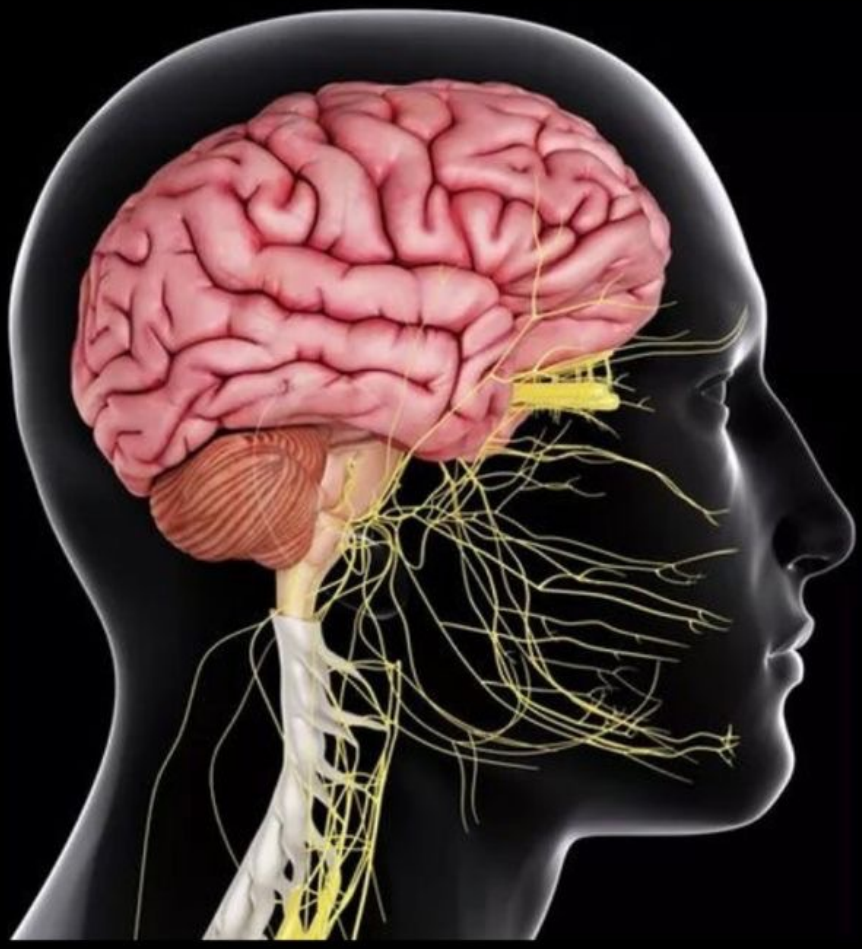
CENTRAL NERVOUS SYSTEM



SUBJECT : Anatomy

LEC NO. : 8

DONE BY : Batool ALzubaidi & Hashem Ata

وَقُل رَّبِّ زِدْنِي عِلْمًا

Cerebellum

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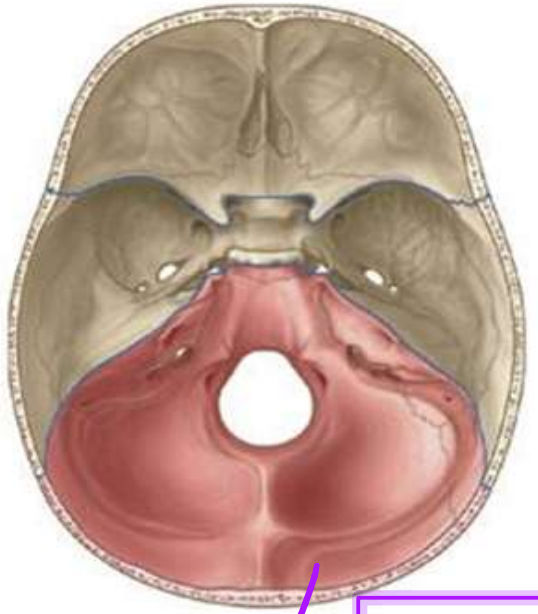
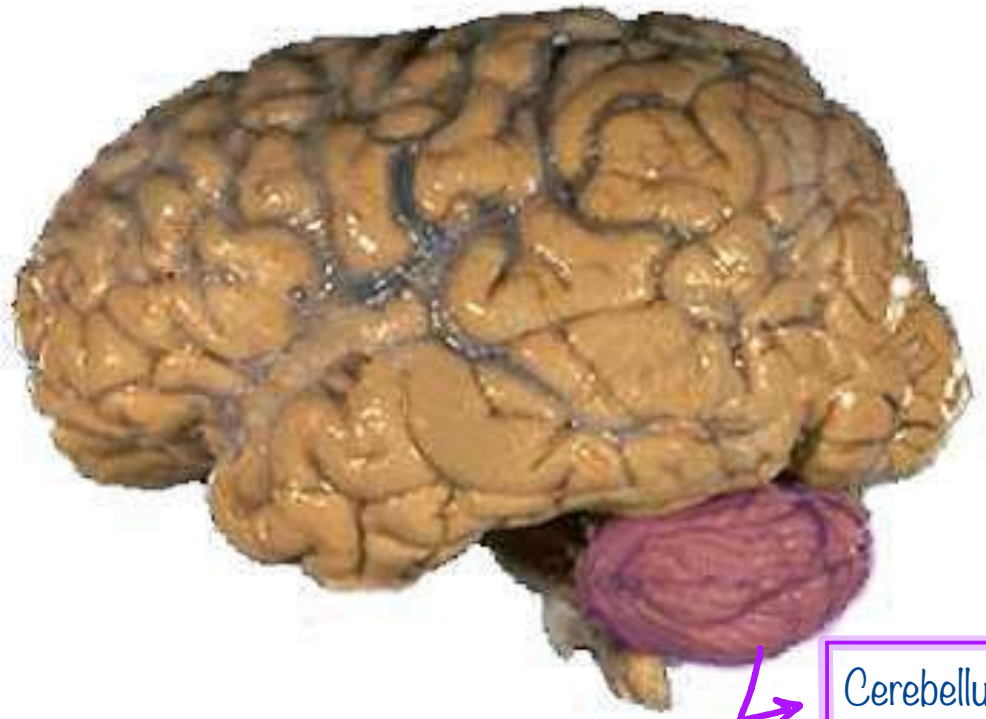
site:

- The term cerebellum is from "latin meaning" the little brain. It is a part of the hindbrain situated in the posterior cranial fossa.

Cerebellum + pones + medulla = hindbrain

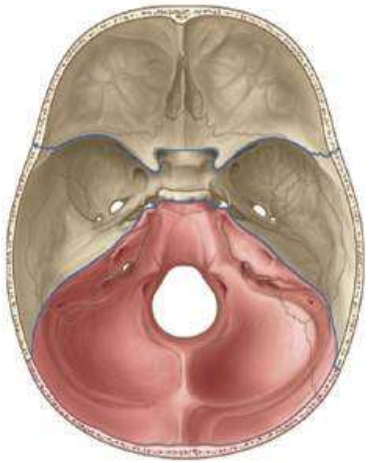


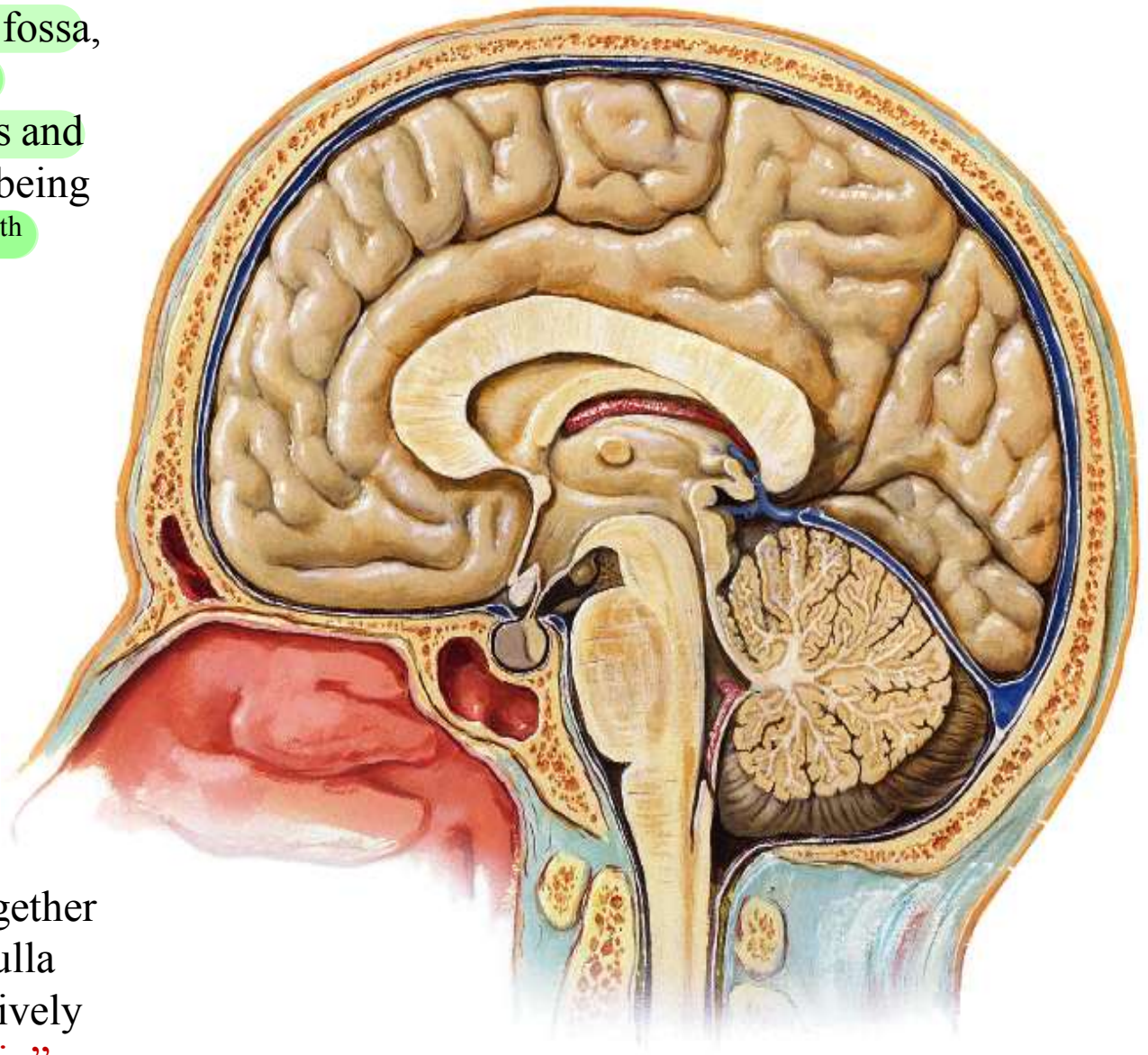
Posterior cranial fossa



Cerebellum

It lies in posterior cranial fossa, under cover of tentorium cerebelli, and behind pons and open medulla oblongata, being separated from them by 4th ventricle.





