cranial cavity

Lect 1

cranial cavity

The meninges are the coverings of the brain. They protect the brain by housing a fluid-filled space, and they function as a framework for blood vessels.

The meninges have three layers: the dura mater, the arachnoid mater, and the pia mater. The arachnoid mater is attached to the pia mater by arachnoid trabeculae, which is a weblike matrix of connective tissue.

The space between the two layers, the subarachnoid space, is filled with cerebrospinal fluid (CSF).

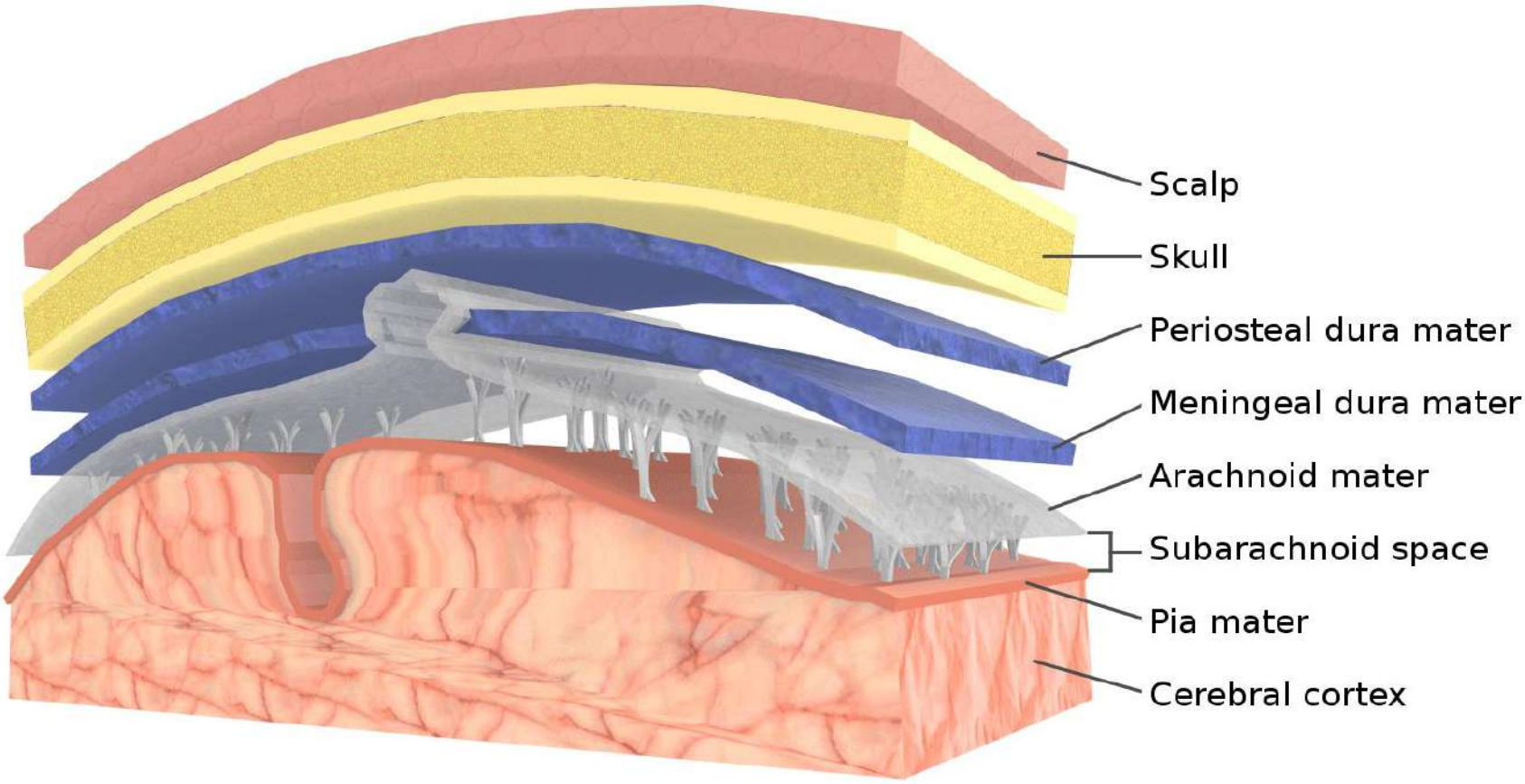
The subarachnoid space includes several cisterns, areas where the space between the pia and arachnoid mater is widened due to an accumulation of CSF, that function as reservoirs.

