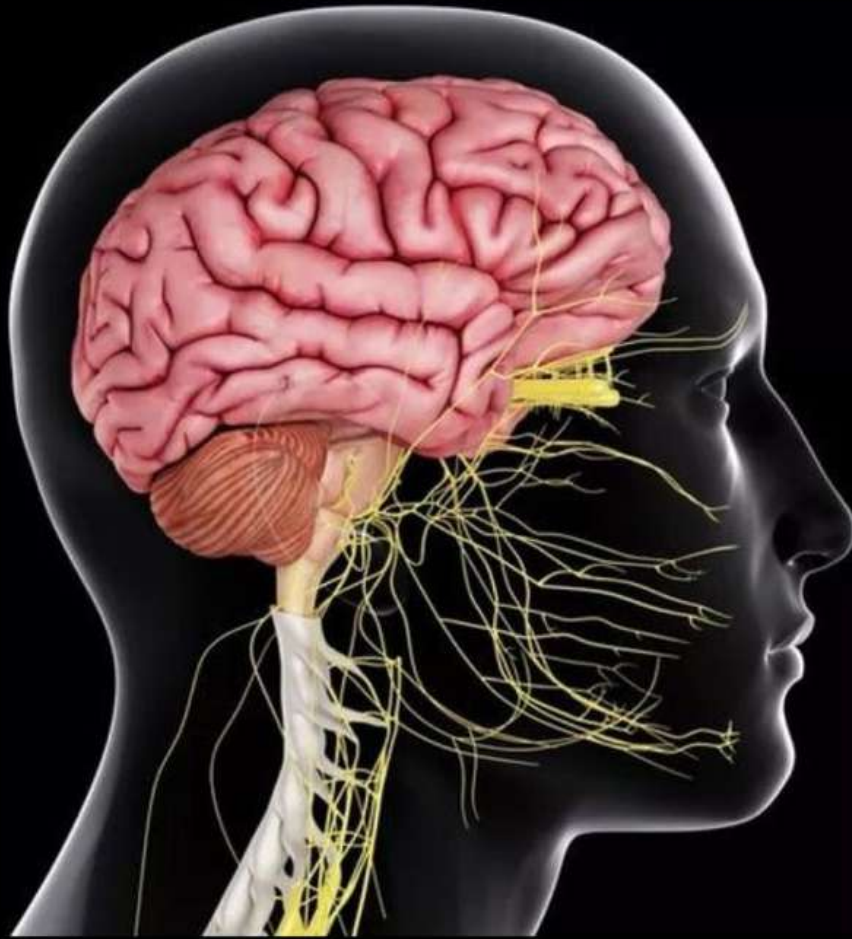




CENTRAL NERVOUS SYSTEM



SUBJECT : Anatomy

LEC NO. : 11

DONE BY : Batool ALzubaidi & Hashem Ata

وَقُلْ رَبِّ زِدْنِي عِلْمًا



Cerebral Hemispheres & Functional Cortical Areas 1

- **Dr Ashraf Sadek** *PhD, MD, MRCPCH*
- Assistant Professor of anatomy and embryology

Intended Learning Outcomes

By the end of this lecture , the student will be able to:

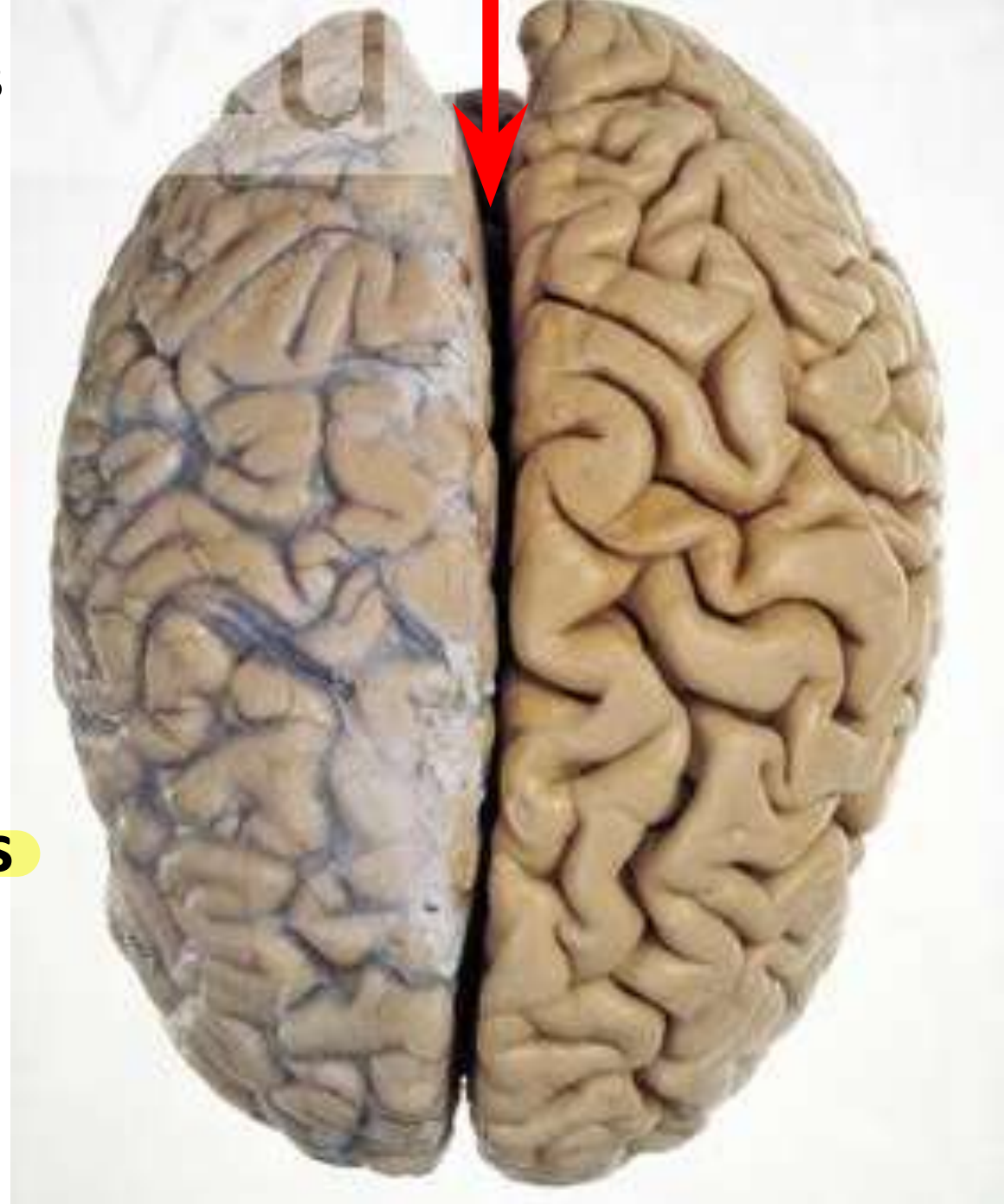
- 1. Name** major sulci, gyri & lobes of cerebral hemispheres.
- 2. Locate** the main cortical functional areas
- 3. Predict** effect of lesion in any of these areas
- 4. Define** cerebral assymetry & cerebral dominance.

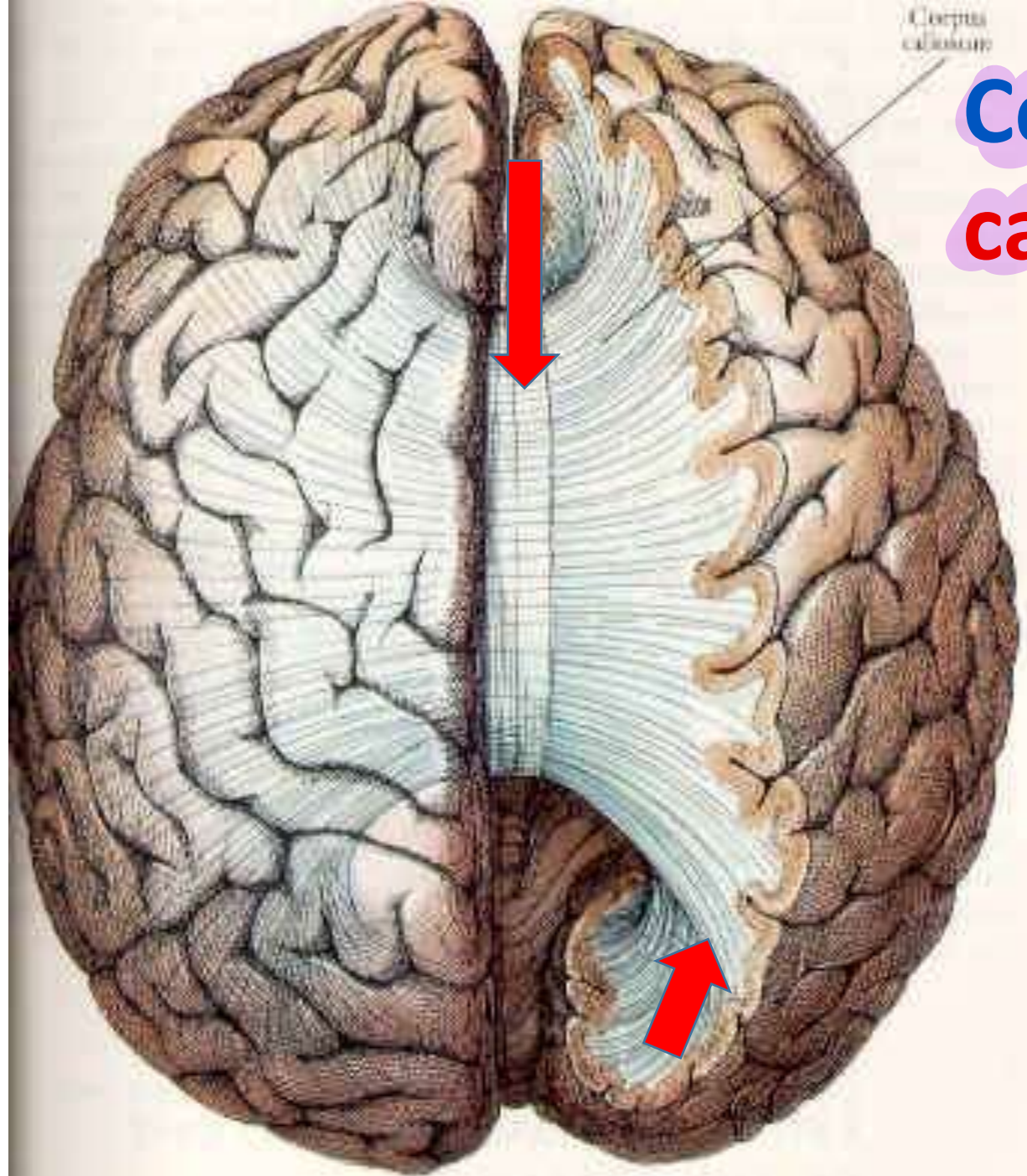
The cerebral hemispheres

**Longitudinal
fissure**

**Right & left
cerebral hemispheres**

و ال cortex من الخارج بتعمل elevations الي
بنسميهم gyri و depressions بنسميهم sulci