[N.B.] Cerebellum together with pons and medulla oblongata are collectively called the "Hindbrain".

Function of cerebellum

- ✓ Maintenance of Equilibrium, balance, posture, eye movement
- ✓ Adjustment of Muscle Tone
- ✓ Motor ~~Leaning~~ Learning – Motor Skills
- ✓ Cognitive Function
  - Theoretically

Parts of the cerebellum

بقسم ال cerebellum horizontally
ل superior and inferior surfaces

- **Two large lateral cerebellar hemispheres**

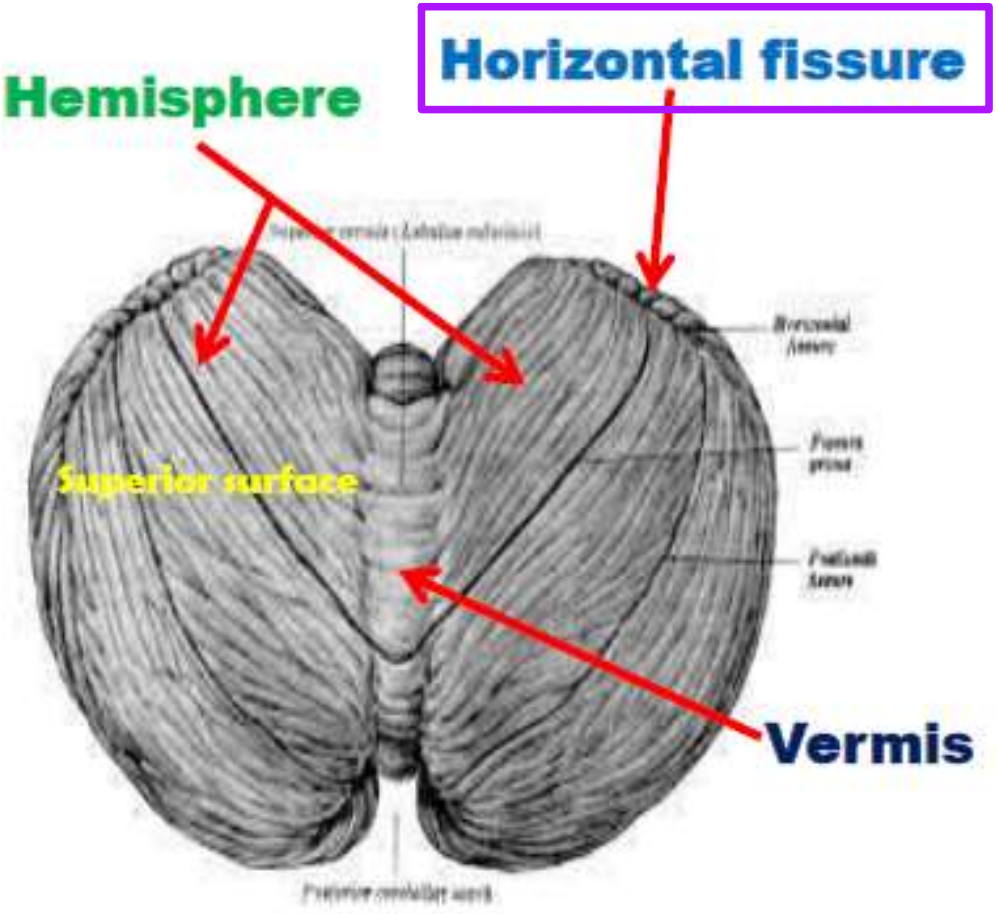
اسم تاني لل gyri يعني اليرقة

formed of many gyri called folia separated by deep fissures (sulci).

Gyri » elevations of gray matter

- **Vermis** → يعني شكل الدودة

narrow median part joining the two cerebellar hemispheres. It is divided into superior and inferior vermis.



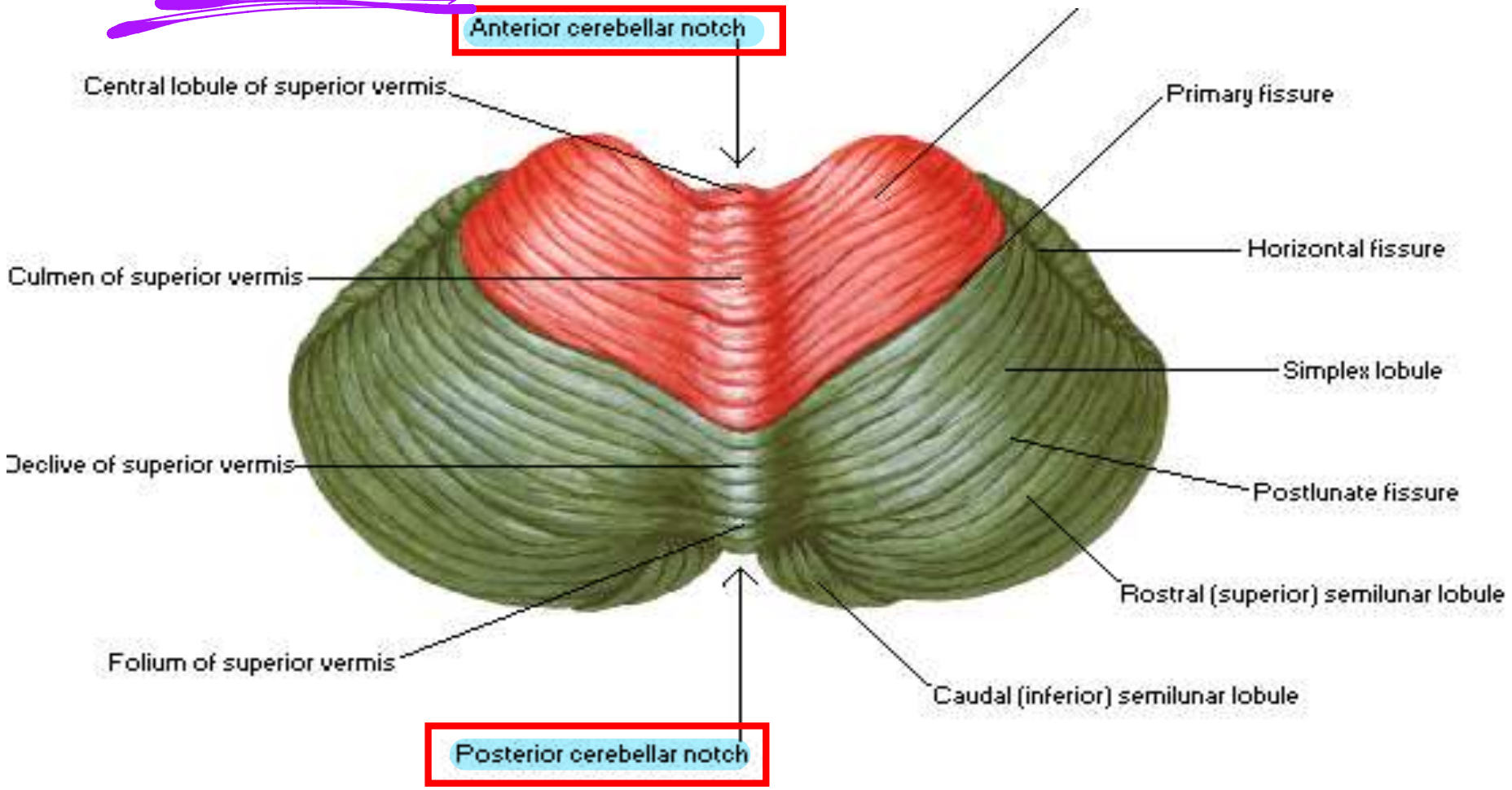
Medulla, pones, 4th ventricle

NGU. SCHOOL of MEDICINE

- **anterior notch**: related to **back of brain stem.**

Pointed notch

- **posterior notch**: receives **falx cerebelli.**
- **Two surfaces** : **superior & inferior.**