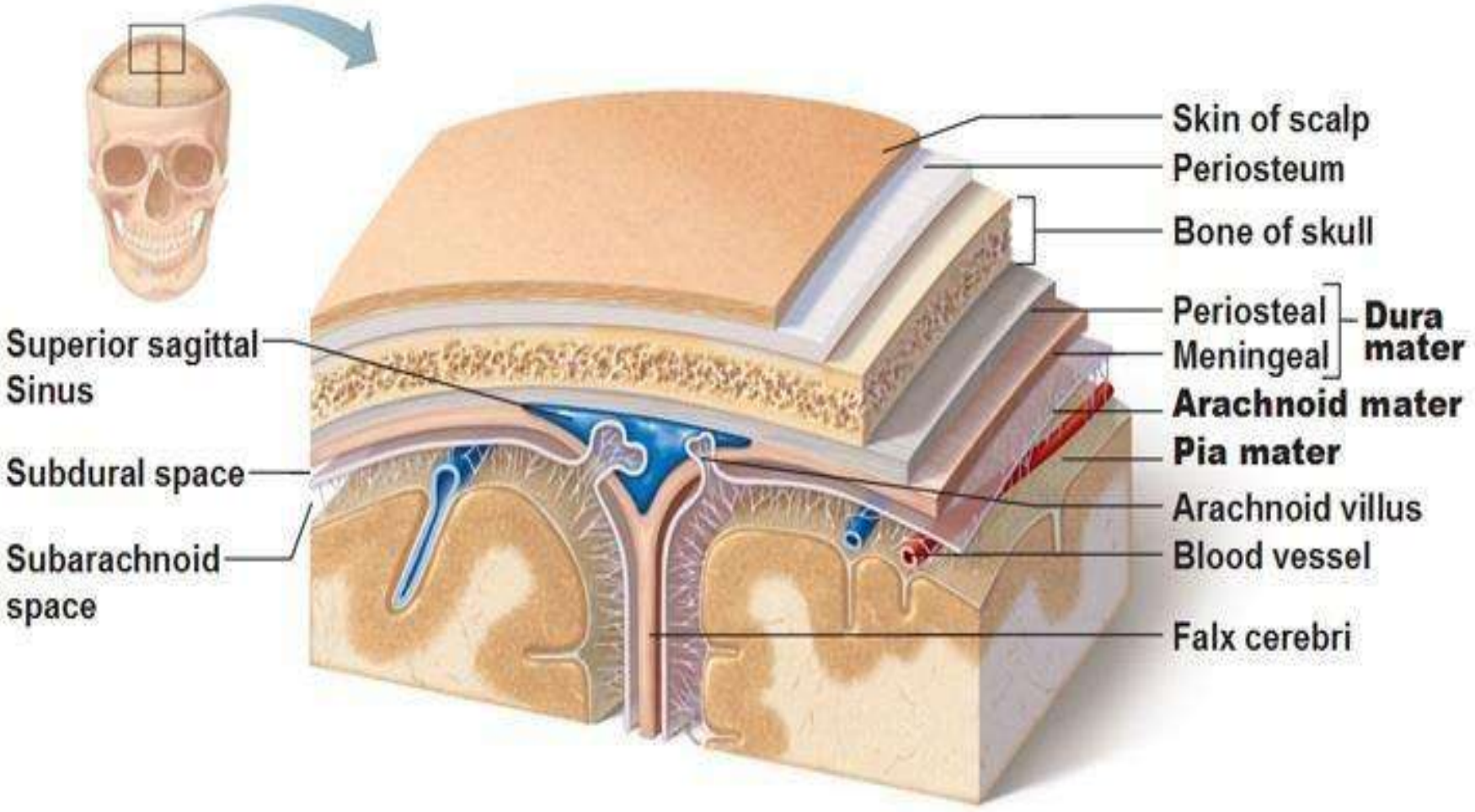
Pressure from the cerebrospinal fluid presses the arachnoid mater against the dura mater. The pia mater adheres to the surface of the brain.

* The dura mater is the most superficial layer of the meninges and contains folds and sinuses.

* The dura mater contacts the endosteum that lines bones of the cranial cavity.

* The dura mater is a strong fibrous membrane that surrounds the brain and is continuous with the dura that covers the spinal cord.