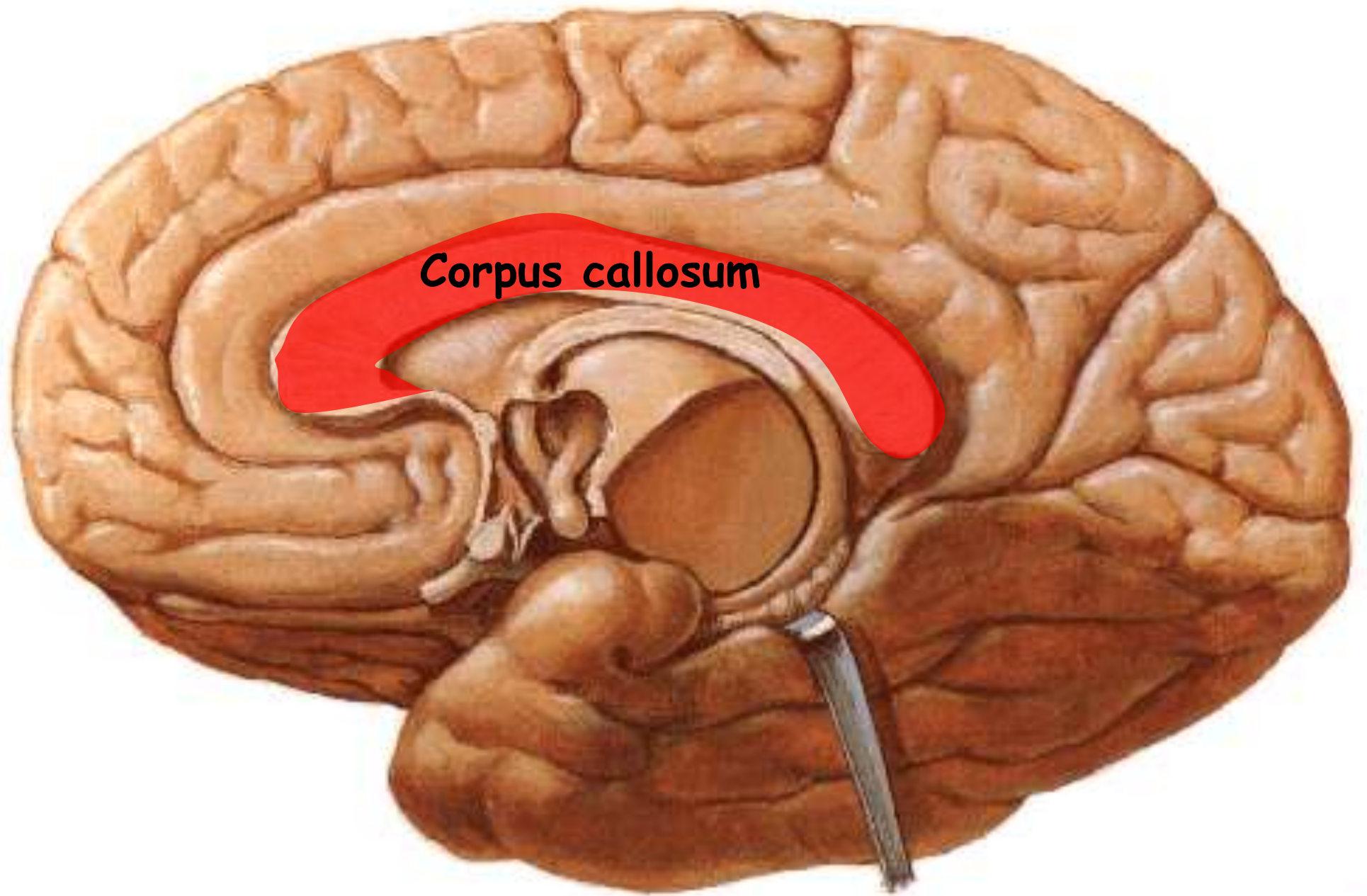




Corpus callosum

Corpus callosum

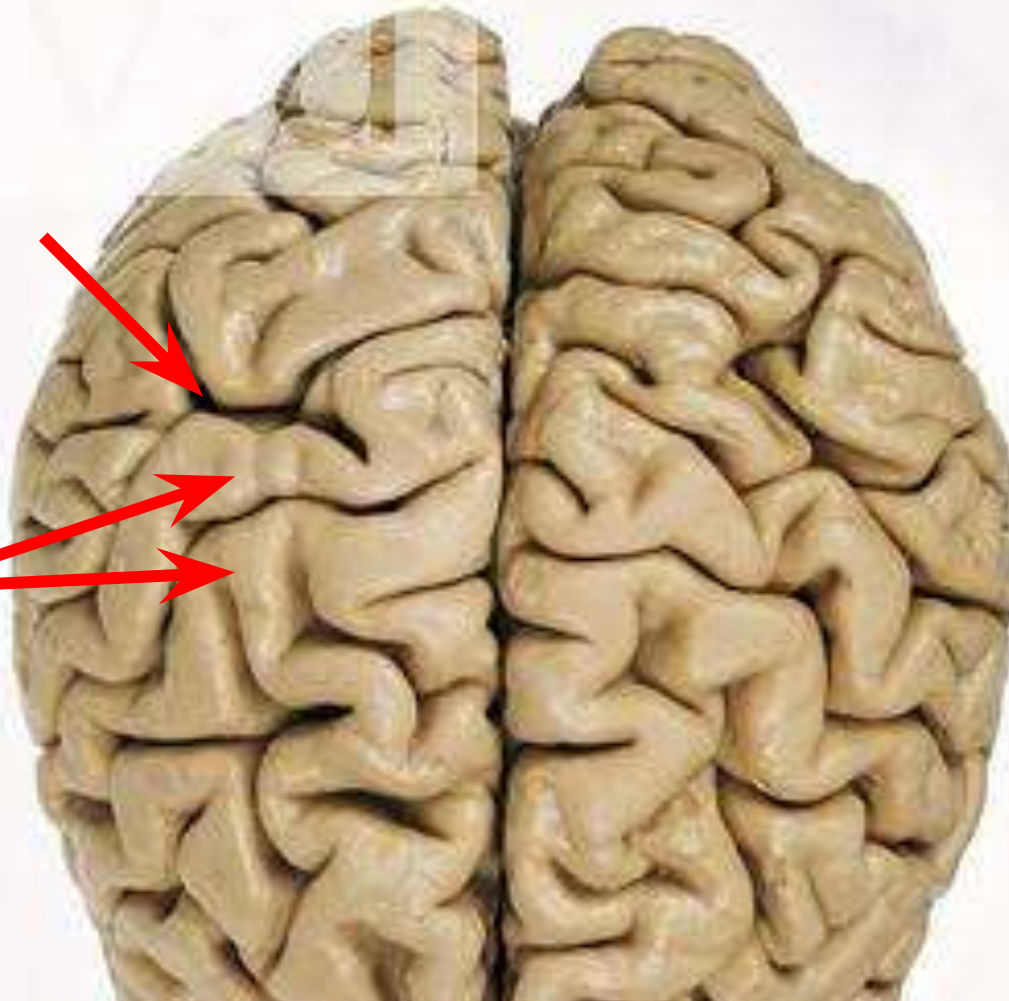
Commissural fibers which connect the right & left hemispheres



Corpus callosum

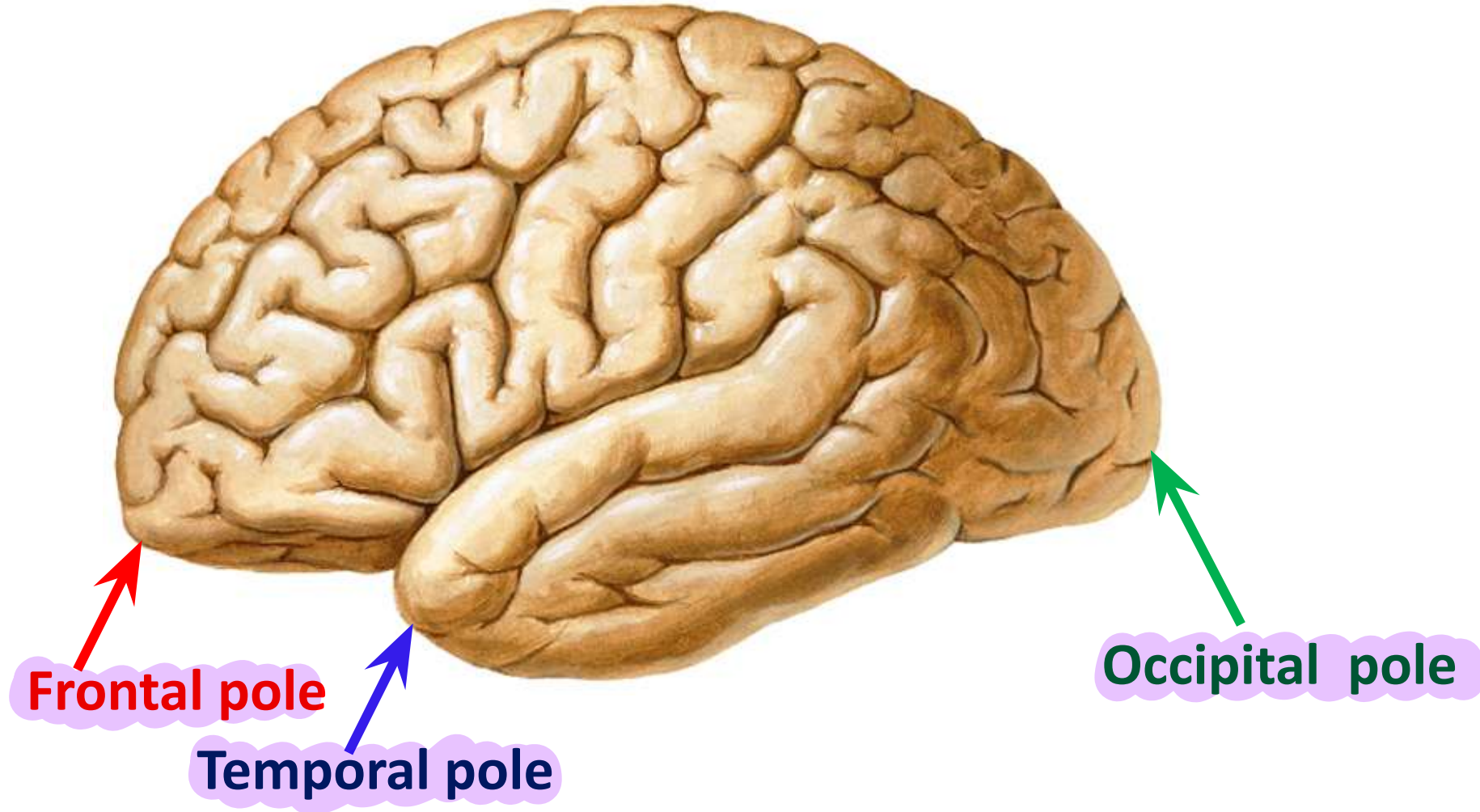
Sulcus

Gyrus

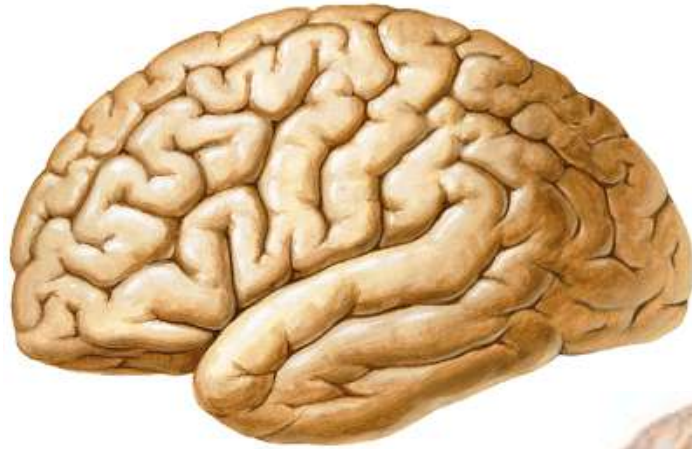


Surface of cerebral hemisphere is composed of grey matter (cerebral cortex) that is thrown into **grooves "Sulci"** separated by folds **"Gyri"** to increase the surface area of the **brain.**

Each cerebral hemisphere has 3 poles



Each cerebral hemisphere has 3 surfaces



Lateral surface



Inferior surface



Medial surface

**Main sulci that help divide
the hemisphere into lobes**

Central sulcus

One cm. behind midpoint between frontal & occipital poles

كيف اميزه؟ هو الوحيد الي بوصل ال upper border و يكمل لتحت لحد ال lateral sulcus

Parieto-occipital sulcus

Behind central sulcus ينتهي عند بداية ال parieto-occipital sulcus

Parietal Lobe

Infront of central sulcus

Frontal Lobe

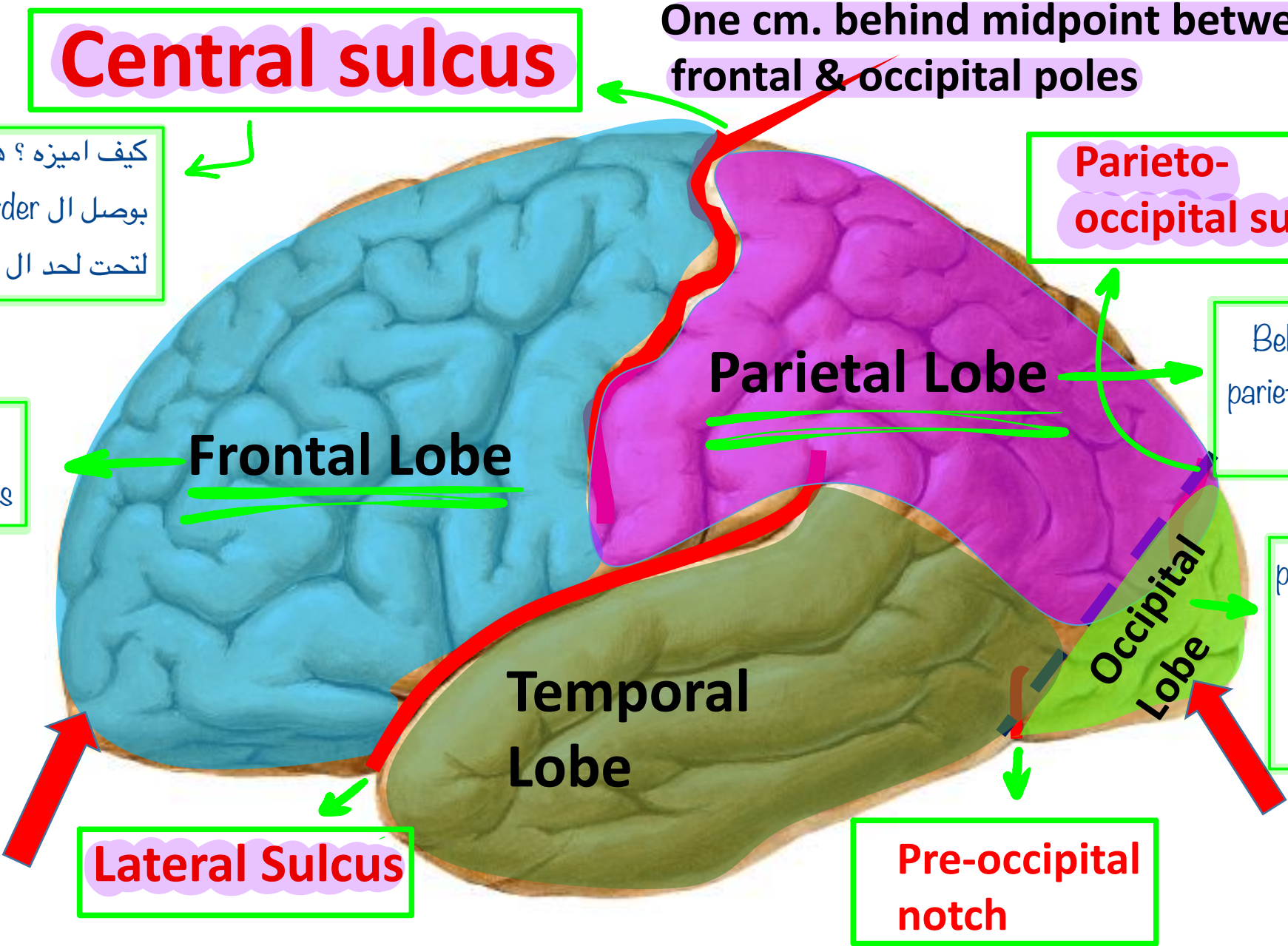
لما اوصل ال parieto-occipital sulcus مع ال pre-occipital notch مع بعض الي وراهم هو ال occipital lobe