Surfaces of Cerebellum

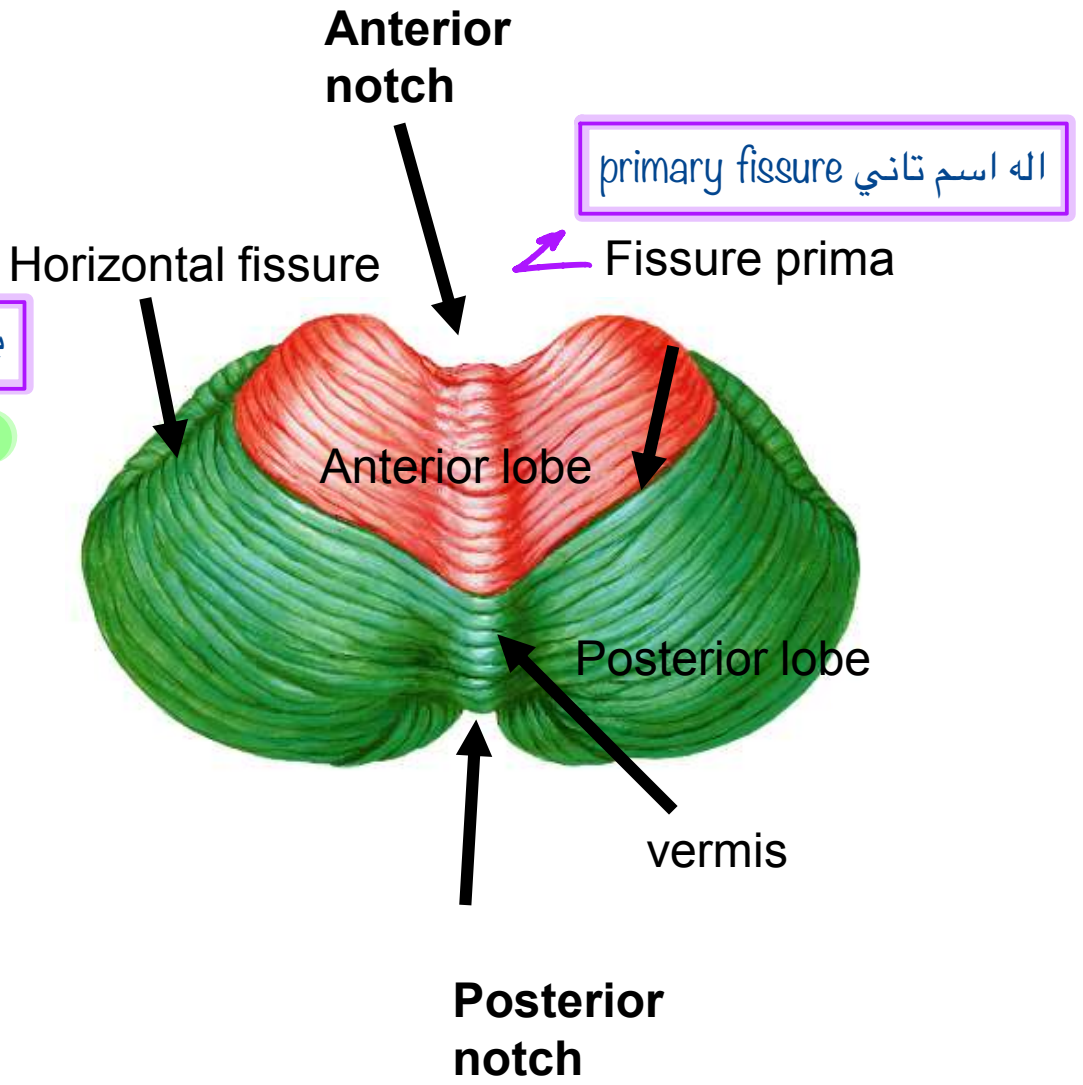
Superior surface:

- it shows superior surface of vermis (raised) & cerebellar hemisphere
- It has a deep fissure **V shaped** called fissure prima that separates anterior lobe from posterior lobe

بتكون مميزة بهاد ال surface بارزة

اللون الاحمر

اللون الاخضر



Surfaces of cerebellum

Inferior surface:

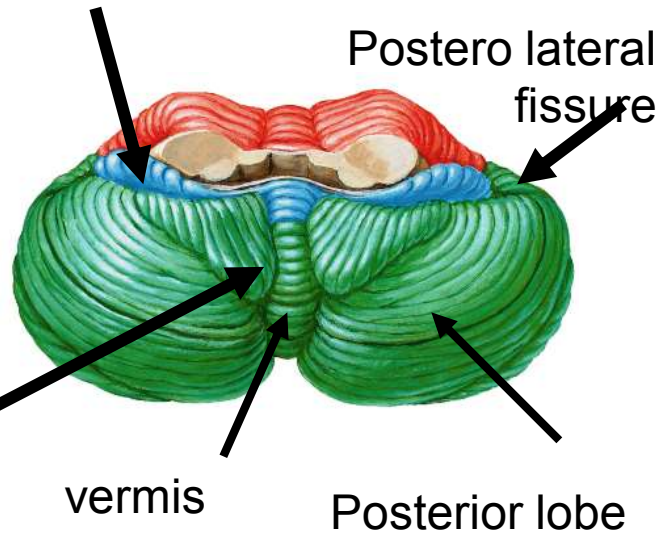
- It includes inferior surface of vermis which lies in a deep groove called vallecula

بفصل الجزء الاخضر عن الازرق

- Posterolateral fissure separates the posterior lobe from flocclu-nodular lobe.

هيك صار فيه ٣ lobes لحد الان

- The most inferior part of the cerebellum is the cerebellar tonsil



At the upper junction of foramen magnum

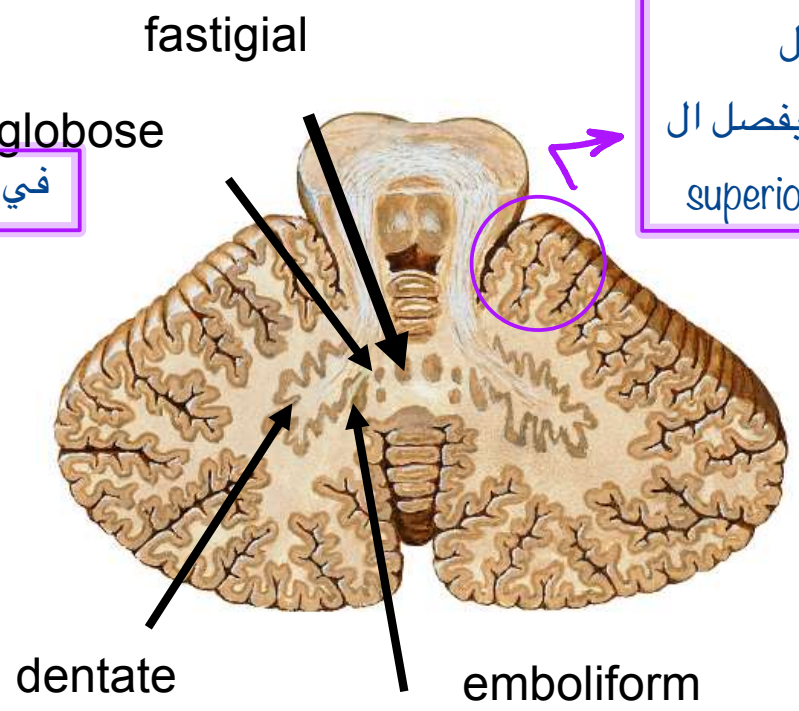
عشان هيك بس يزيد ال intra-cranial pressure اول علامة بتشوفها بال imaging بال MRI ال herniation of cerebellar tonsil

Cerebellar Nuclei

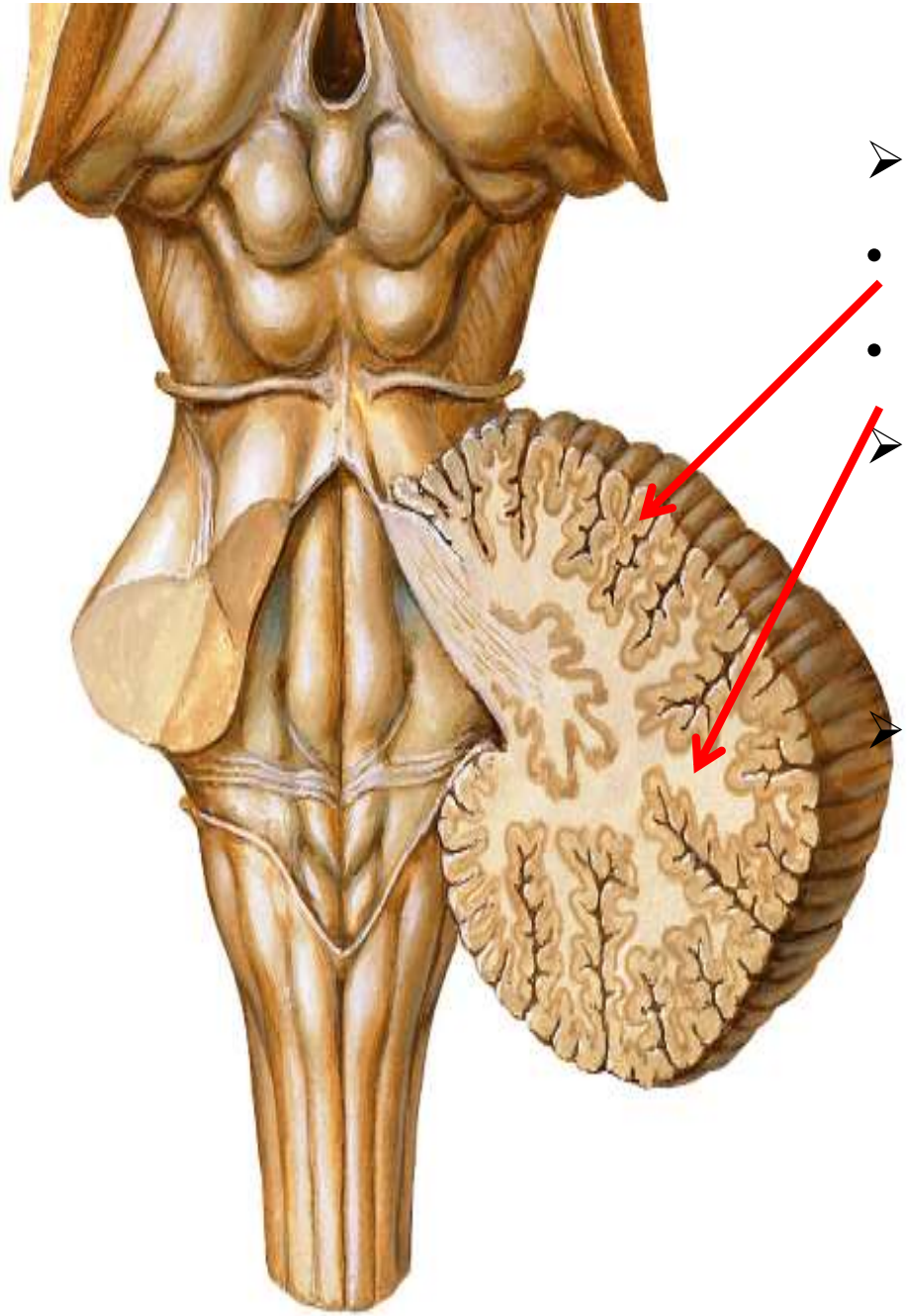
Masses of gray matter scattered in the white matter of the cerebellum