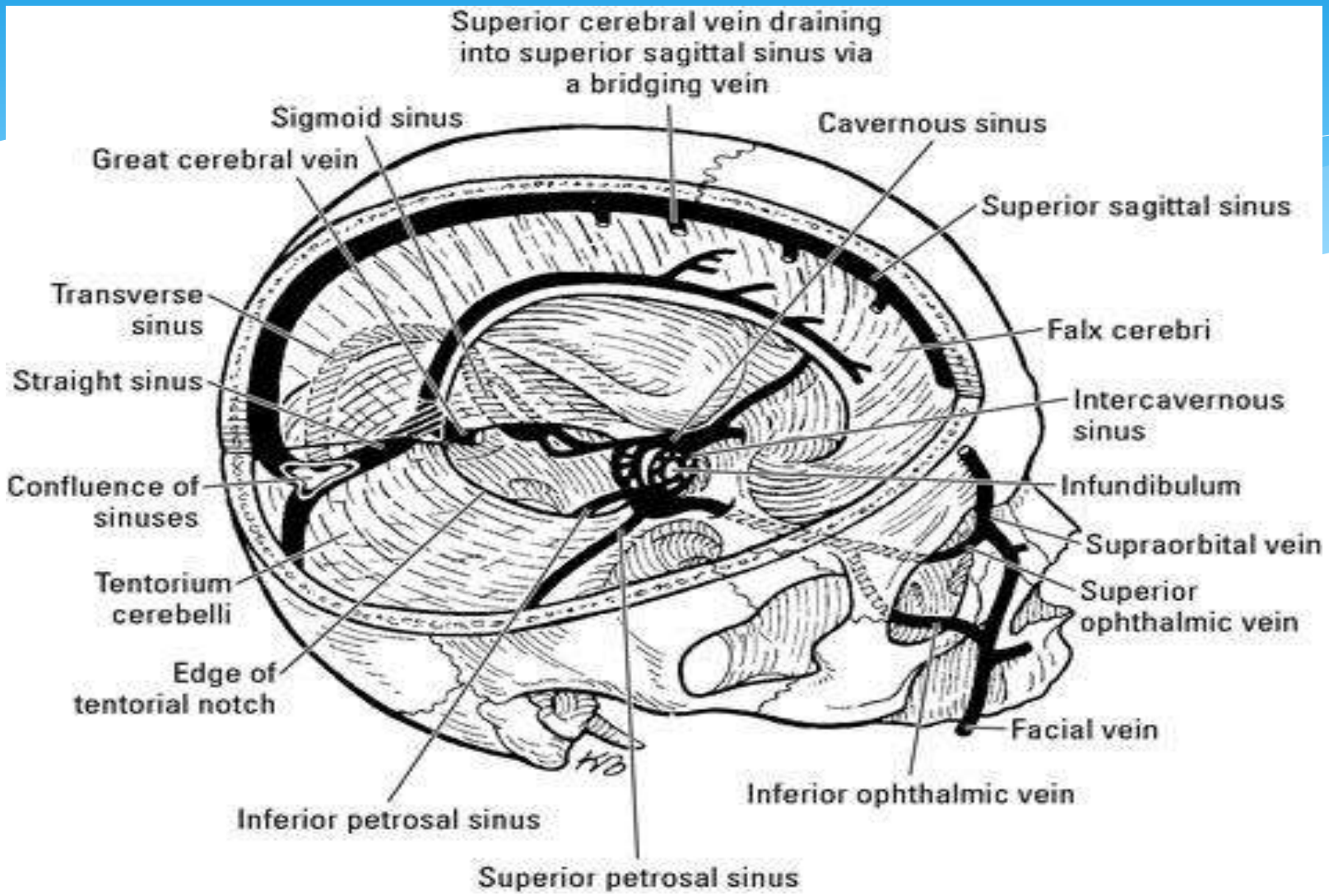

Scalp
Skull
Periosteal dura mater
Meningeal dura mater
Arachnoid mater
Subarachnoid space
Pia mater
Cerebral cortex


Skin of scalp
Periosteum
Bone of skull
Periosteal
Meningeal
Dura mater
Arachnoid mater
Pia mater
Arachnoid villus
Blood vessel
Falx cerebri
Superior sagittal Sinus
Subdural space
Subarachnoid space