Occipital Lobe

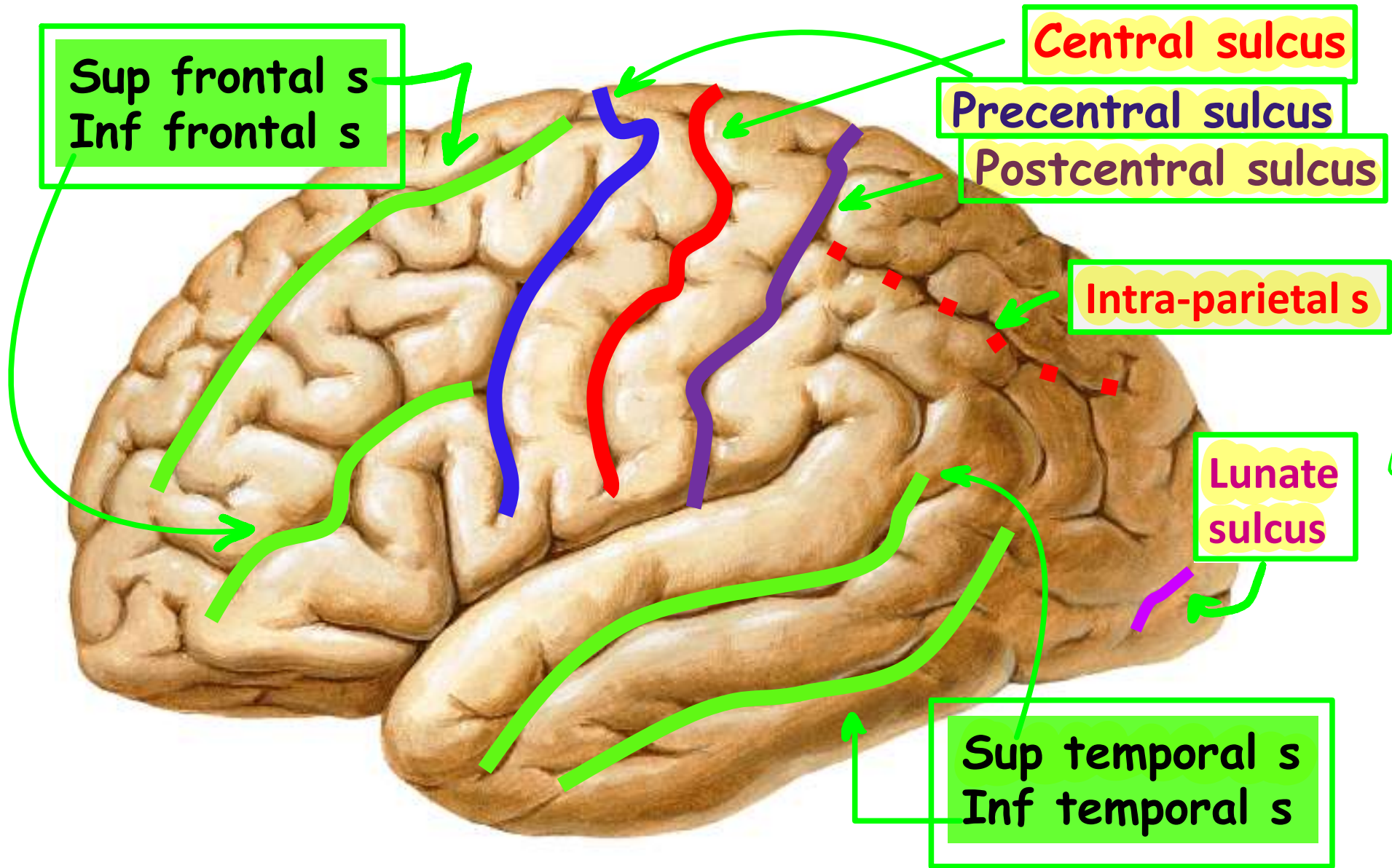
Temporal Lobe

Lateral Sulcus

Pre-occipital notch



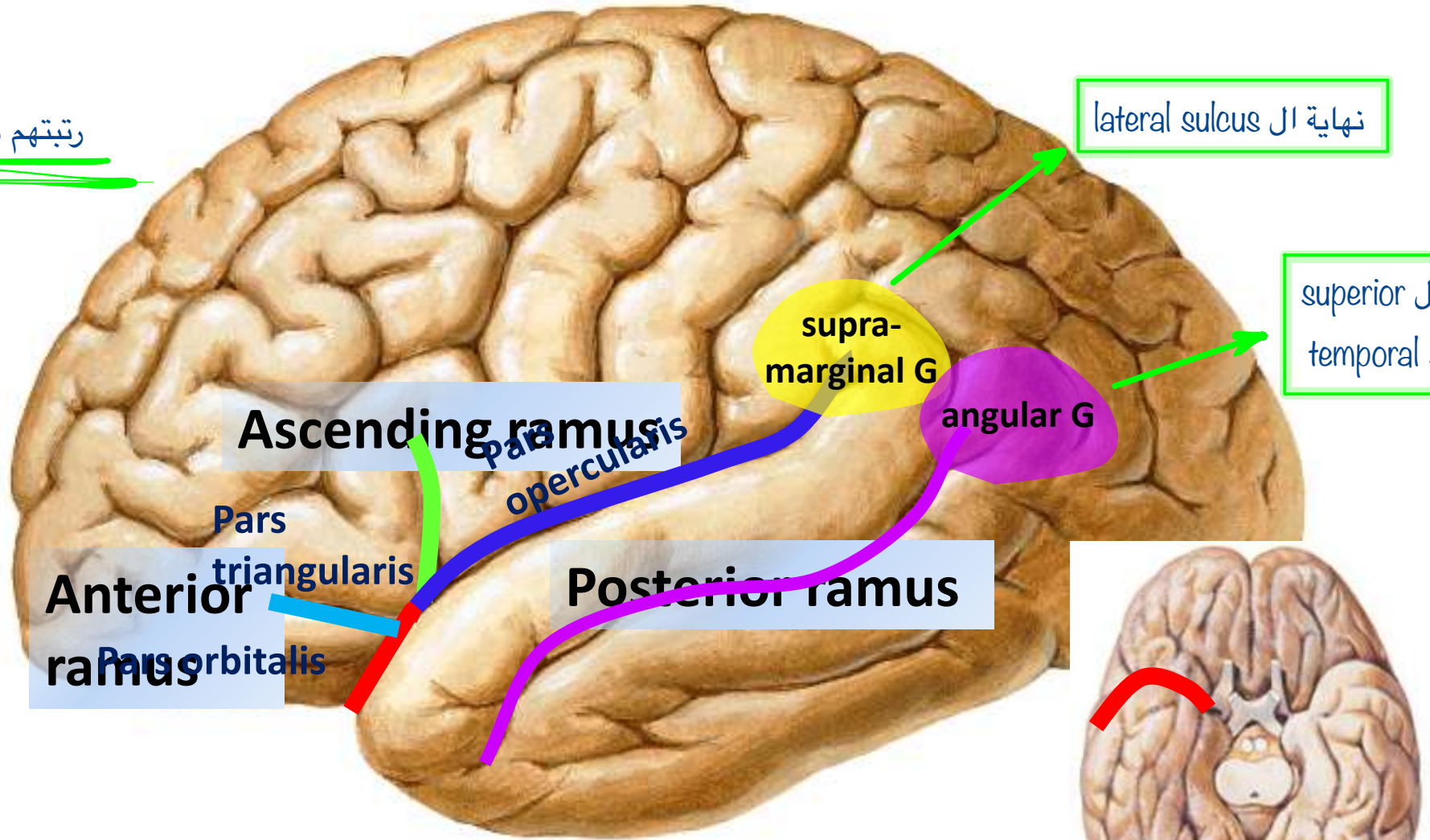
Other sulci on lateral surface of cerebral hemisphere