1. Dentate — Most lateral and largest one — في الخارج ناحية ال lateral كبيرة و شكلها زي الاسنان
2. Emboliform — يعني شكل ال embolism
3. Globose
4. Fastigial — Most medial

From lateral to medial



شايفين كيف ال gray matter عاملة elevations زي اليرقات، و فيه sulci كتيرة اكبرهم ال horizontal sulcus اللي بفصل ال superior and inferior surface



- Cerbellum consists of
  - outerlayer of grey matter (*cortex*)
  - inner layer of white matter (*medulla*)
- The medullary core is composed of incoming and outgoing fibres projecting to and from the cerebellar cortex.
- Medullary core also contain four cerebellar nuclei

هدول ال fibers راح يكونوا معديين فين؟ ال cerebellar peduncles

Anatomical lobes(3)

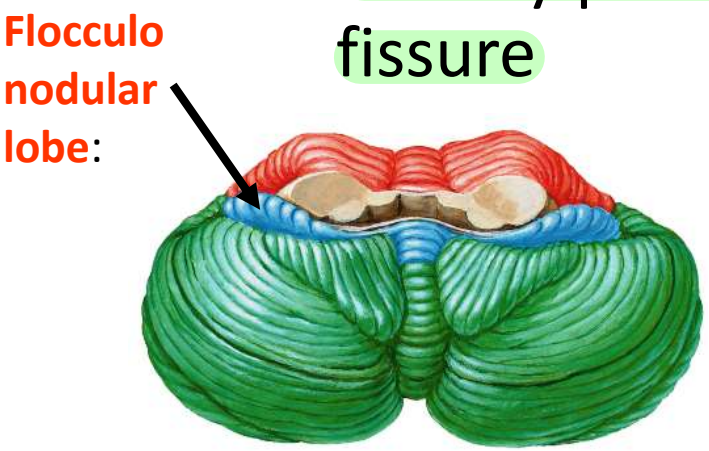
- **Anterior lobe**:

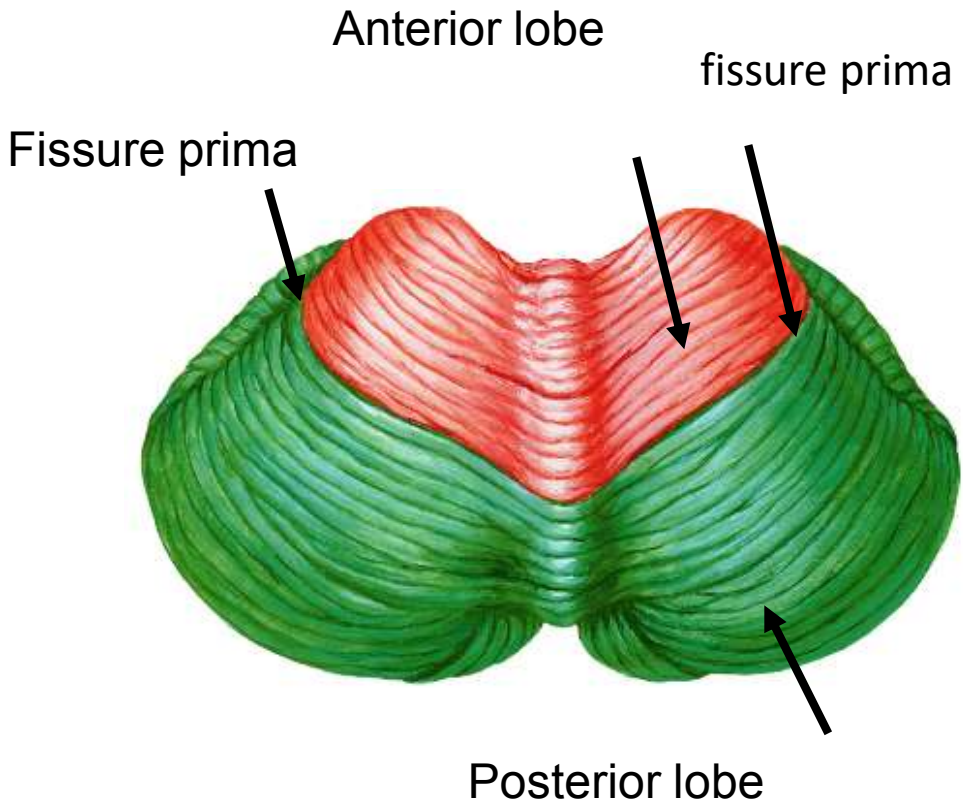
anterior to fissure prima

- **Posterior lobe**: posterior to fissure prima

- **Flocculonodular lobe**:

separated from posterior lobe by posterolateral fissure





هاي التقسيمة المهمة

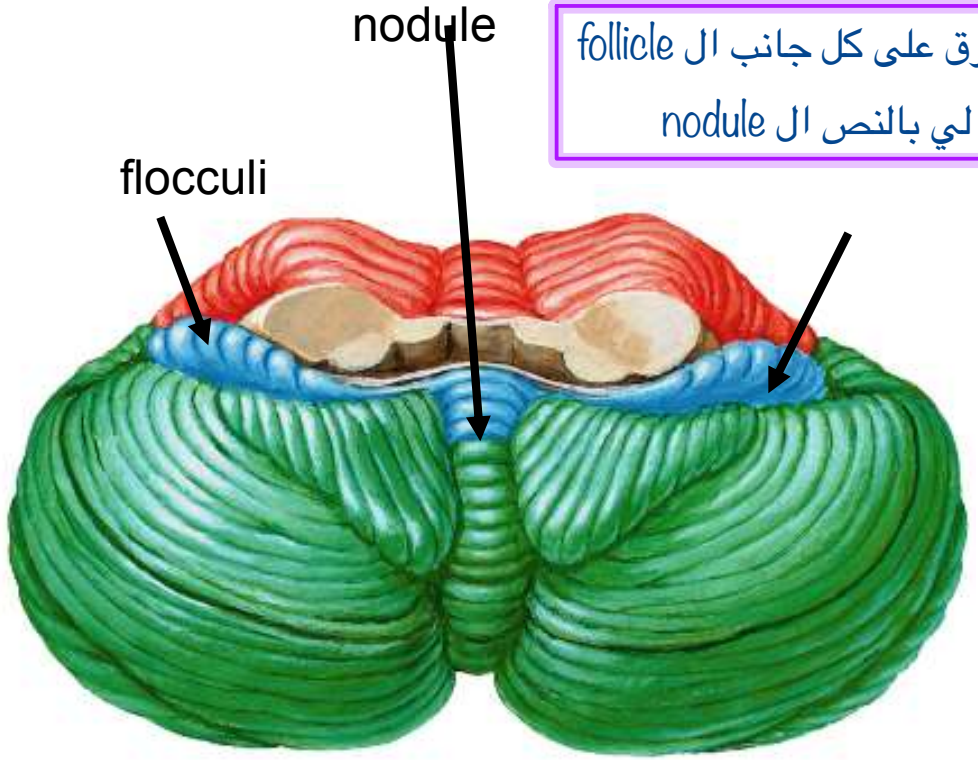
Functional Lobes of Cerebellum (3)

الاسم اجا من الحيوانات البدائية و بتلاقيه كبير و ال lobe الرئيسي بالطيور

ال archi يعني عتيق اسمه ال cerebellum العتيق ال هو ال folliculo-nodular

1. Archicerebellum:

- Its connections are vestibular
- Concerned with equilibrium
- Formed of 2 flocculi& nodule(part of vermis)



الجزء الازرق على كل جانب ال follicle
اما الجزء الي بالنص ال nodule

- **Fastigial nucleus** (medially): linked functionally with **archicerebellum**.

Lobes of Cerebellum

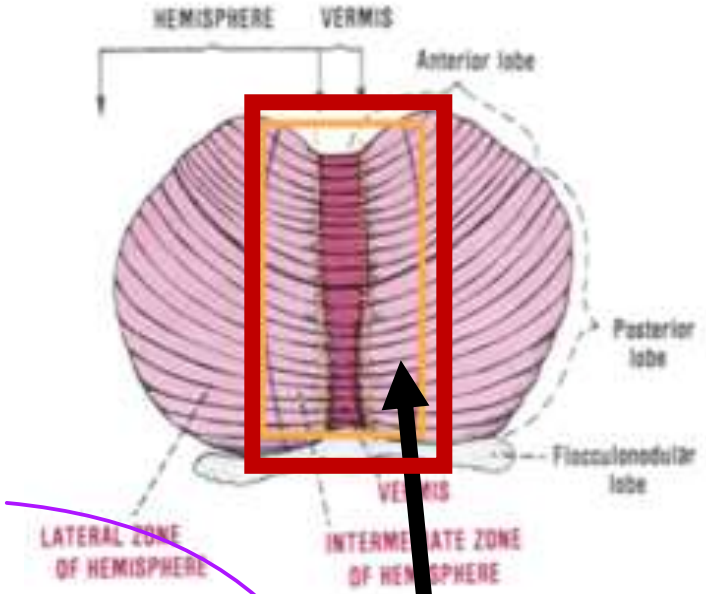
ال paleo يعني قديم و هاد بكون موجود بالكائنات القديمة الي بتكون اعلى شوي من الكائنات البدائية و بكون كبير فيها