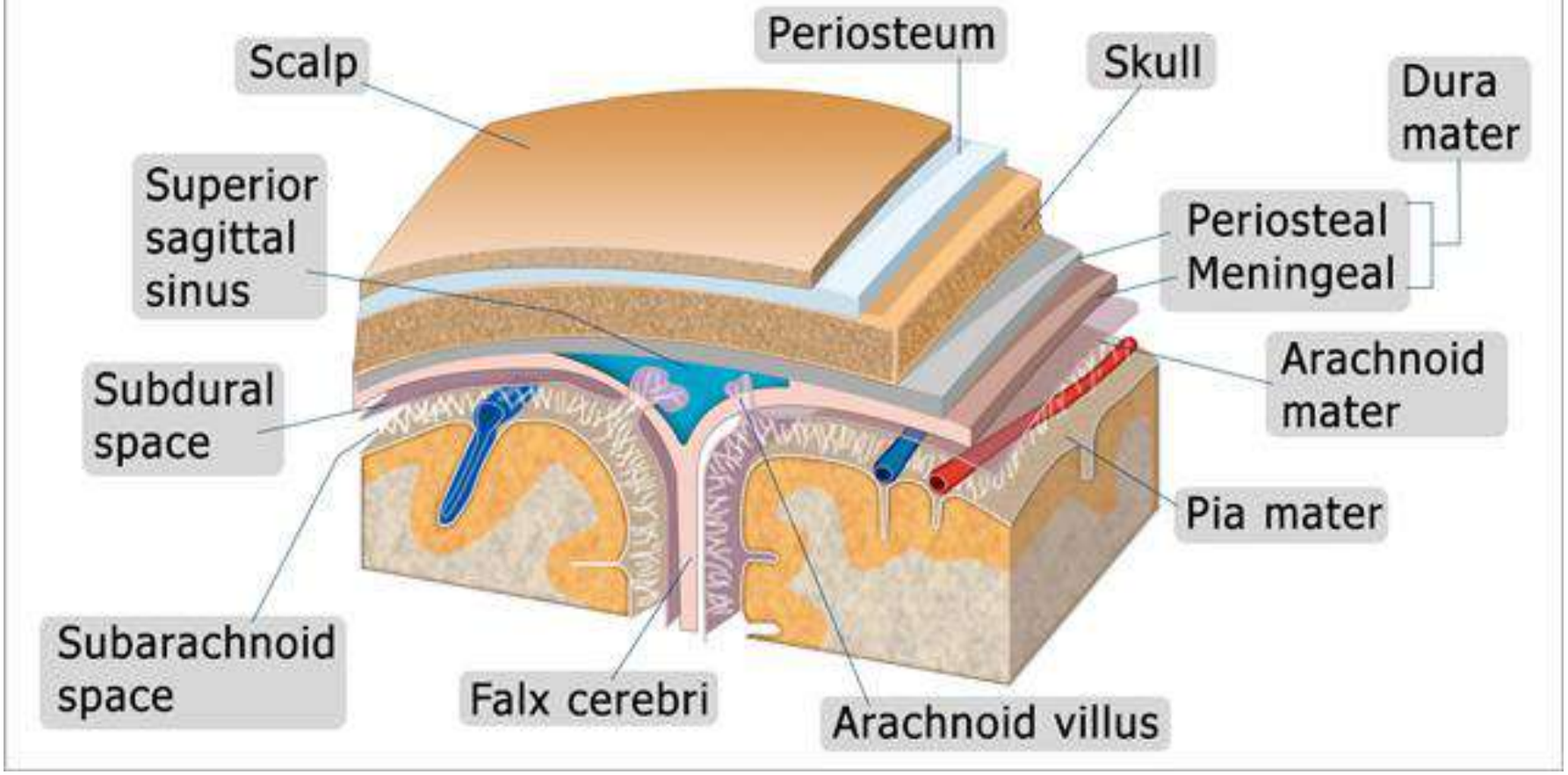
* Meningitis is an infection of the meninges caused by viruses or bacteria. Generally, the bacterial forms are much more serious. Patients with meningitis usually are sensitive to light and have a fever, severe headache, stiff neck, mental disturbances, nausea, and vomiting. Meningitis can be diagnosed by blood tests and by performing a lumbar puncture, in which cerebrospinal fluid is collected and analyzed for cell counts, glucose, and protein. Treatment requires antibiotics and may require hospitalization.