صحن كبرى
مفيد لنا

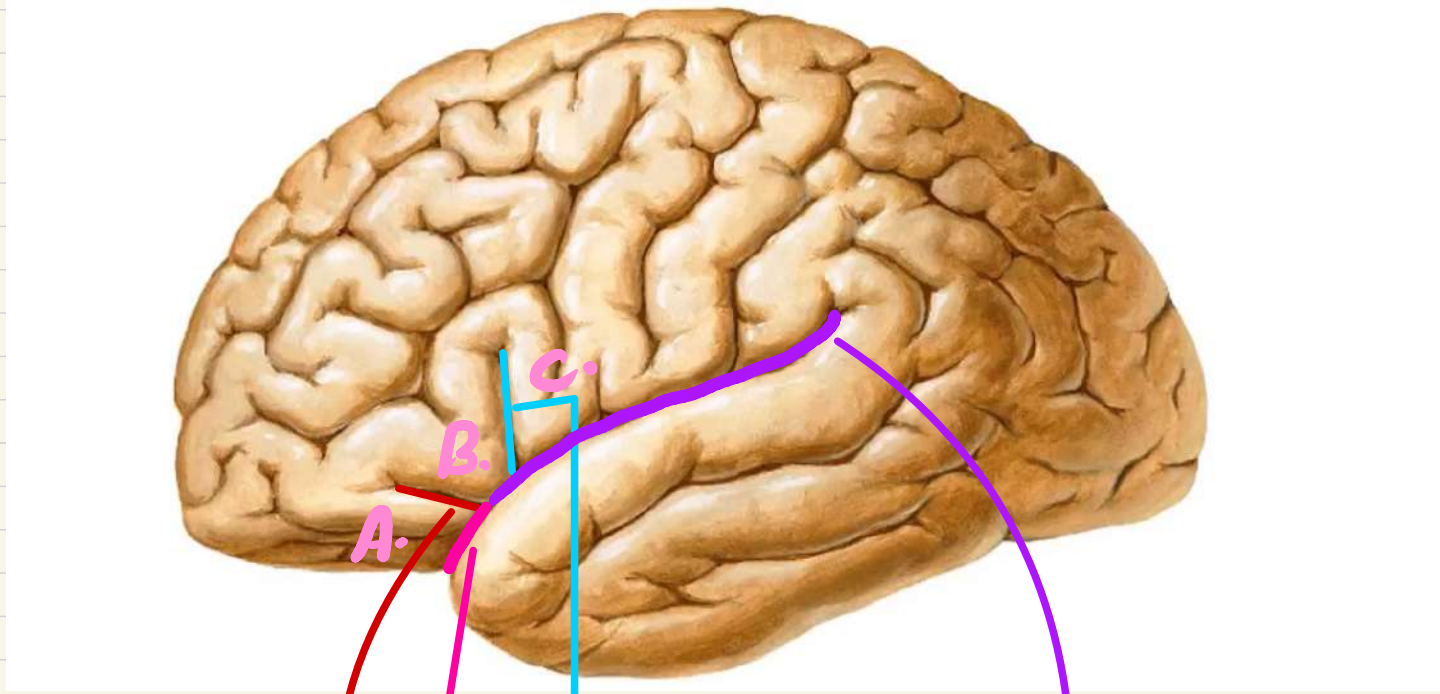
Lateral sulcus

رتبتهم تحت عشان هون عجة



Stem + 3 rami

Stem



Anterior ramus

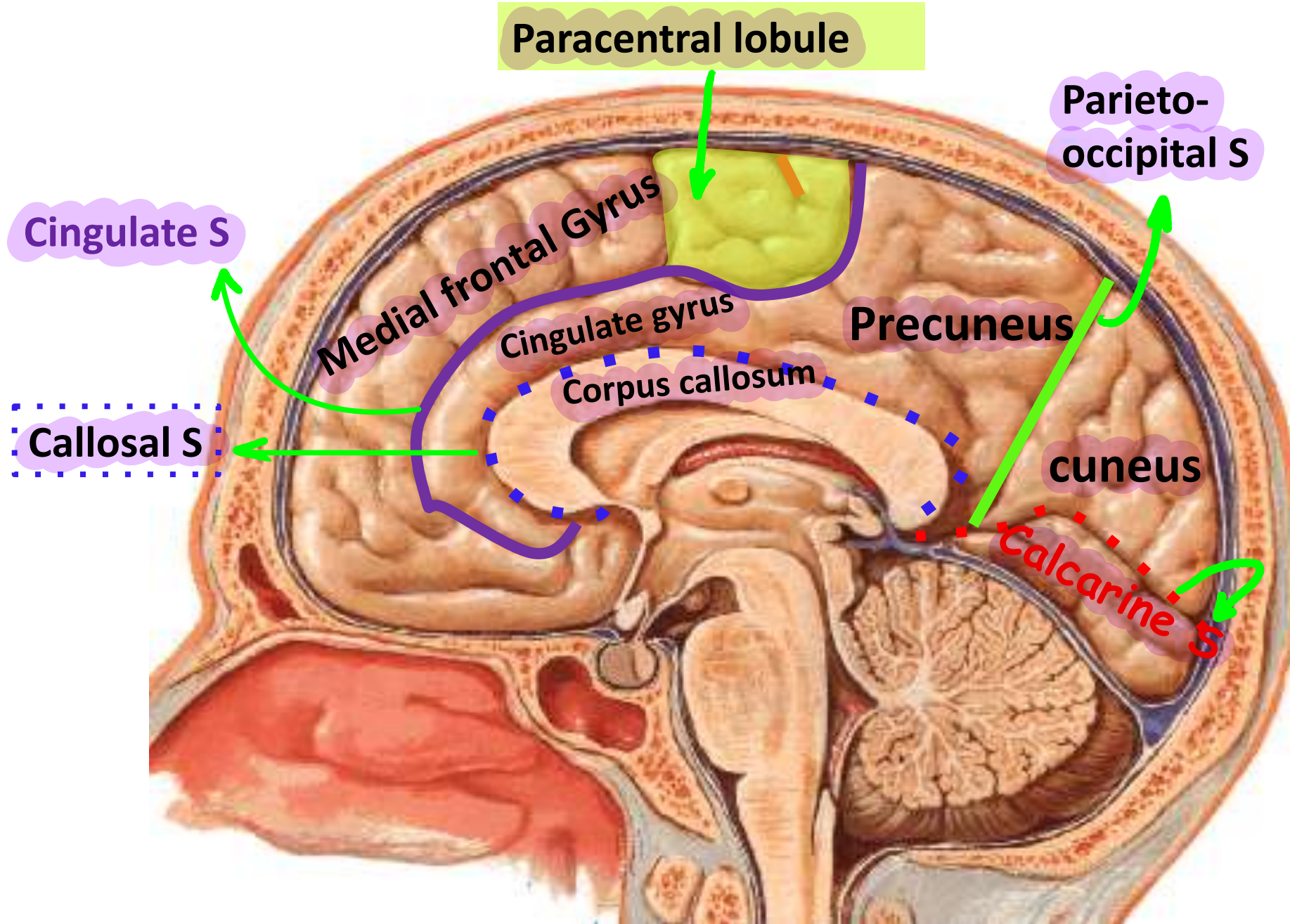
Ascending ramus

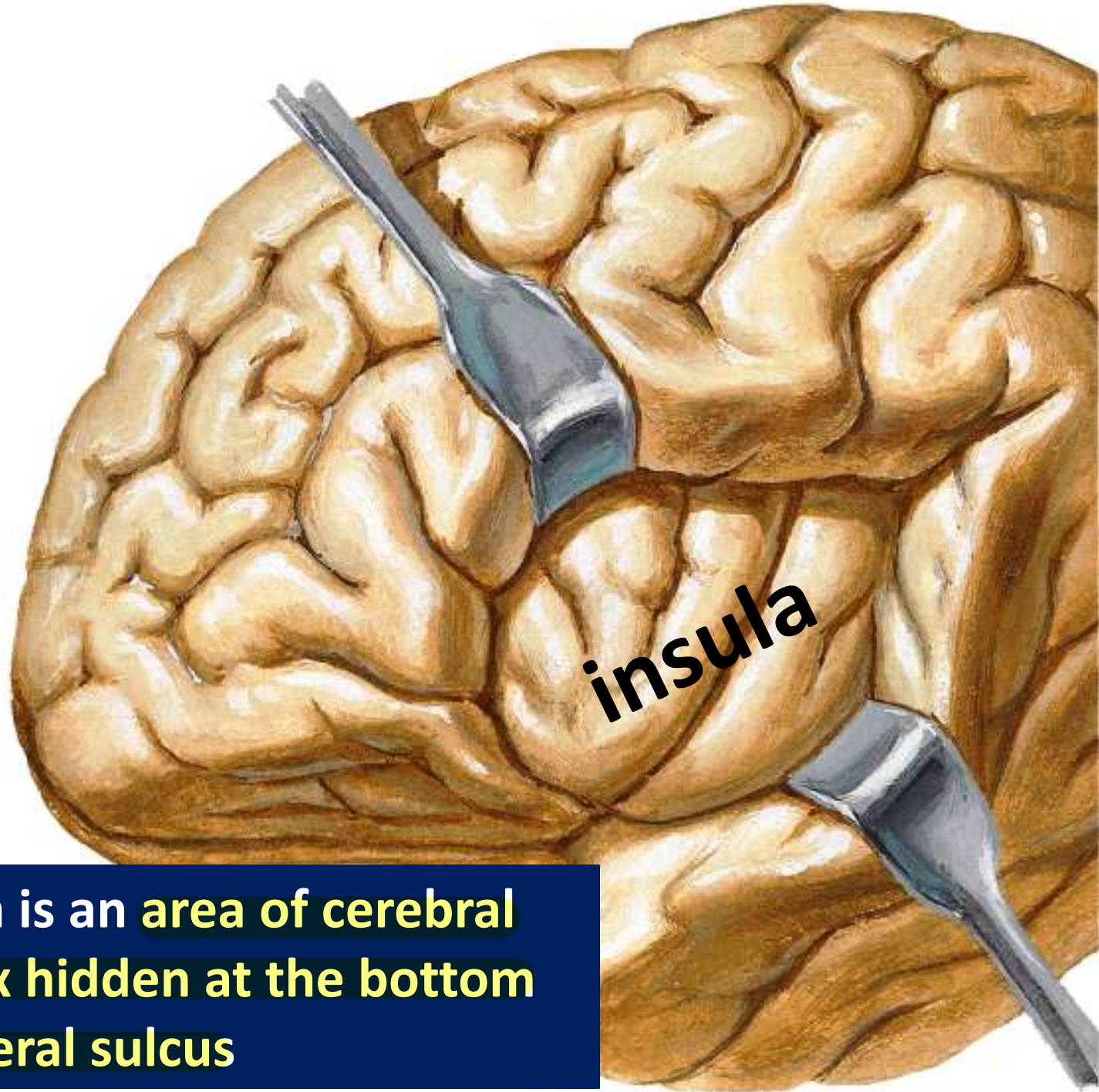
Posterior ramus

Stem

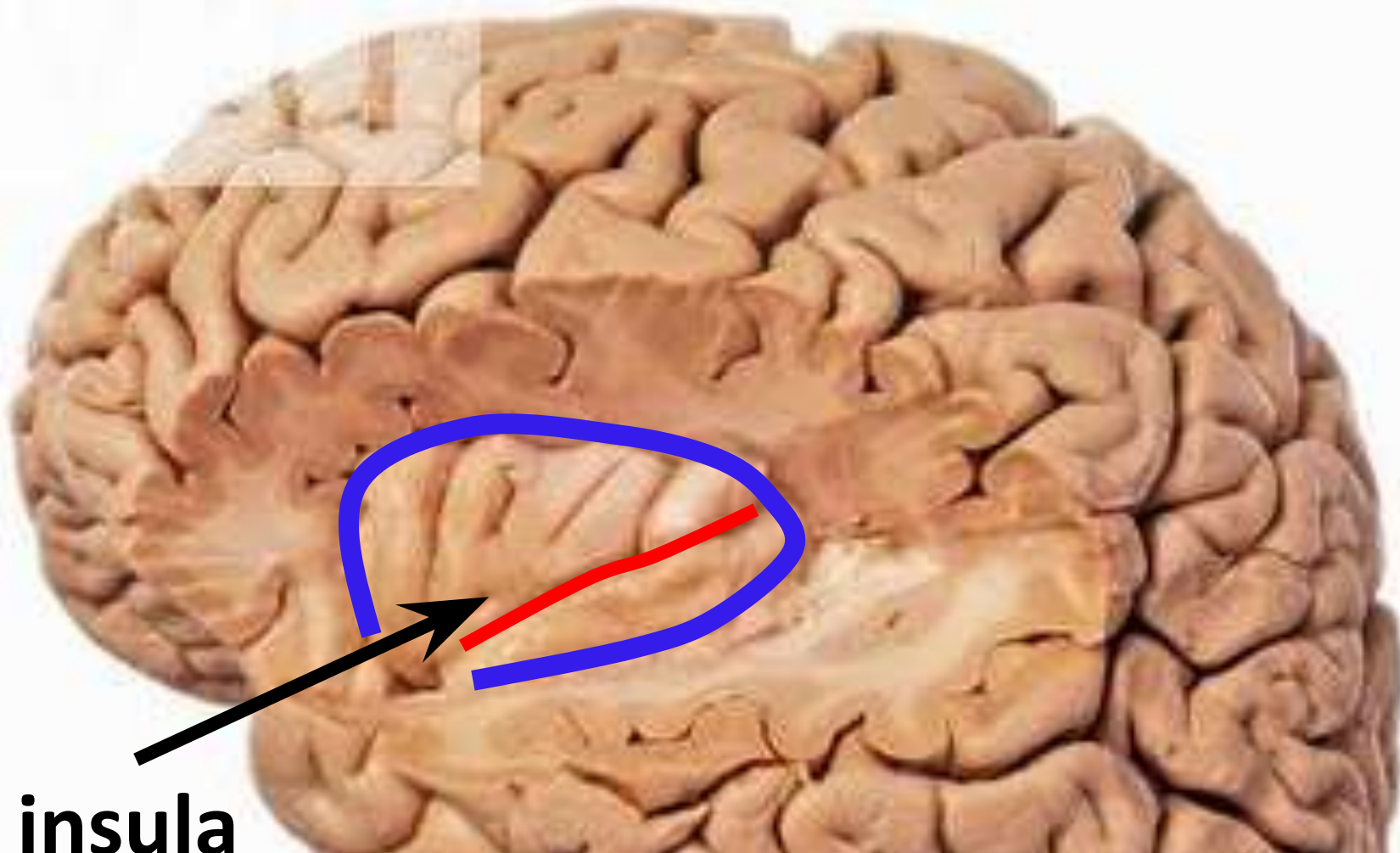
ال rami قسموا المكان ل ٣ اجزاء A/B/C
A : pars orbitalis .. B : pars trangularis .. C : pars orbicularis

Sulci & gyri on medial surface of cerebral hemisphere





Insula is an area of cerebral cortex hidden at the bottom of lateral sulcus



insula

Function of insula:

- 1) Ant. Part ? Smell, taste & visceral sensation (autonomic)
- 2) Post. Part ? 2nd somatosensory area

H- shaped orbital sulci

- A ? anterior
- P ? posterior
- M ? medial
- L ? lateral

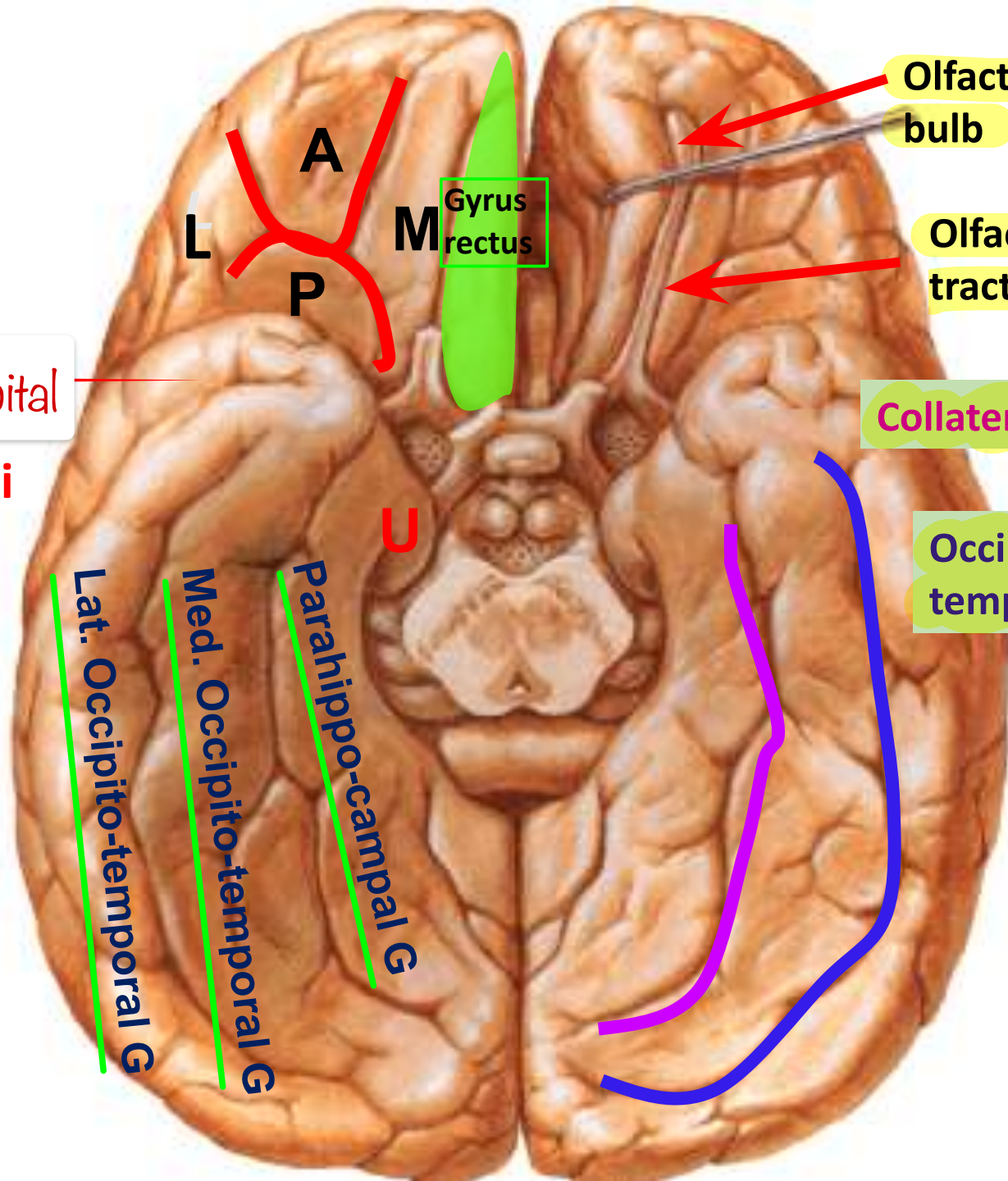
Orbital gyri

cingulate gyrus متوصل بال

uncus

parahippocampus gyrus الجزء العلوي من ال

Sulci & Gyri on inferior surface



Gyrus rectus

Olfactory bulb

First cranial nerve

Olfactory tract

Collateral S

Occipito-temporal S

Lat. Occipito-temporal G

Med. Occipito-temporal G

Parahippo-campal G

A
L
P
M

U

Functional Cortical Areas

The frontal lobe

Frontal lobe

Precentral area
Motor areas

Prefrontal area

4

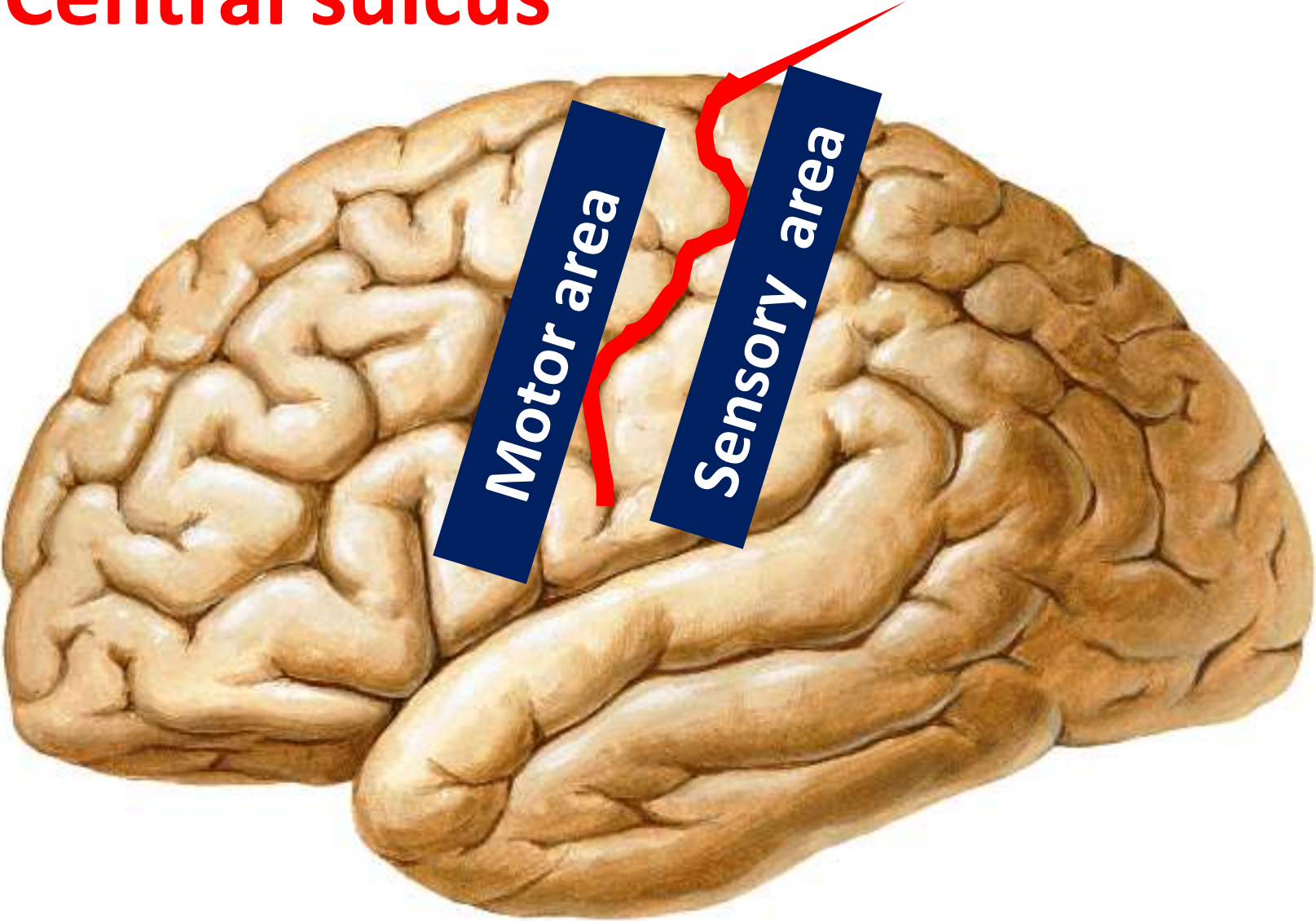
6

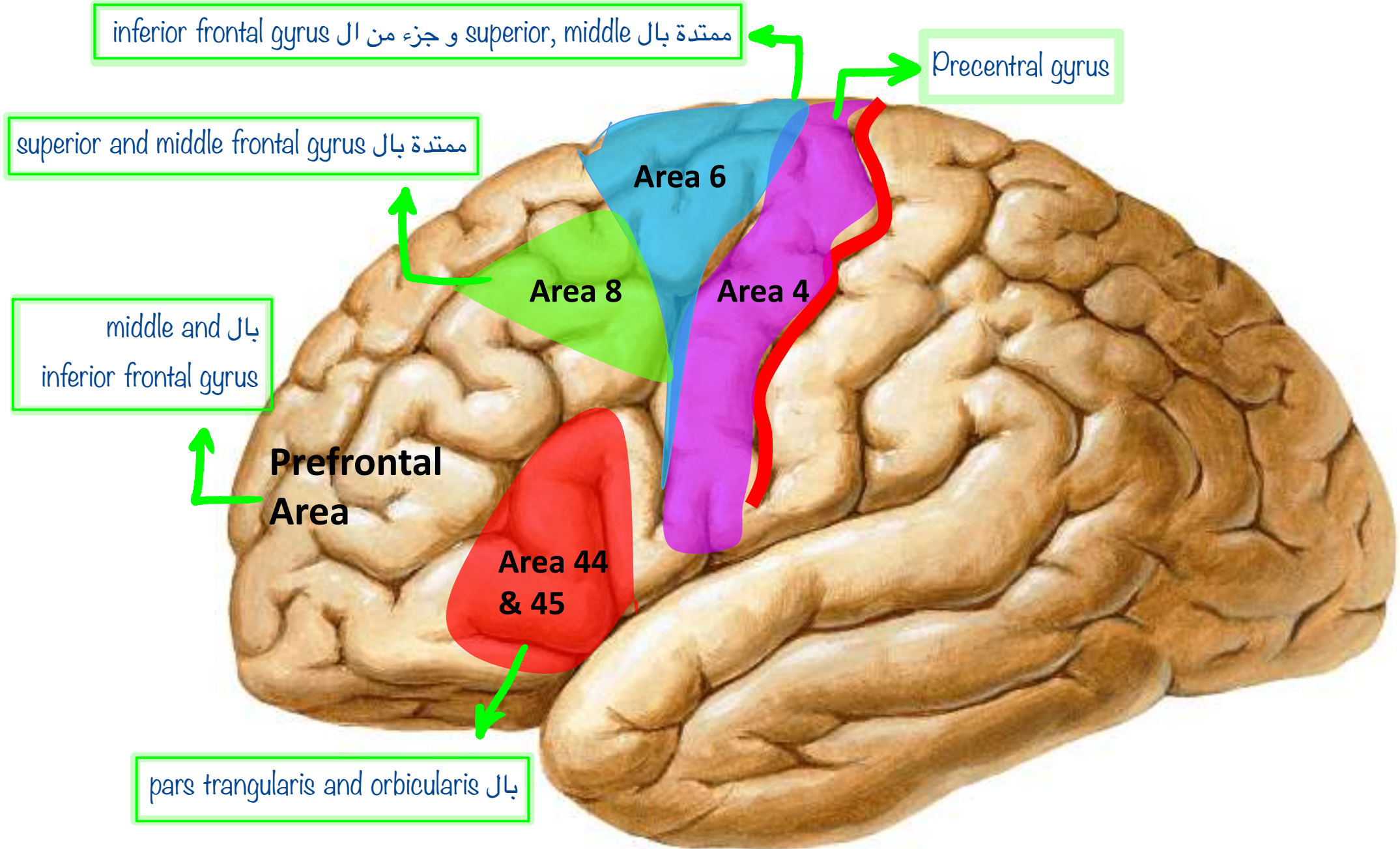
8

Broca's
44,45

Most medial part, responsible for attitude, behaviour, thinking, intelligence, short memory

Central sulcus





inferior frontal gyrus و جزء من ال superior, middle ممتدة بال

Precentral gyrus

superior and middle frontal gyrus ممتدة بال

middle and بال inferior frontal gyrus

Prefrontal Area

pars trangularis and orbicularis بال

Area 6

Area 8

Area 4

Area 44 & 45

Area 4

Primary motor area

site

*representatio
n*

function

lesion

Area 4 (Primary motor area) :

□ **Site:** Precentral gyrus & ant. part of paracentral lobule.