2. **Paleocerebellum**

- Connections are spinal (Spino cerebellar)
- Controls muscle tone, posture& coordinate movements
- Formed of 3 parts

1- **Vermal**: includes whole vermis, it has connections to the trunk muscles of both sides via fastigial nucleus

2- **Two paravermal of cerebellar hemisphere** : are connected to distal limb muscles of the same side via globose & emboliform nucleus



و انت تحرك ايدك عشان تمسك اشي مش لازم يكون في coordination بين ال agonist and antagonist الي بعمل smoothing للل movement بخلي ال agonist and antagonist انهم يمشوا مع بعض و ما يصير interruption بال movemev هو ال cerebellum

هاد ال lobe بتلاقيه well developed بالزواحف زي الافاعي (تس تس انا التعبان 🐍)

3. Lobes of Cerebellum

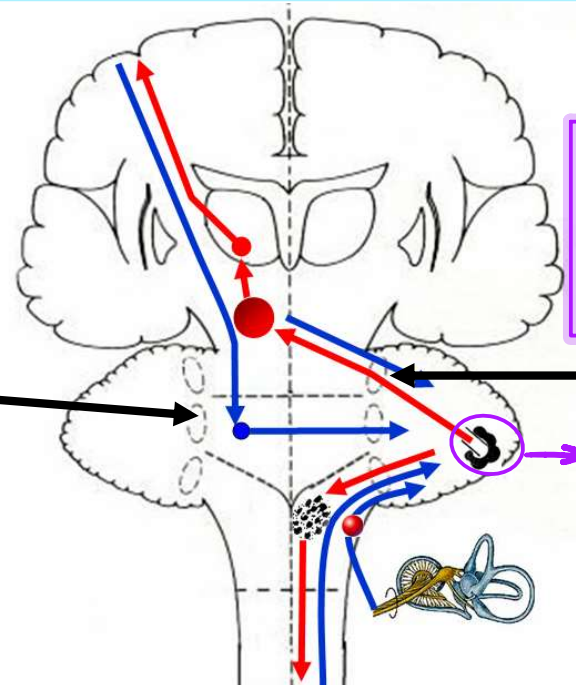
Neocerebellum:

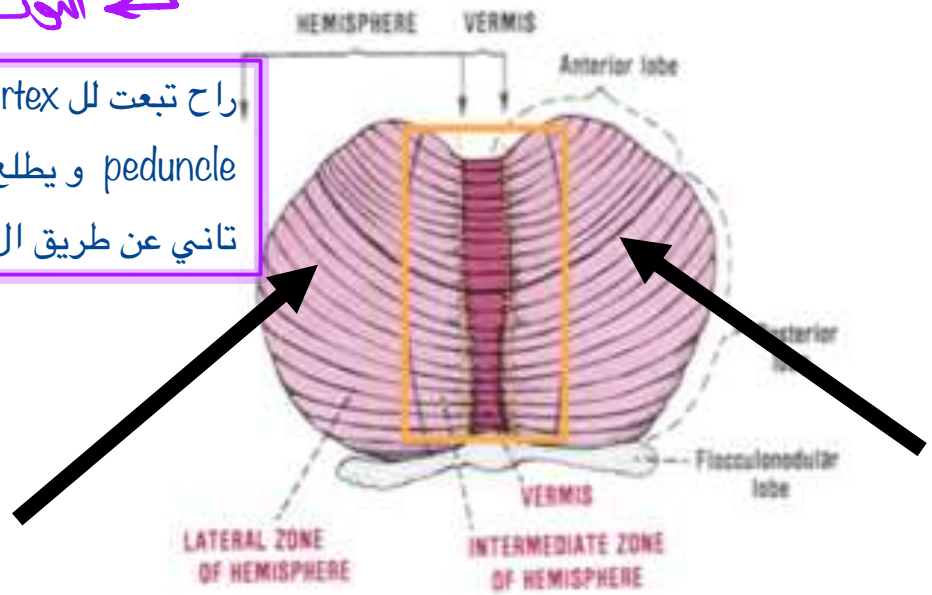
بكون well developed بالحيوانات الي بتحتاج movement skills زي الانسان
مثلا (مع احترامي للجميع بس هو هيك حكى😂😂) هاد اكبر lobe عنا

- its connections are cortico- ponto – cerebellar → اخدناه بال midbrain المحاضرات الماضية
- Projects to the contra lateral cerebral hemisphere via dentate nucleus
- Formed of most of lateral parts of cerebellar hemisphere
- it interacts with motor cortex in planning & programming of movement

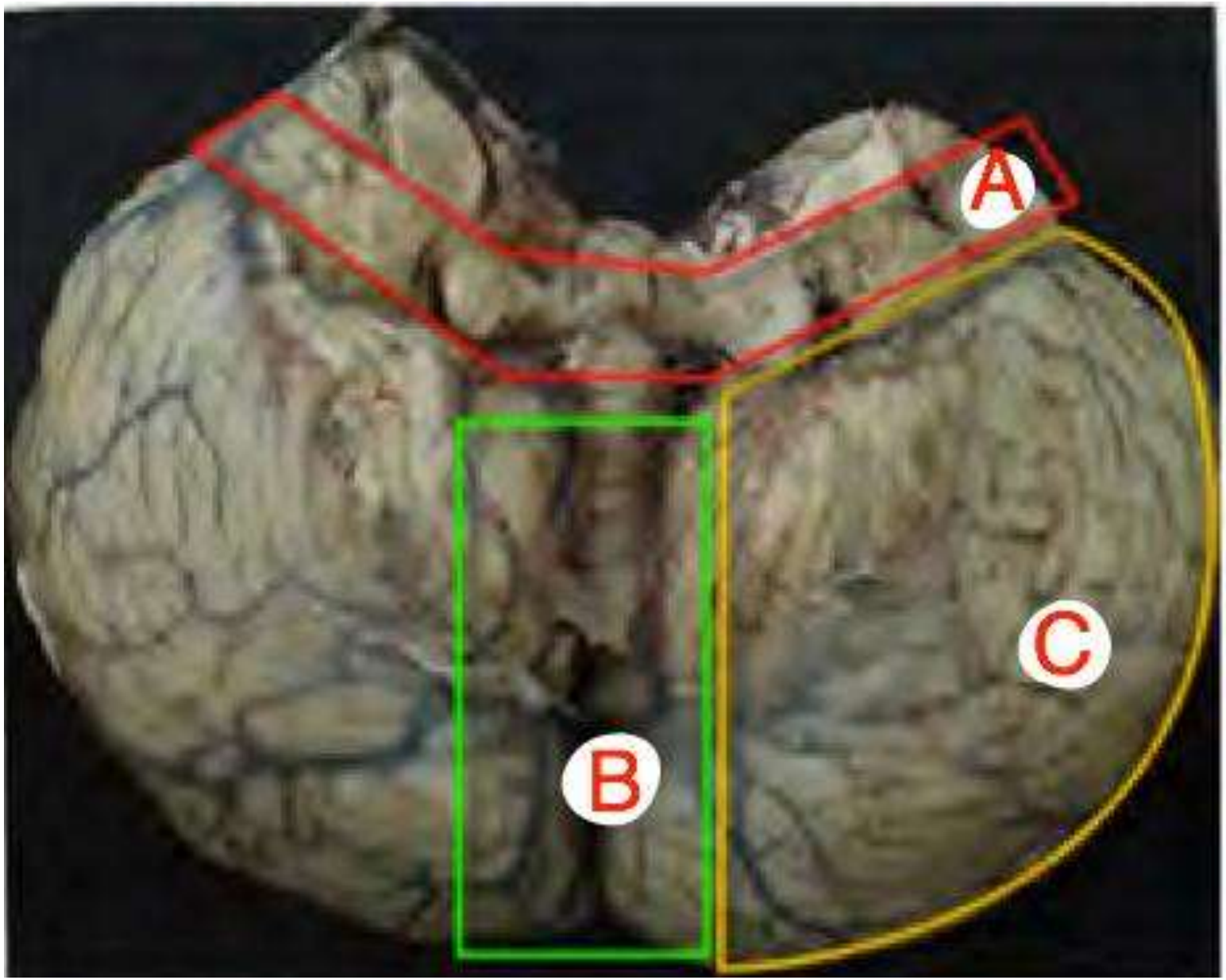
لـ المخ

راح تبعت لل cortex عن طريق ال superior cerebellar
و يطلع على ال thalamus او بروح من طريق peduncle
تاني عن طريق ال red nucleus بعدين على ال thalamus





A » archicerebellum (folliculo-nodular)
B » paleocerebellum
C » neocerebellum



الاشياء الي احنا تعلمناها زي السواقة انت اصلا تعلمت الخطوات فما راح تكون احط يمين شمال ولا السيارة اغير D/P راح تكون smooth اولها بتكون tense لانك بتكون مركز على ال cortex بعدين بتصير subconscious عن طريق ال cerebellum .. كمان لما تعلم طفل الكتابة راح يكون اولها مركز كتير بعديها بتصير يكتب بكل سهولة و الكلام نفس الاشي

Functional Areas of Cerebellar Cortex

Muscles of the trunk

- **Vermis**: influences movement of neck, shoulders, thorax , abdomen
- **Lateral to vermis or intermediate zone**: controls muscles of distal parts of limbs hand and feet
- **Lateral zone** : is concerned with planning of movements of whole body and conscious assessment of movement errors

شو يعني ال errors ؟ مش حكينا فوق ال dentate nucleus بتبعت لل brain ليش طيب بتبعتله ؟ عشان تحكيله اذا فيه خطأ بالحركة و انت تكتب مثلا، ب اي skill في feedback اسمه trial and error و انت تعمل اشي غلط مين راح ينتبه انه غلط ؟ ال brain و بصلحلك اياها و في المرات الجاية بتضل تعملها احسن

- **Dentate nucleus** (laterally): linked functionally with **neocerebellum**.