THE DURAL INFOLDINGS

* The meningeal layer folds up to form dural infoldings that divide the cranial cavity into different compartments:


Superior cerebral vein draining into superior sagittal sinus via a bridging vein
Sigmoid sinus
Great cerebral vein
Cavernous sinus
Superior sagittal sinus
Transverse sinus
Falx cerebri
Straight sinus
Intercavernous sinus
Confluence of sinuses
Infundibulum
Supraorbital vein
Tentorium cerebelli
Superior ophthalmic vein
Edge of tentorial notch
Facial vein
Inferior ophthalmic vein
Inferior petrosal sinus
Superior petrosal sinus

Dura Mater


Scalp
Periosteum
Skull
Dura mater
Superior sagittal sinus
Periosteal
Meningeal
Subdural space
Arachnoid mater
Pia mater
Subarachnoid space
Falx cerebri
Arachnoid villus

The Cranial Meninges

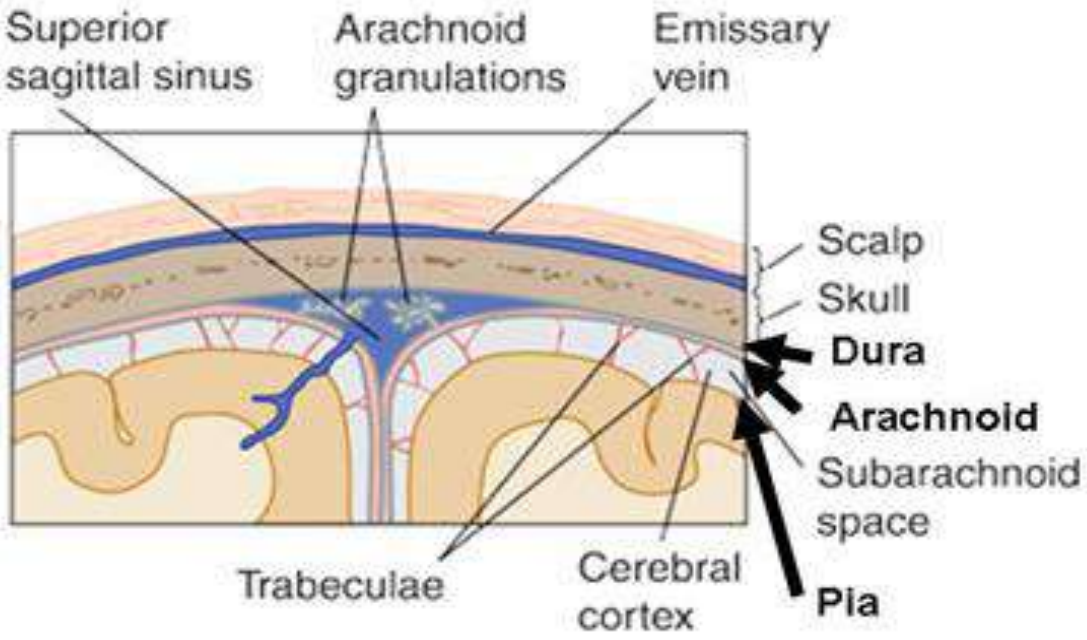


Figure 11-5. Schematic illustration of a coronal section of the brain. Enlargement of the top. In: Waxman SG. *Clinical Neuroanatomy*, 26th ed. http://www.accessphysiotherapy.com. Accessed October 20, 2009.

The Cranial Meninges (*Cont.*)

- The meningis form three spaces
  - Epidural space
  - Subarachnoid space
  - Subdural space