← ممتدة لل medial surface

□ **Body representation:** it contains a map of contralateral ½ of body represented upside down (motor homunculus) so face is lower down & leg and foot in paracentral lobule.

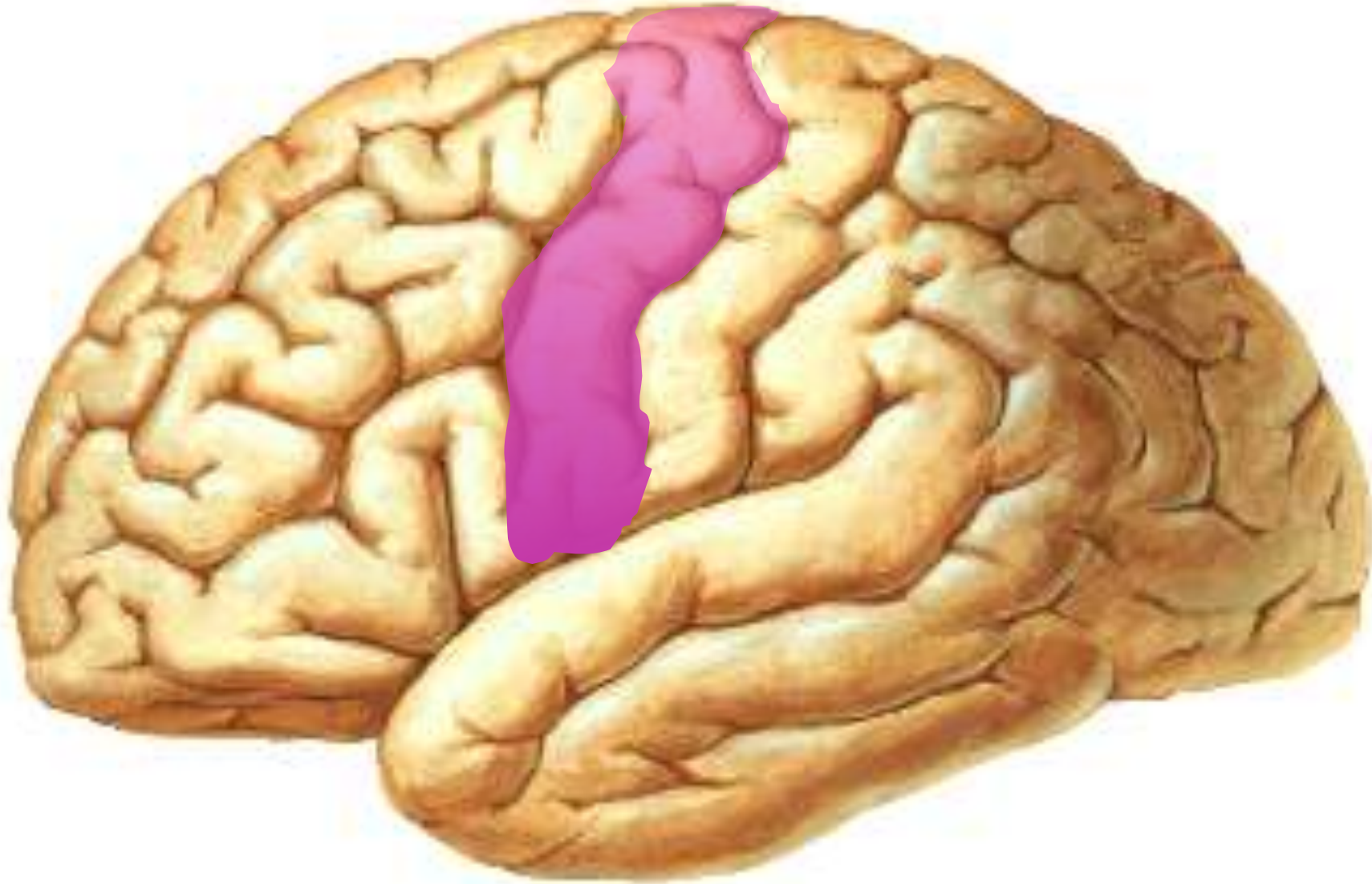
قزم، انسان مصغر

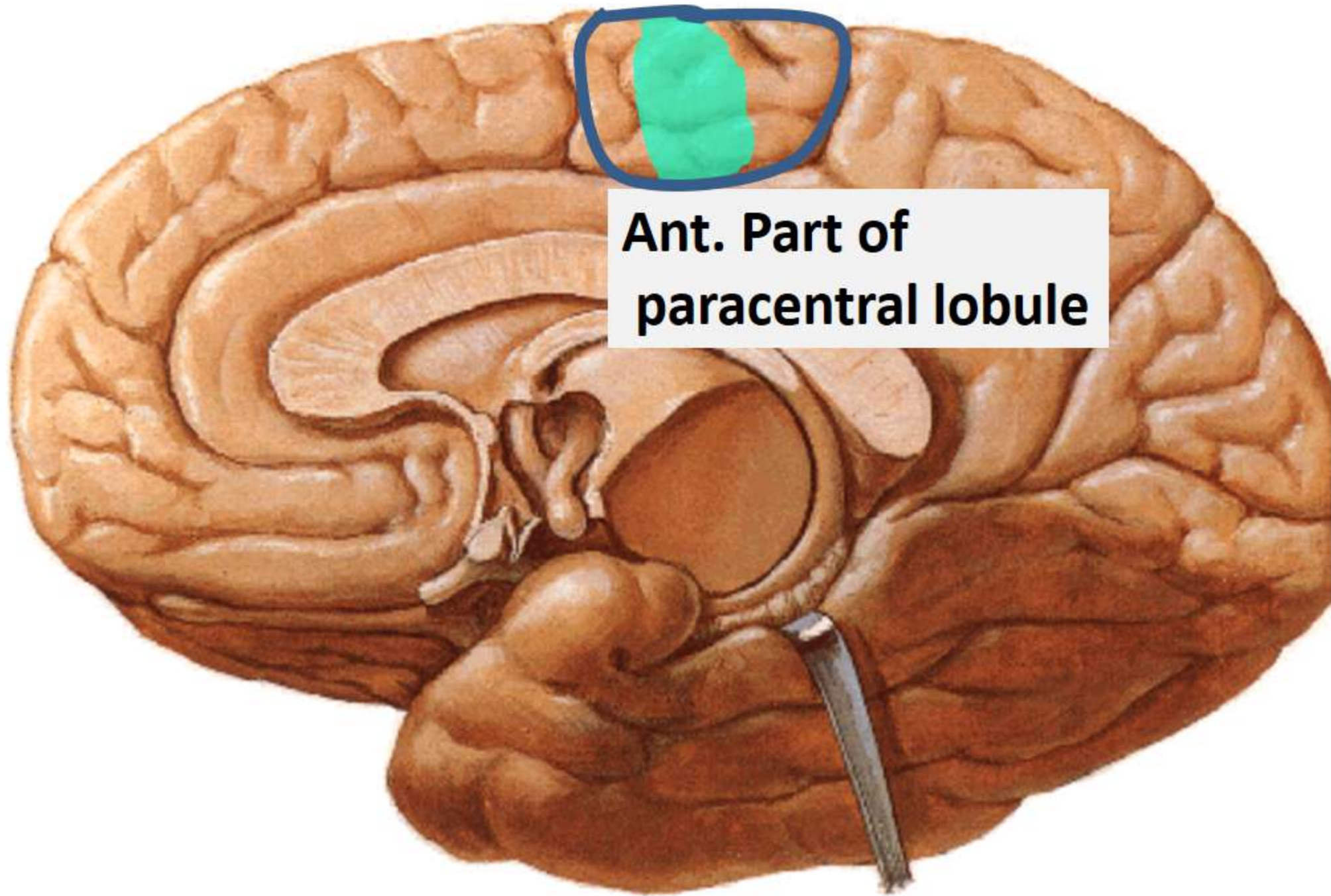
□ **Representation is proportionate to skill;** so parts with fine skilled movements e.g. hands occupy larger areas.

□ **Function:** initiates discrete voluntary movements which were planned in area 6.

□ **Lesion:** Contralateral hemiplegia.

Precentral gyrus





**Ant. Part of
paracentral lobule**

Representation

**Contralateral half of
body**

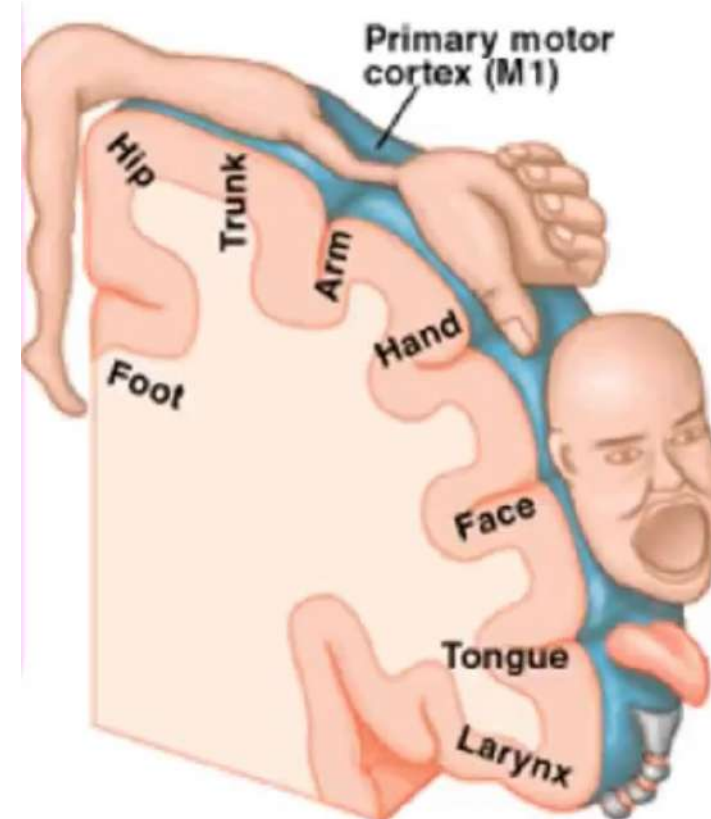
Up side down

**(face lower down
while leg & foot are
in paracentral lobule)**

**Area of
representation**

**is according to *skill*
of movements
not according to
size of
body part**

لو صار lesion بال paracentral lobule راح يصير upper motor neuron lesion
بال foot .. ممكن يجي مريض عنده upper motor neuron lesion paraplegia
و انت بتتوقع يكون ال spinal lesion بال paracentral lobule
بتعمل MRI يكون زي الفل فوقتها بتشك بال



Premotor Area 6

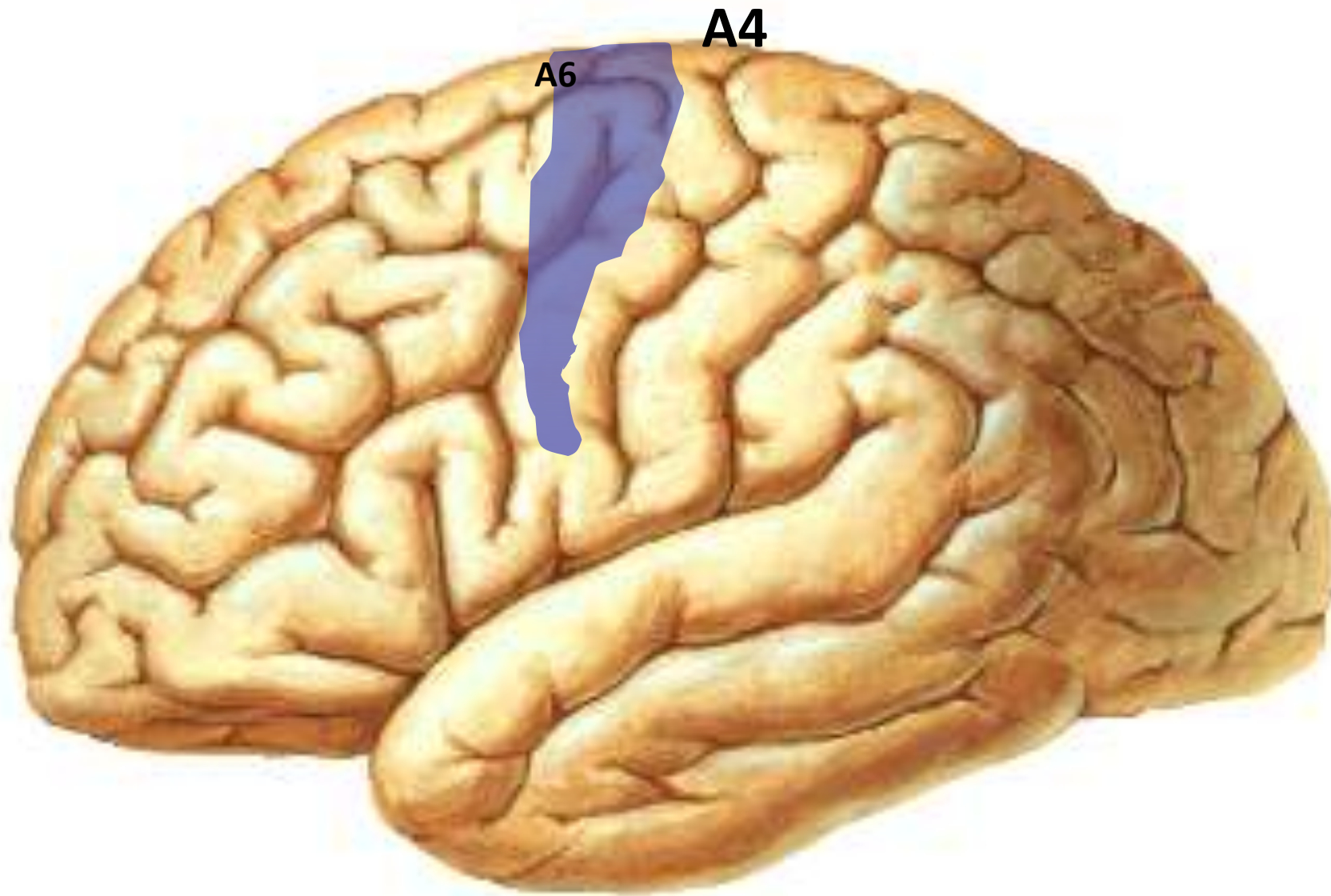
- Site ? in front of area 4 in sup., middle & inf. frontal gyri + extends on med. surface
- Functions ? plans the movement & stores the plan. It adjusts the posture to start the movement. It inhibits muscle tone & grasp reflex.
- Lesion ? awkwardness of movements “apraxia” , spasticity of muscles & reappearance of grasp reflex.