- **Fastigial nucleus** (medially): linked functionally with **archicerebellum**.

و الها جزء مع ال paleocerebellum الجزء تاع ال trunk

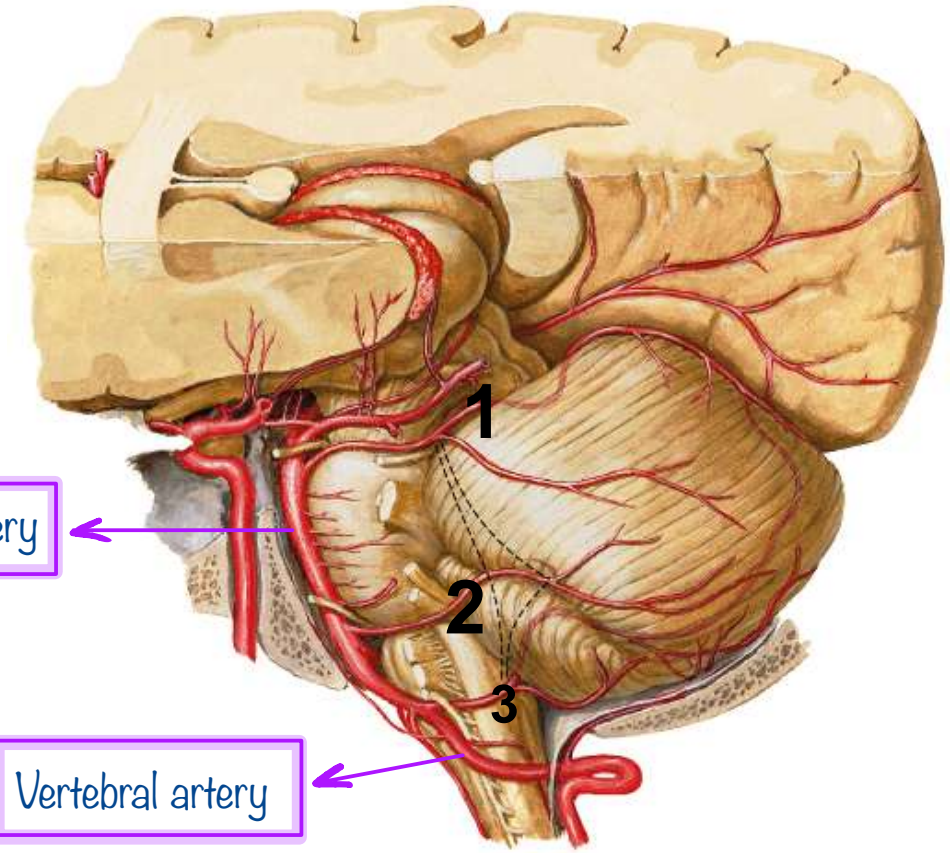
- **Nucleus interpositus** (emboliform and globose nuclei) in between : linked functionally with paravermal zone of **spinocerebellum**.

Blood Supply of Cerebellum

1. Superior cerebellar(of basilar)
2. Anterior inferior cerebellar(basilar)
3. Posterior inferior cerebellar(vertebral)

حكينا عنه بعمل supply لل lateral part of the spinal cord و بعمل ال lateral medullary syndrome

عشان هيك بس تصير فيه مشكلة بعمل epsilateral ataxia

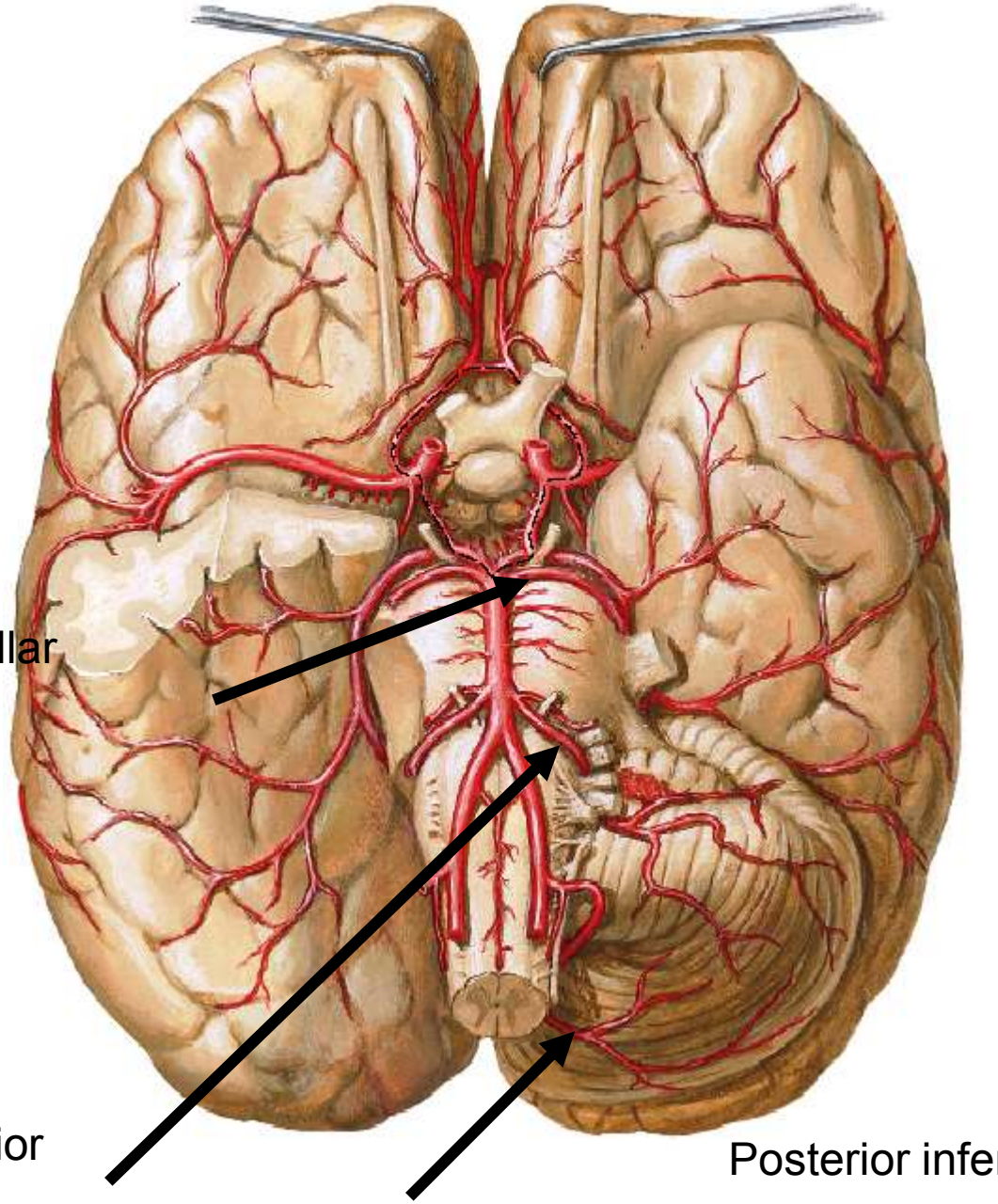


Arterial supply

Superior cerebellar artery: arises from basilar artery and supplies superior surface

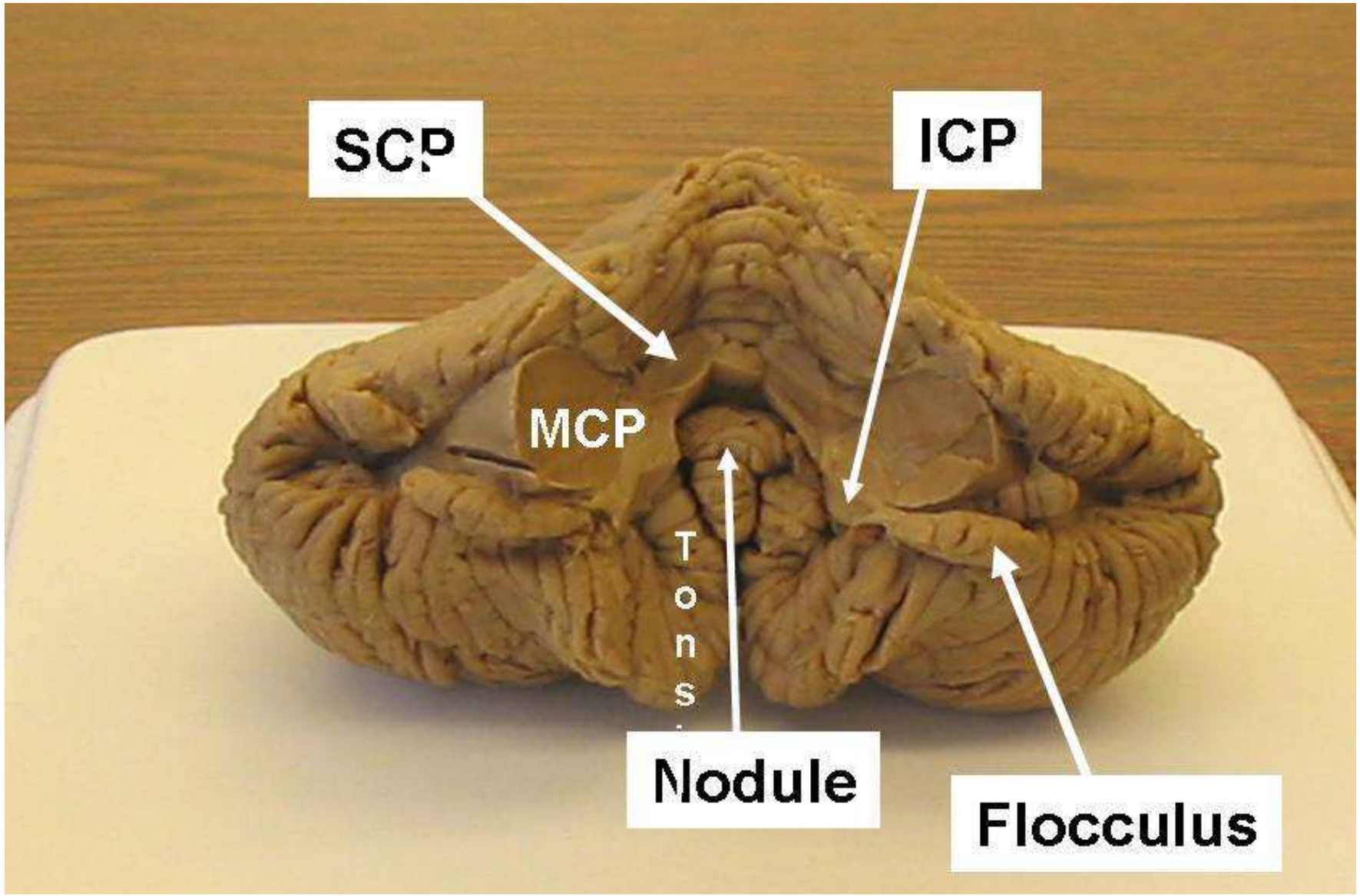
Anterior inferior cerebellar artery : arises from lower part of basilar artery and supplies small anterior part of the inferior surface

