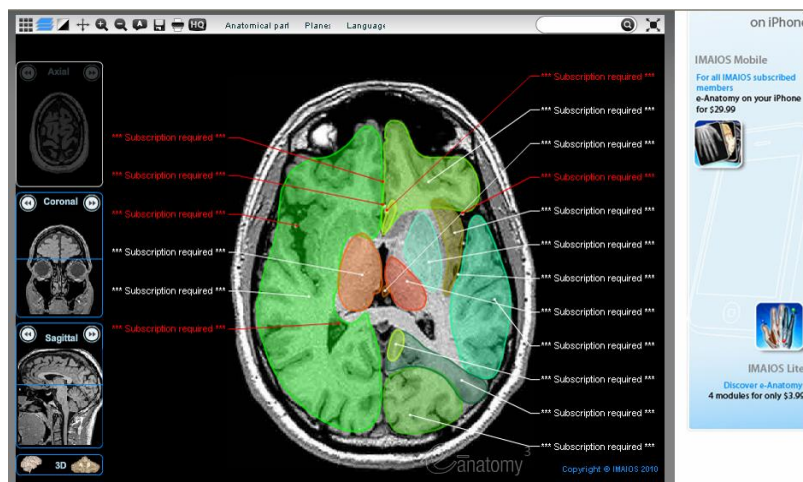
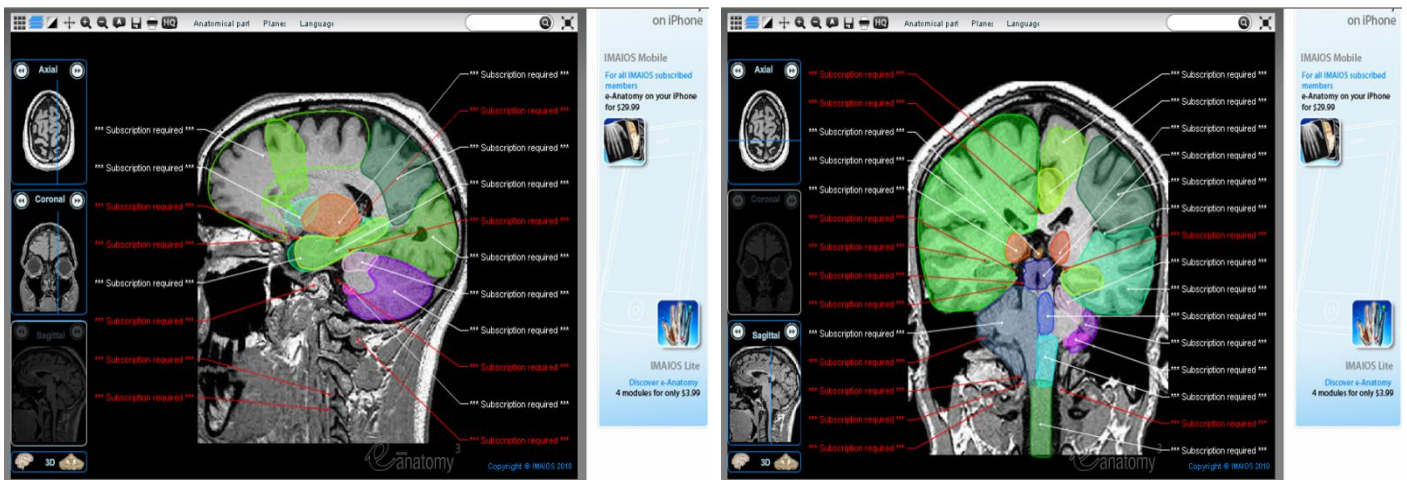
Answers:

Q1) 2

Q2) 3



Useful application to learn radiology:



Useful e-Resources:

- The whole brain atlas, Harvard University.
- Radiologic Anatomy, Wayne State University.
- E-anatomy, www.imaios.com
- Visible body, www.visiblebody.com
- Radiology assistant, www.radiologyassistant.nl

Group Leaders:

Hanin Bashaikh

Mohammed Alduayj

Group Members:

Aseel Badukhon

Ghaida Alsaeed

Najd Altheeb

Wejdan Azaid

Omar Almugheer



<https://www.onlineexambuilder.com/3-cerebral-hemispheres/exam-184563>



<https://drive.google.com/open?id=1g-hyfqVPGHCGBE6BBQMU8WsS1HURtzU9FjpCP0KhI18>





https://drive.google.com/open?id=1PO3kVWNdOhC4T8eixprwDxFZPSQ_hXoiFt7229xWYDo

References:

Girls & Boys slides

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Team 436