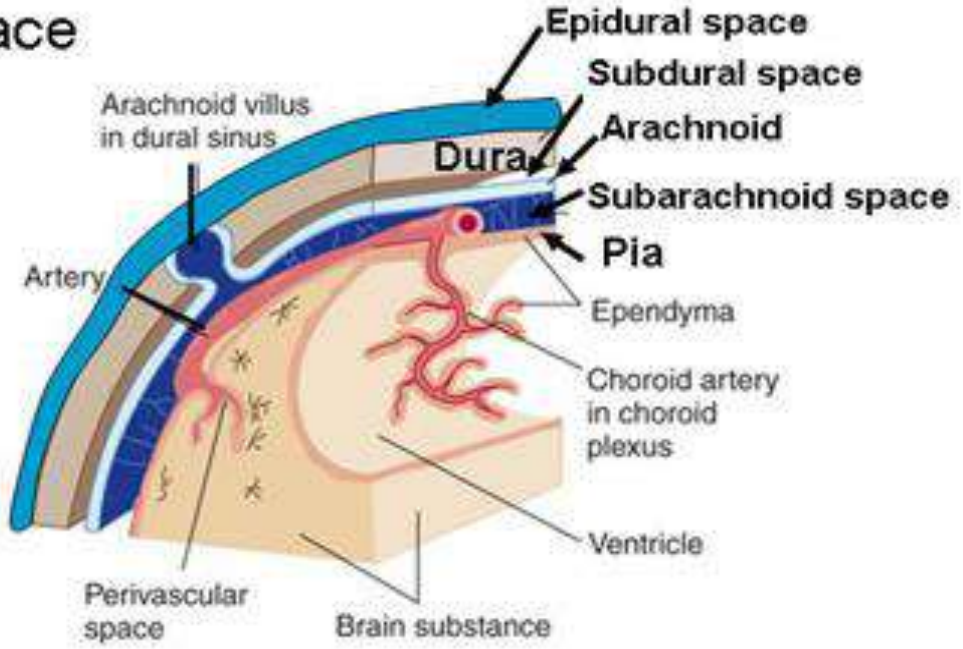


Figure 11-15. Schematic illustration of a coronal section of the brain. Enlargement of the top. In: Waxman SG. *Clinical Neuroanatomy*, 26th ed. http://www.accessphysiotherapy.com. Accessed October 20, 2009.

Arachnoid Granulations

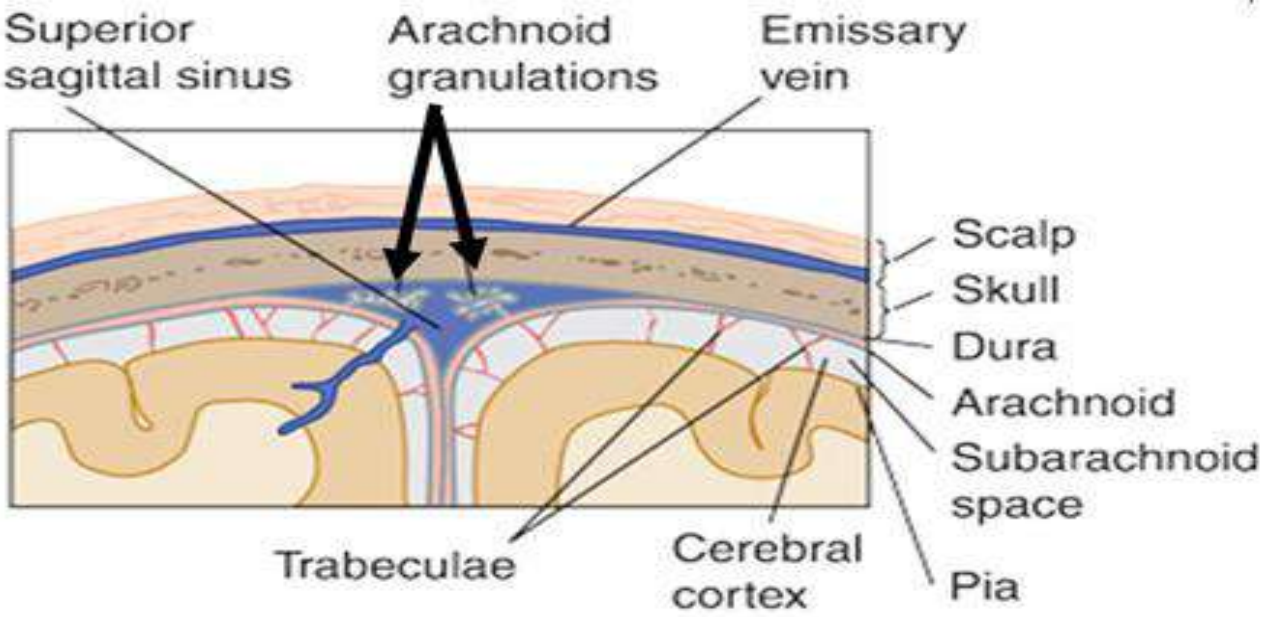


Figure 11-5. Schematic illustration of a coronal section of the brain. Enlargement of the top. In: Waxman SG. *Clinical Neuroanatomy*, 26th ed. http://www.accessphysiotherapy.com. Accessed October 20, 2009.