عشان الايد ما تكون مخشبة

بنشوفه عند الاطفال بعدين بختفي

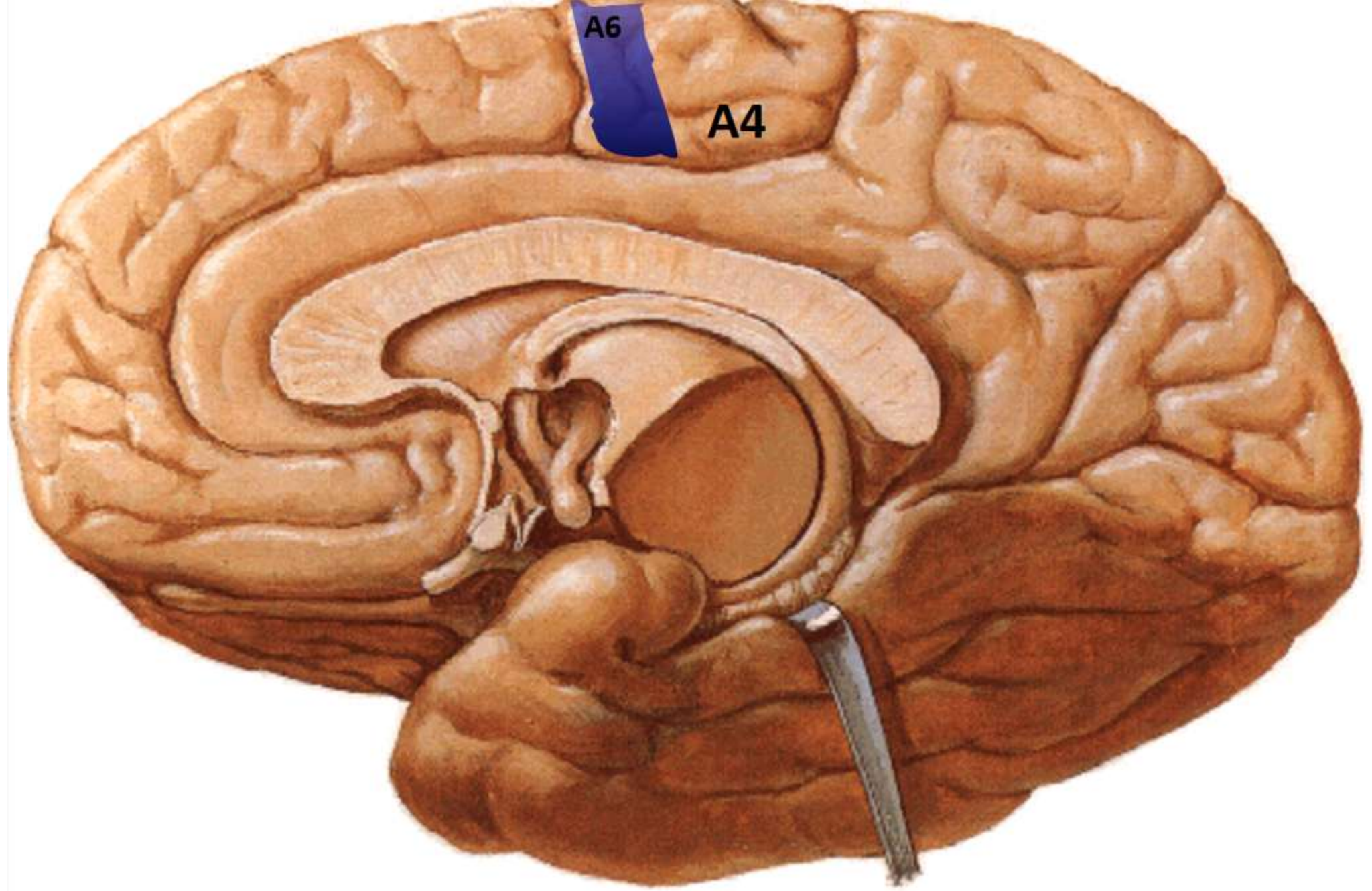
اكيد كلنا و احنا حاملين بيبي فجاة لقيته ماسك بشعرك بقوة و شدك اياه

Arc



A4

A6



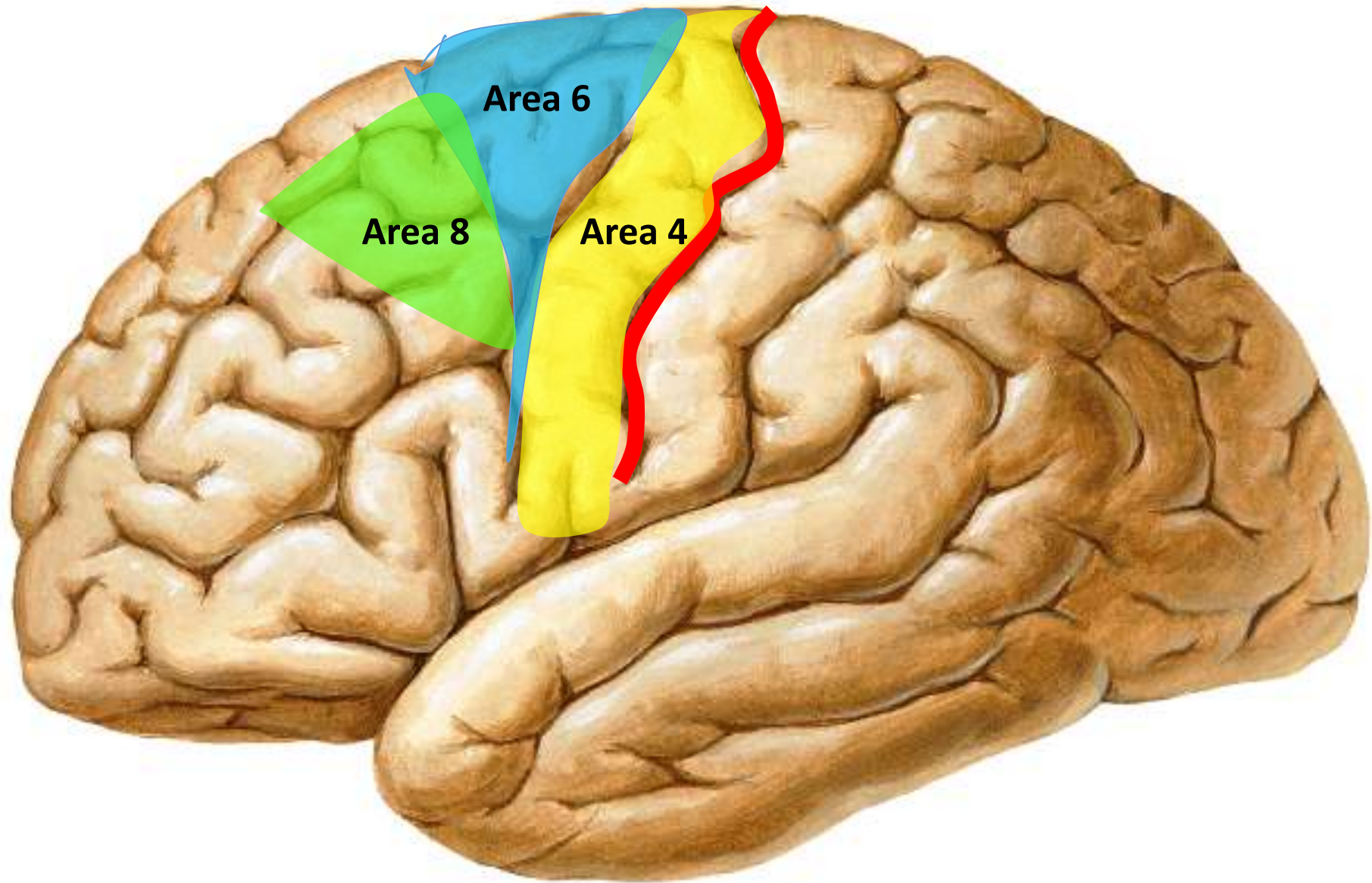
Area 8 (frontal eye field)

- Site ? in front of area 6 in sup. & middle frontal gyri
- Function ? voluntary conjugate eye movements. Its stimulation leads to contralateral deviation of both eyes.
- Lesion ? 1) ipsilateral deviation of both eyes towards side of the lesion
2) inability to turn eyes to opposite side

يعني لو عملت stimulation بجهة اليمين راح يروحوا لجهة الشمال

يعني العينتين التنتين يكونوا ماشيين زي بعض التنتين يروحوا لليمين او الشمال مش كل وحدة بجهة

Reflex conjugate eye movement is not affected
since it is controlled by occipital eye field.



Area 6

Area 8

Area 4

Function

Frontal eye field

A8

Responsible for

voluntary

conjugate

Eye movement

☐ Contralateral

deviation of

both eyes

Eyes deviate to the right

**Stimulation of left
frontal eye field A8**

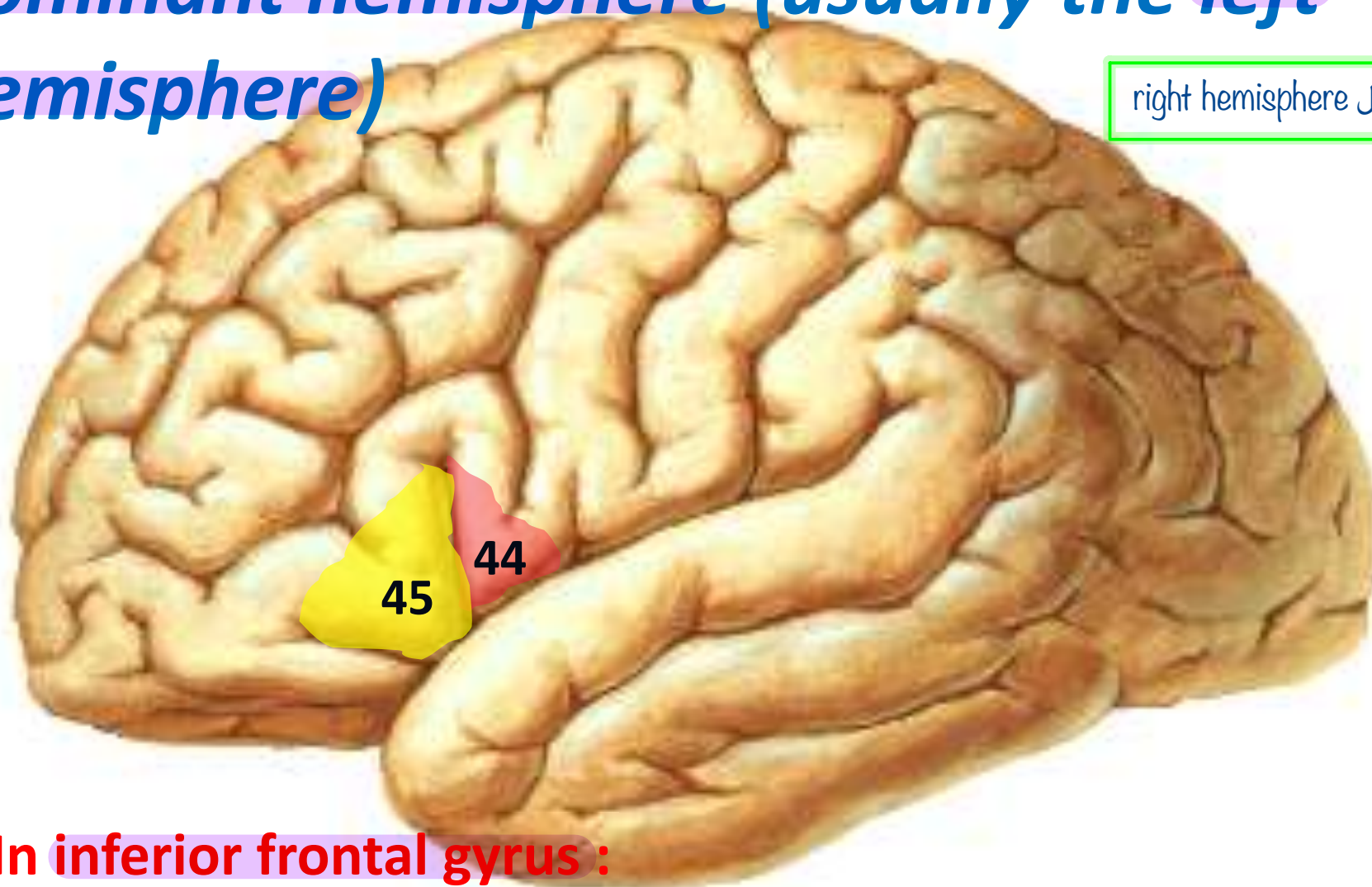


موضحة جداً

Broca's area

Broca's area is present only in the dominant hemisphere (usually the left hemisphere)

التي يكتبوا بالشمال يتكون بال right hemisphere



In inferior frontal gyrus :

pars triangularis (A 45) & pars opercularis (A 44)

Function

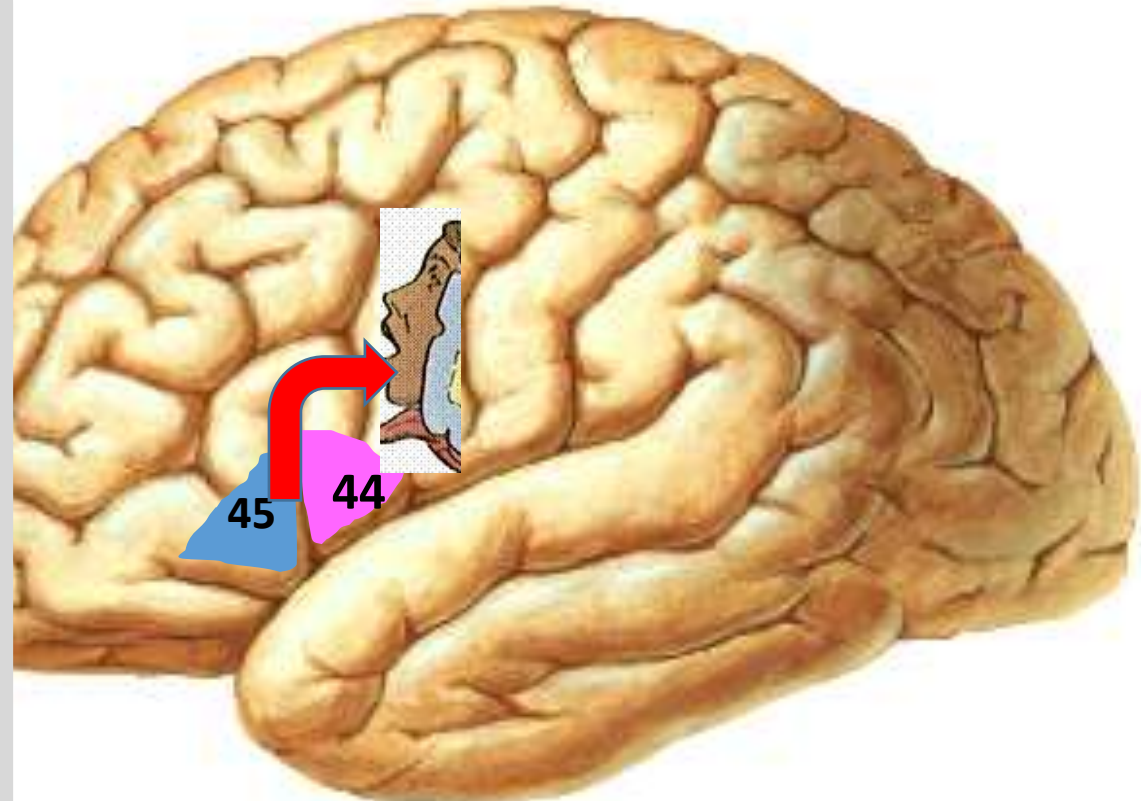
Broca's area
(**motor speech area**)