Posterior inferior cerebellar artery: arises from veretebral artery and supplies large posterior part of inferior surface


Superior cerebellar
Anterior inferior cerebellar
Posterior inferior cerebellar

The cerebellum is connected to Brain stem by three peduncles SCP, MCP and ICP

Superior, middle, inferior peduncles



Cerebellar Peduncles(3)

3 pairs of peduncles that connect cerebellum with brain stem

1- Inferior cerebellar peduncle connects cerebellum to medulla (mostly afferents)

Afferent fibers أخذناهم قبل

1. Posterior spino cerebellar: from ipsilateral Clarks
2. Dorsal external arcuate fibers or Cuneo cerebellar from accessory cuneate
3. Ventral external arcuate: from arcuate nucleus
4. Olivo cerebellar: from inferior olivary nucleus(climbing fibers)
5. Para olivo cerebellar: from dorsal & medial accessory olivary nuclei
6. Vestibulo cerebellar: from vestibular nerve & nuclei end on flocculonodular lobe
7. Reticulo cerebellar

Inferior Peduncle

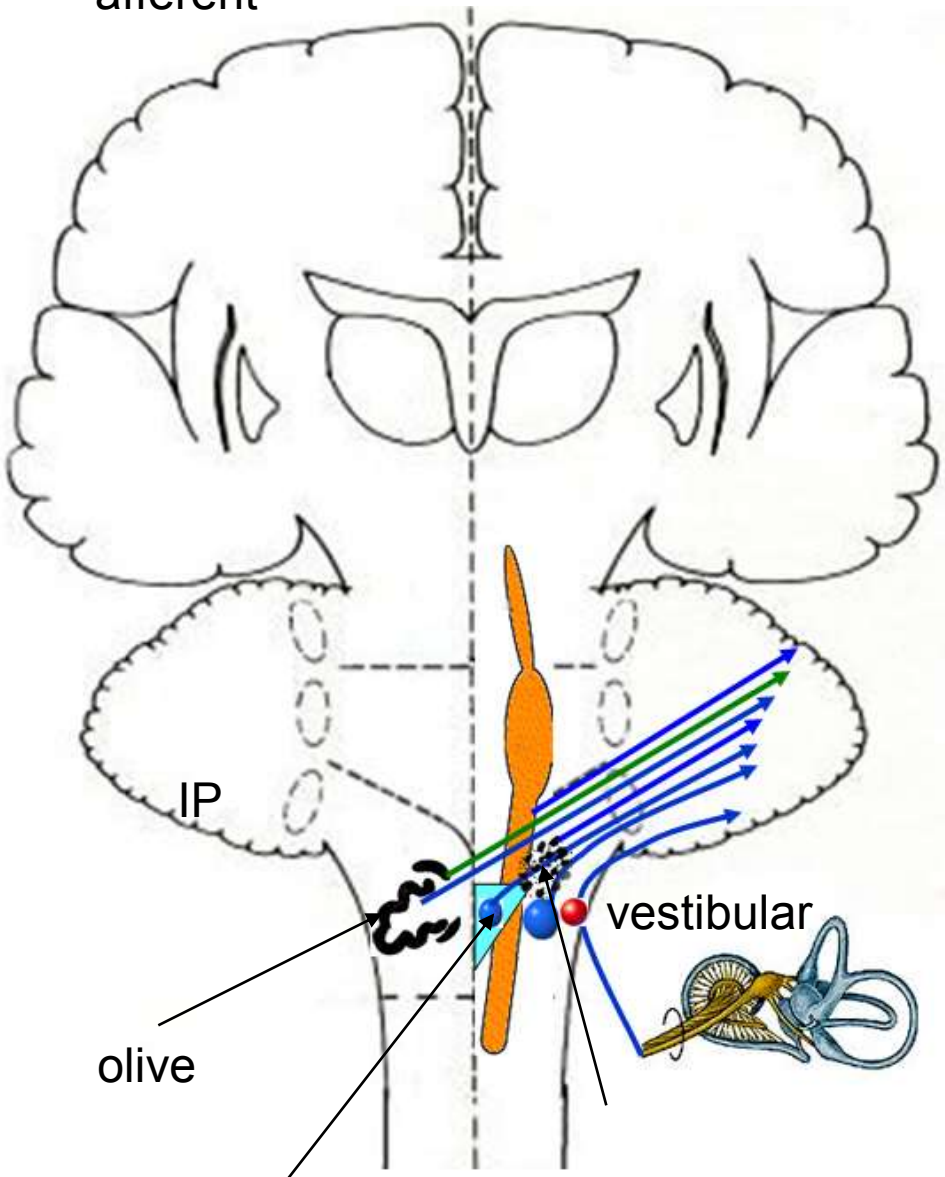
Efferent fibers:

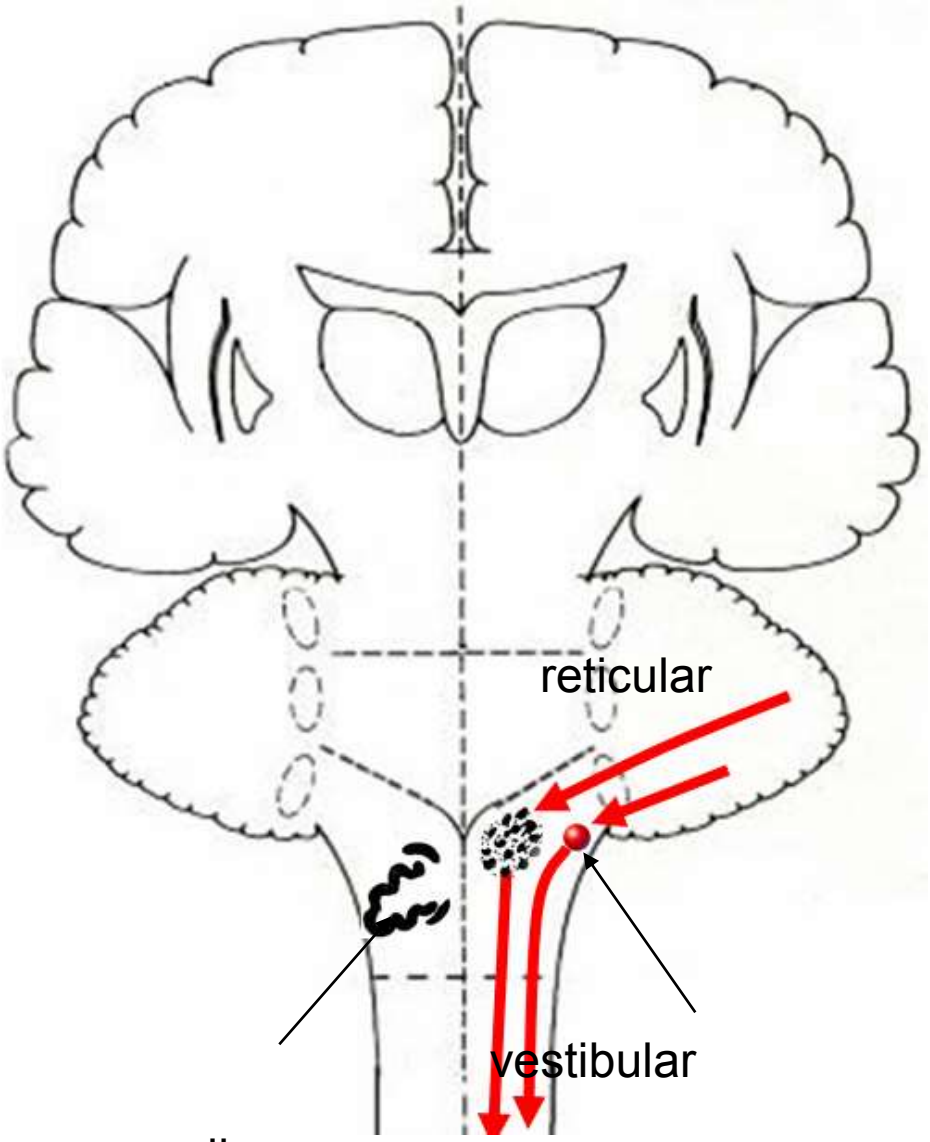
- Cerebello vestibular: from flocculonodular lobe to vestibular nuclei
- Cerebello olivary: to inferior olive
- Cerebello reticular