Responsible for
production of intelligible words

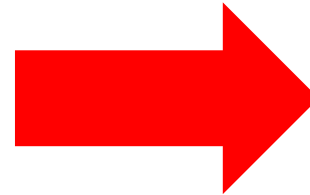
(**لغة مفهومة**)

Programs sequence of muscle contractions to produce intelligible sounds (words)

then send these orders to the nearby motor area 4



Lesion:
motor
(expressive)
aphasia

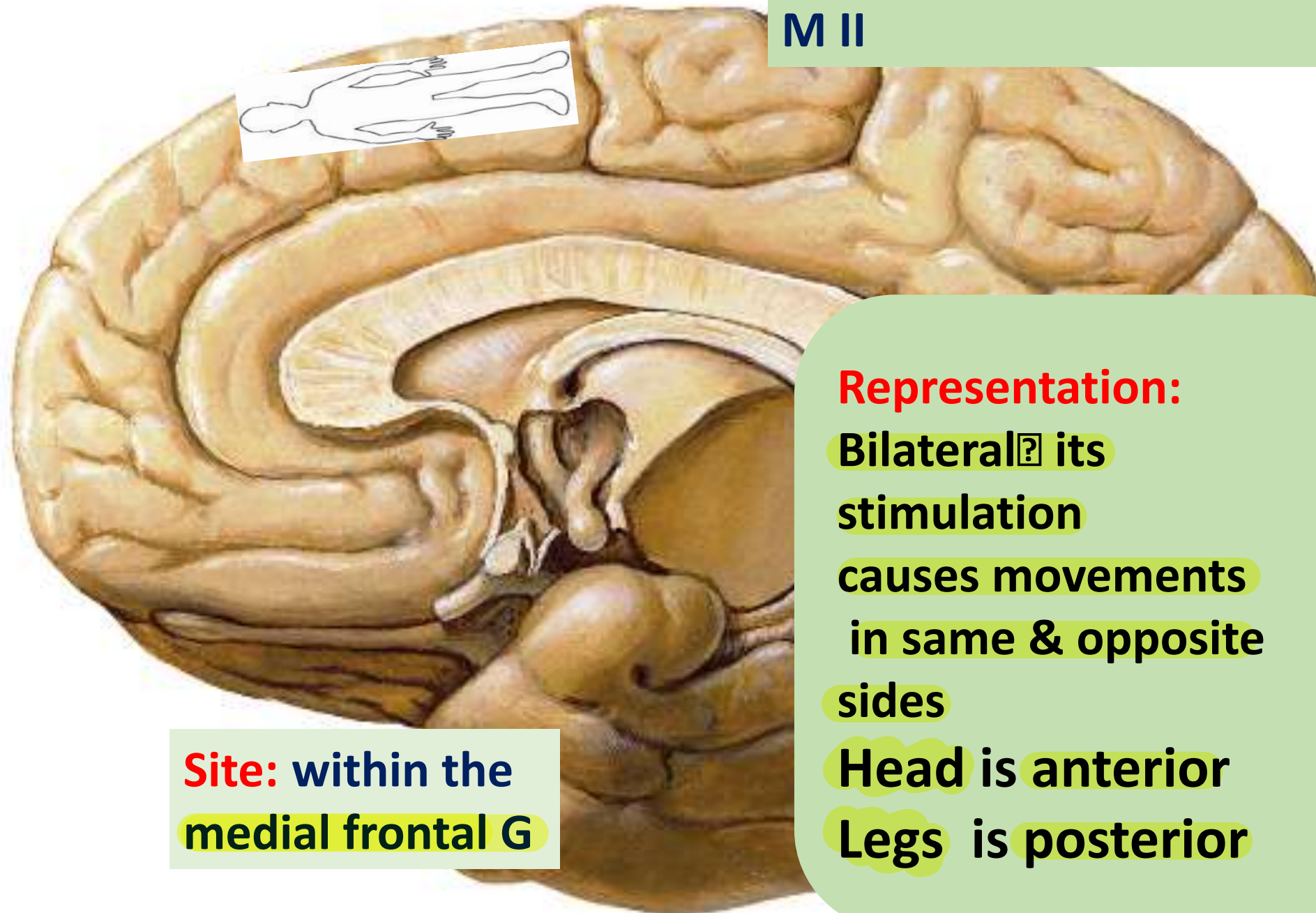


The patient
cannot
pronounce
the words
easily, but
selects the
proper words.



بحكي بصعوبة جدا بالعافية، بكون عارف معنى الكلام و
sequence of contractions فاهمه بس مش قادر يعمل ال
المزبوط بالطريقة المزبوبة ال smooth الي تخليه يحكي

Supplementary motor area M II



Site: within the
medial frontal G

Representation:

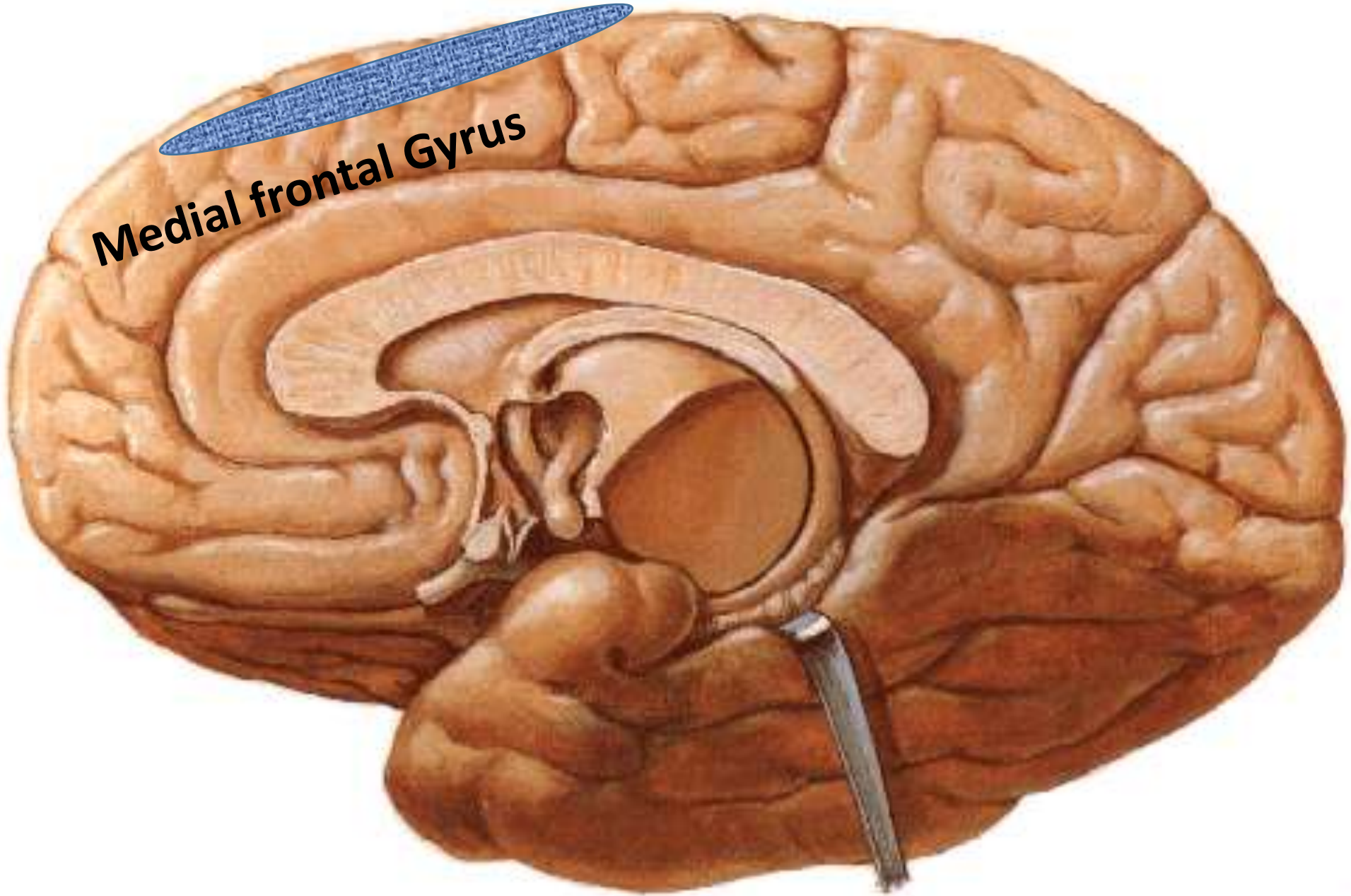
Bilateral its
stimulation

causes movements
in same & opposite
sides

Head is anterior

Legs is posterior

Medial frontal Gyrus



MII Function

- ❑ It plans & stores programmes for difficult or complex movements for example movements involving both hands

Bimanual movement



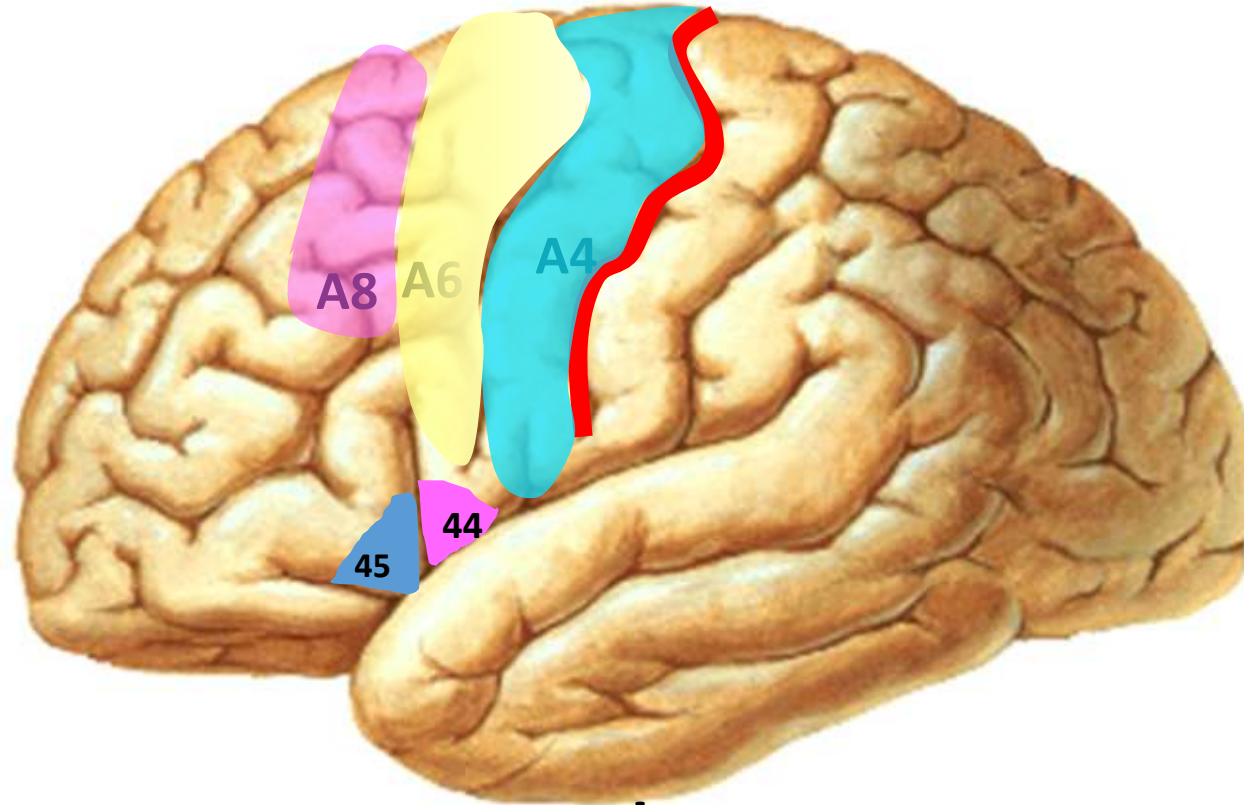
- ❑ Contains a superior speech center

bilateral presentation لانه عنده

- ❑ **Lesion**? temporary : aphasia & inability to move (Akinetic mutism)

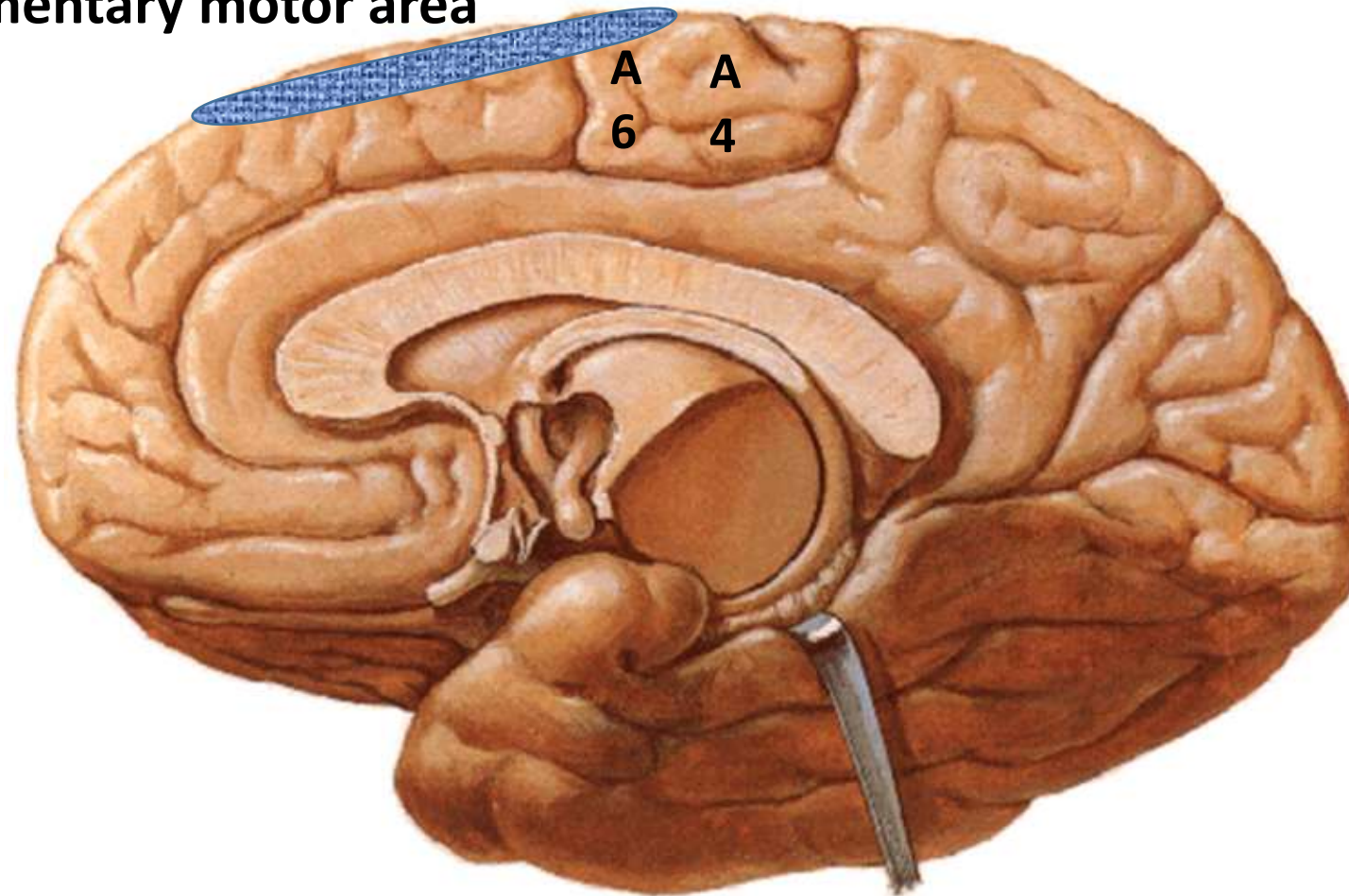
difficulty in performing complex movements