ICP

afferent

efferent





Reticular formation

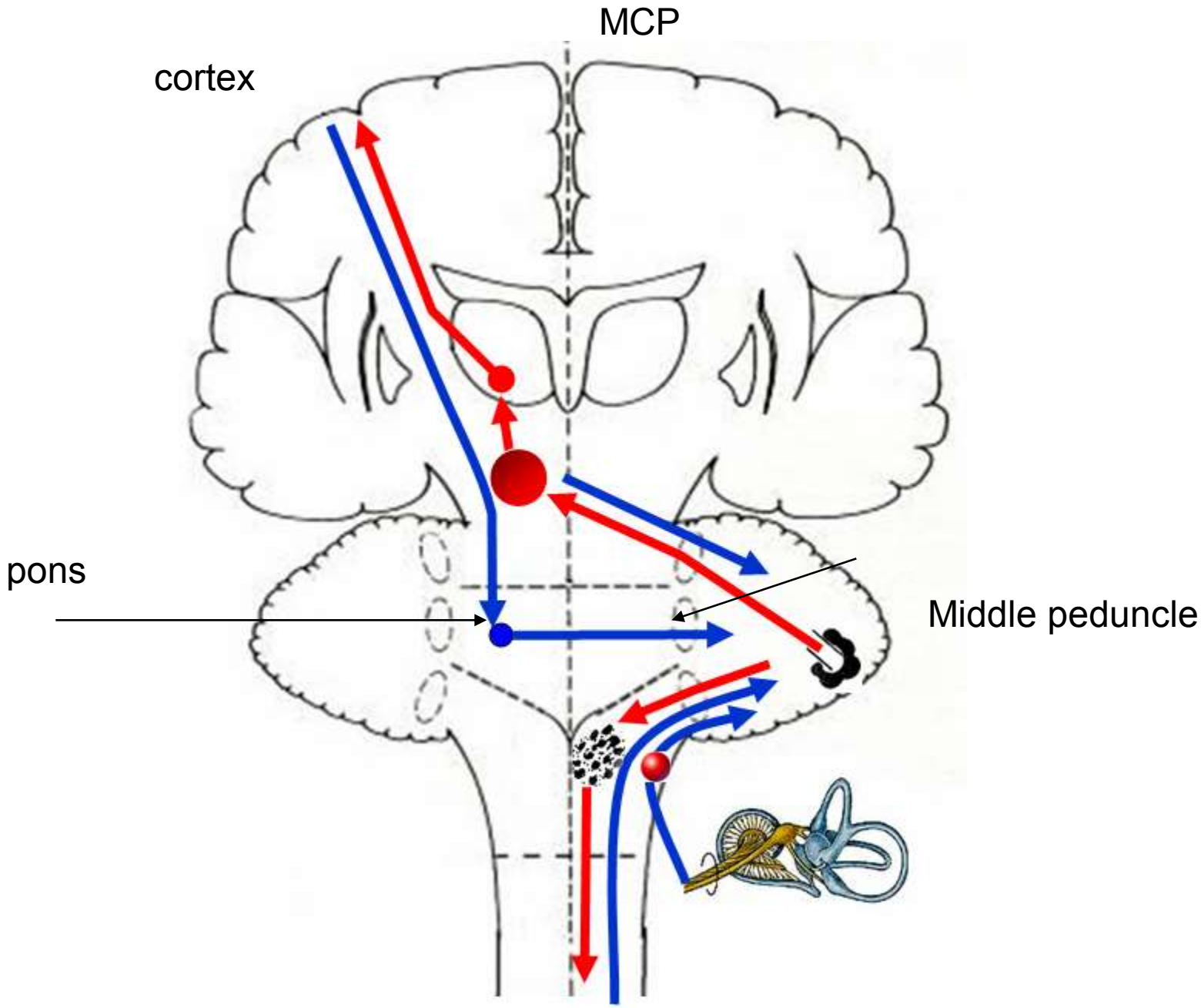
Middle Cerebellar Peduncle

Largest peduncle connects cerebellum to pons

Contains cotrico- ponto cerebellar fibers

- Fibers arise from frontal, parietal, temporal & occipital lobes
- Descend in internal capsule the through the crus cerebri of the midbrain lateral 1/5 for ..... Medial 1/5..... Frontal
- Terminate on pontine nuclei Parietal, temporal, occipital
- Pontine nuclei form **transverse pontine** fibers which cross mid line and enter cerebellum as middle cerebellar peduncle

cortex receives from contralateral side الـ اما cerebellum receives from epsilateral side of the body الـ


MCP
cortex
pons
Middle peduncle

Superior Cerebellar Peduncles

Connects cerebellum to mid brain

Afferents fibers

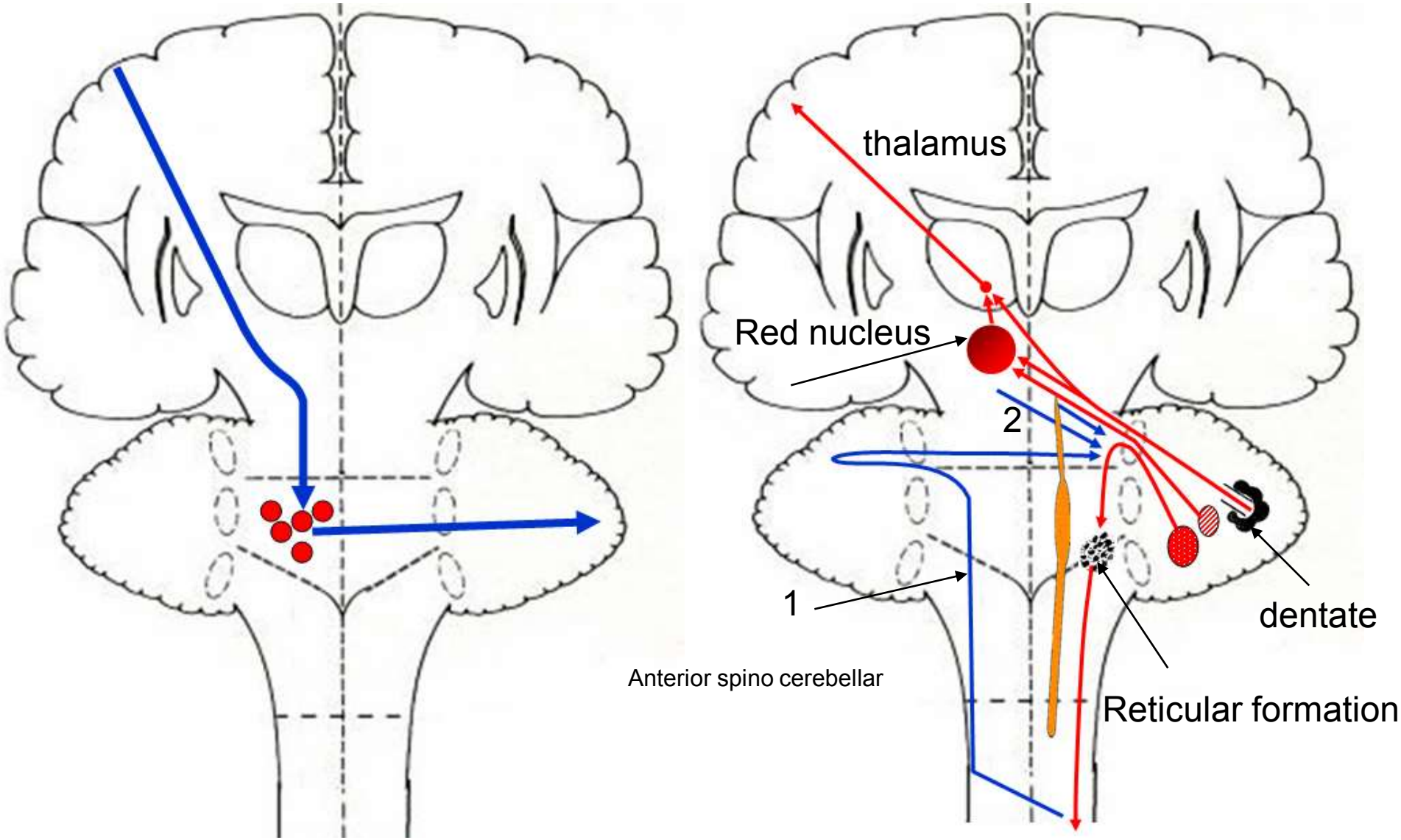
1. Anterior spino cerebellar
2. Tectocerebellar from superior colliculus

حكينا عنها قبل المسؤولة عن حركة العين اتجاه اي audio, visual stimulus

Efferent fibers

1. Fastigio reticular
2. Cerebello rubral: from globose & emboliform to red nucleus
3. Dentate thalamic to VLN of thalamus and dentate rubro thalamic to same nucleus of thalamus VLN but via red nucleus then to the cortex

أهم اسئلة


thalamus
Red nucleus
2
1
dentate
Anterior spino cerebellar
Reticular formation

MCP

SCP

Applied Anatomy

تعالوا نتخيلها على شكل قصة.. بالافلام الكوميدية في مشهد مشهور لما يكون فيه حدا سكران، ليش بهمنا الكحول هون لانه ال cerebellum هو اكتر جزء حساس اله و راح يضل ماثر عليه حتى لو نسبته قلت، فشكل الشخص السكران بشبه الي عنده cerebellar ataxia

Lesion presents with signs and symptoms on the same side

- Hypotonia ما بكون فارد حاله و هو ماشي
- Disturbance in gait بكون ماشي يمين شمال
- Cerebellar attaxia which present with (incoordination of the voluntary movement in absence of motor weakness). The range, rate, force and direction of movement are affected in cerebellar lesions.

Incoordination in range, rate, direction of movement, force

عينه زايغة

1- nystagmus: horizontal oscillation in both eyes.
2- staccato speech : interrupted explosive speech. و هو بحكي يكون يفضل الحروف عن بعض و بالنص صوته بصير عالي
3- intention tremors: (Shaking of fingers when attempting to do a movement)
4- dysmetria :(Ask patient to point to tip of nose by finger, he either past points it or misses it). ما بعرف يحدد المسافات منيح
5- dysdiadokokinesia (Patient is unable to do rapid alternating movements as Pronation/ Supination)


THANK YOU