Precentral area



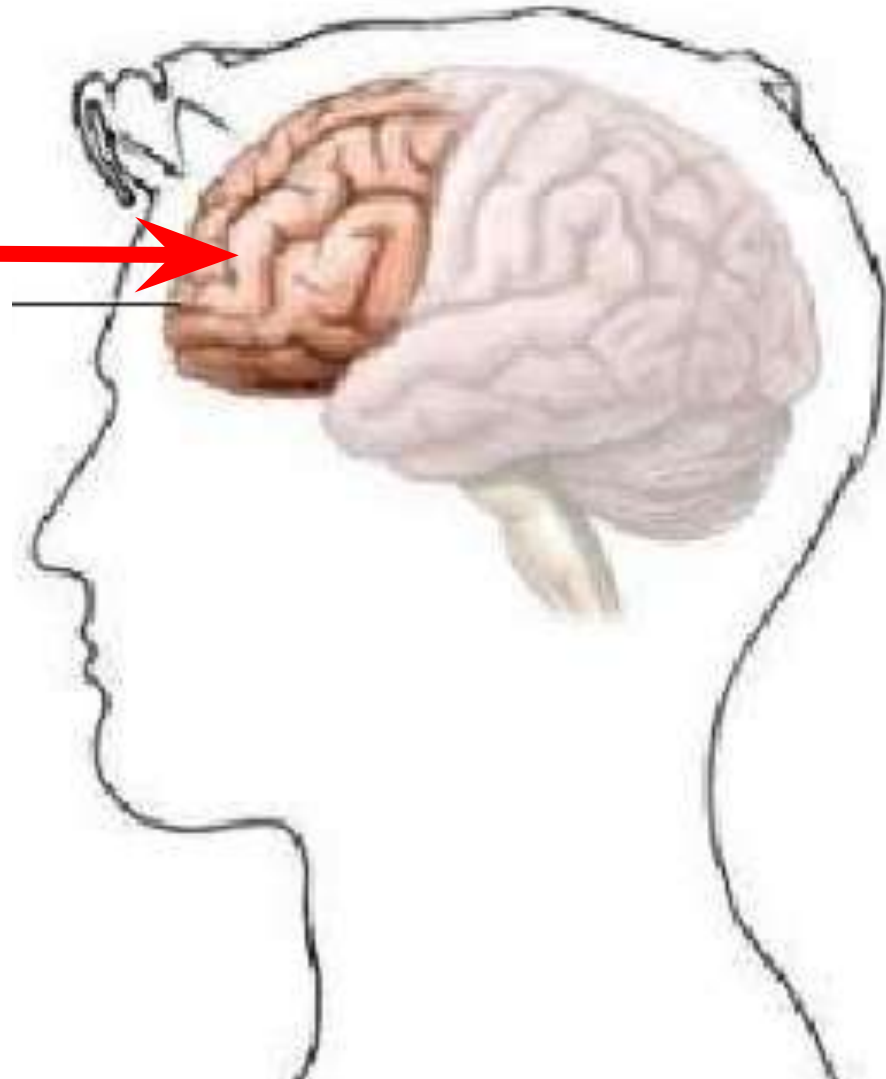
Broca's Area = Motor speech area

Supplementary motor area



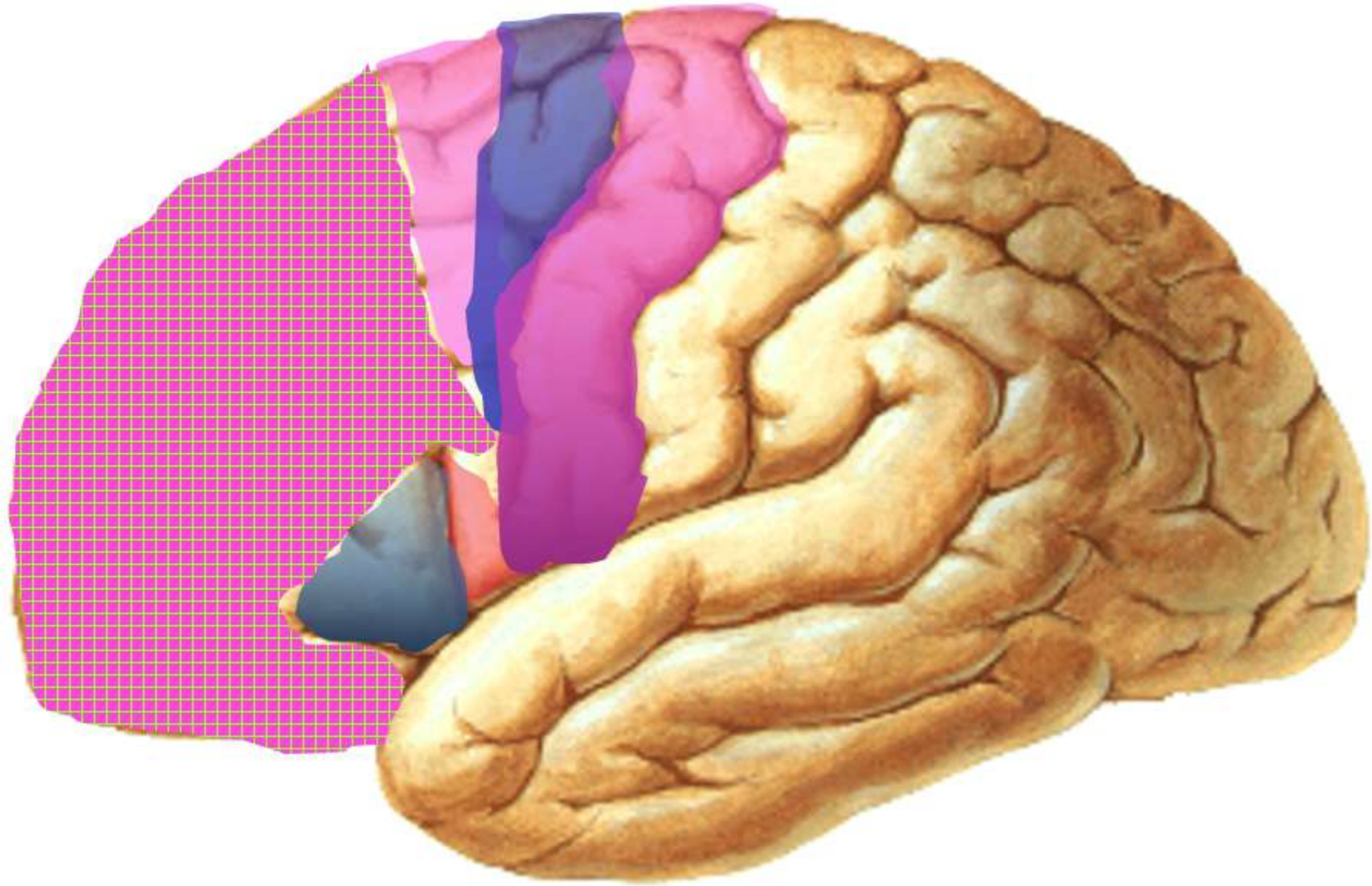
Prefrontal area

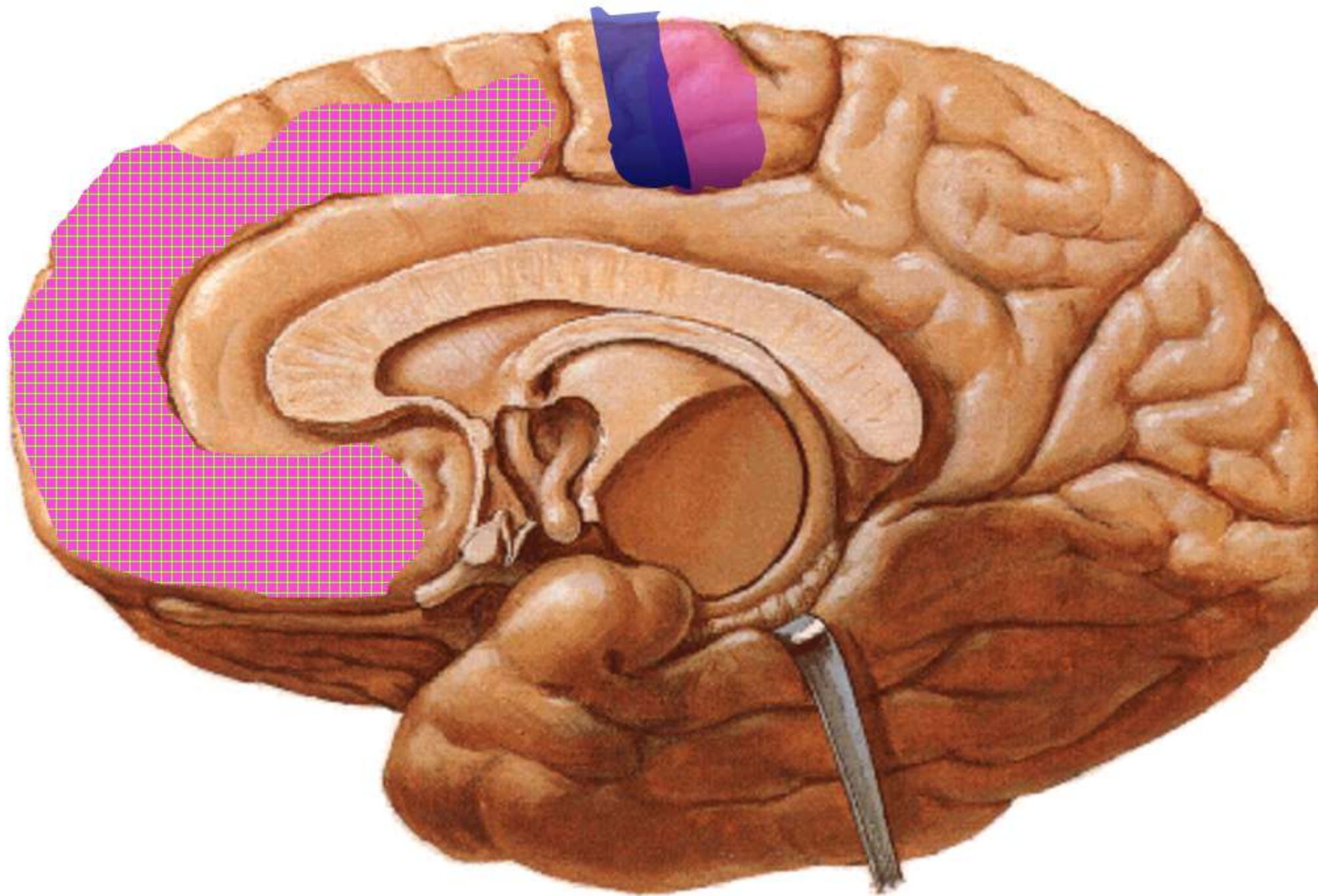
Prefrontal area



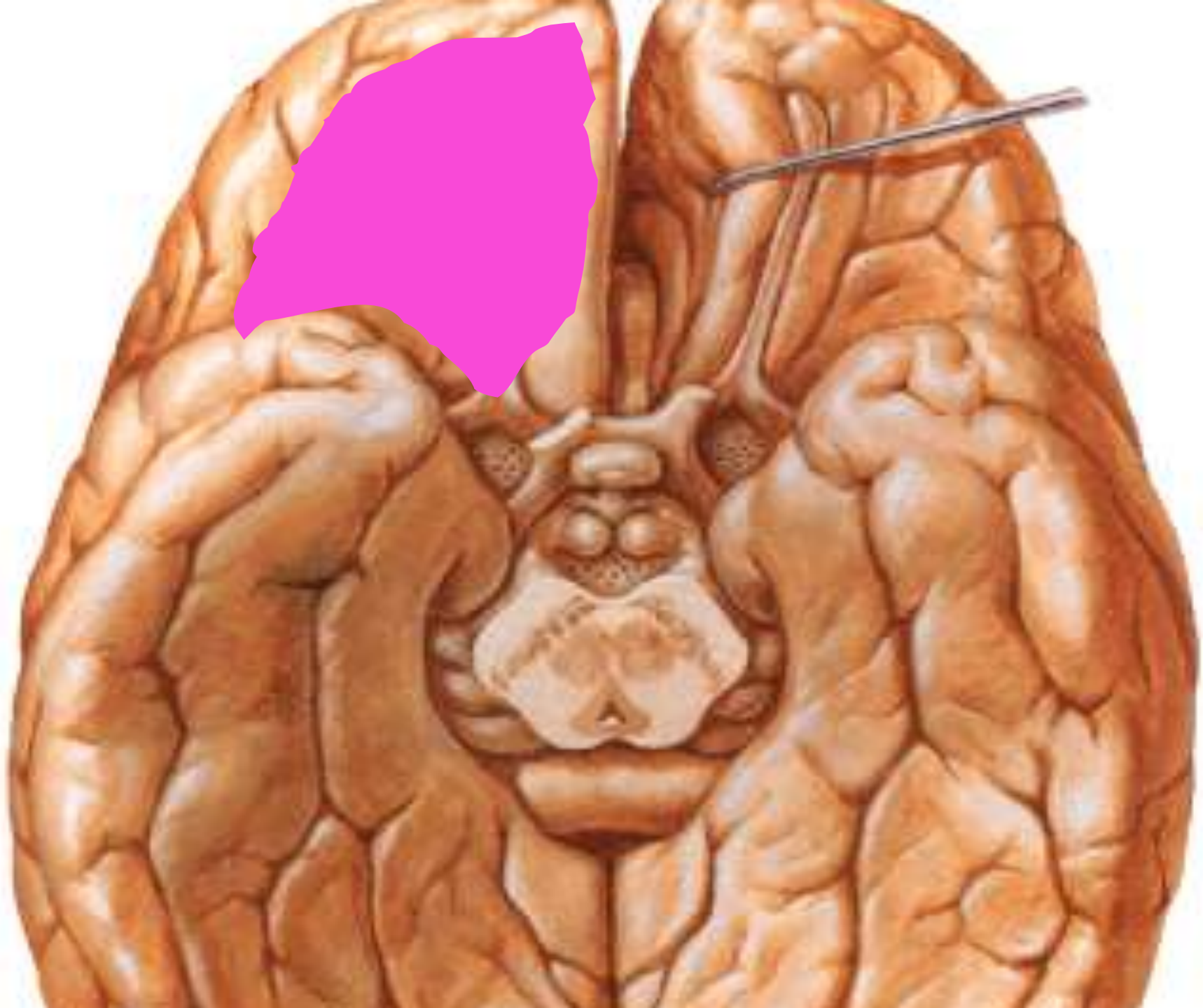
Site :

- 1) Remainder of **sup., middle & inf. frontal gyri**
- 2) **Most of medial frontal gyrus**
- 3) **Orbital gyri**





P1



Function

- 1) *Intelligence*
- 2) *Expression of emotion*
- 3) *Ability to predict consequences of an action*
- 4) *Controls behavior, mood & personality*

Lesion?

Changes in Behavior, Mood & Personality



Thank you