The Functions and Structure of Dura Mater

Dura mater comprises two layers, which are called periosteal (endosteal) layer and the meningeal layer.

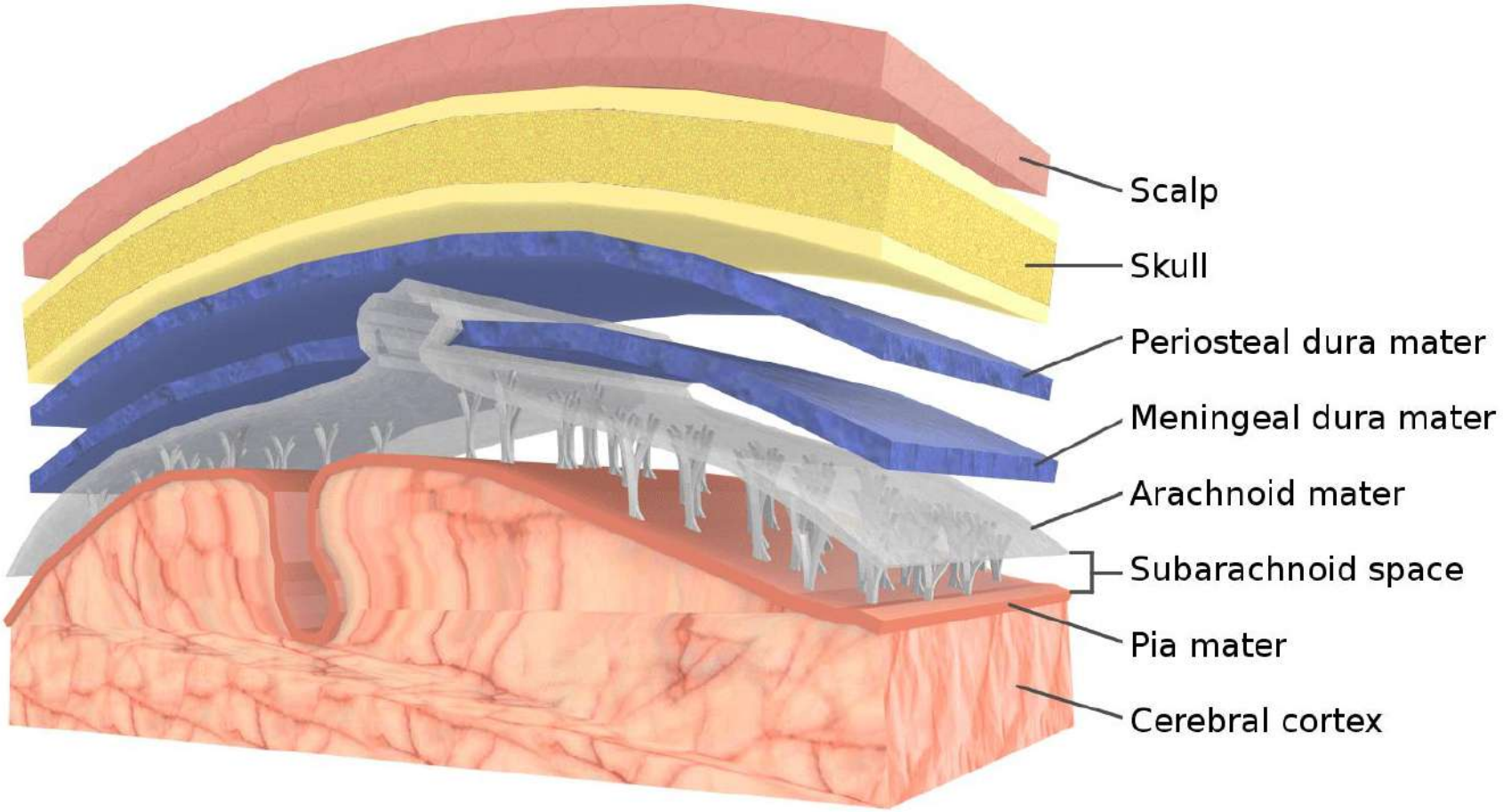
Endosteal layer is the outer, periosteal layer that covers the inner surface of the skull. The periosteal and the inner meningeal layer are joined, with the exception of places where dural venous sinuses or the dural folds are present.

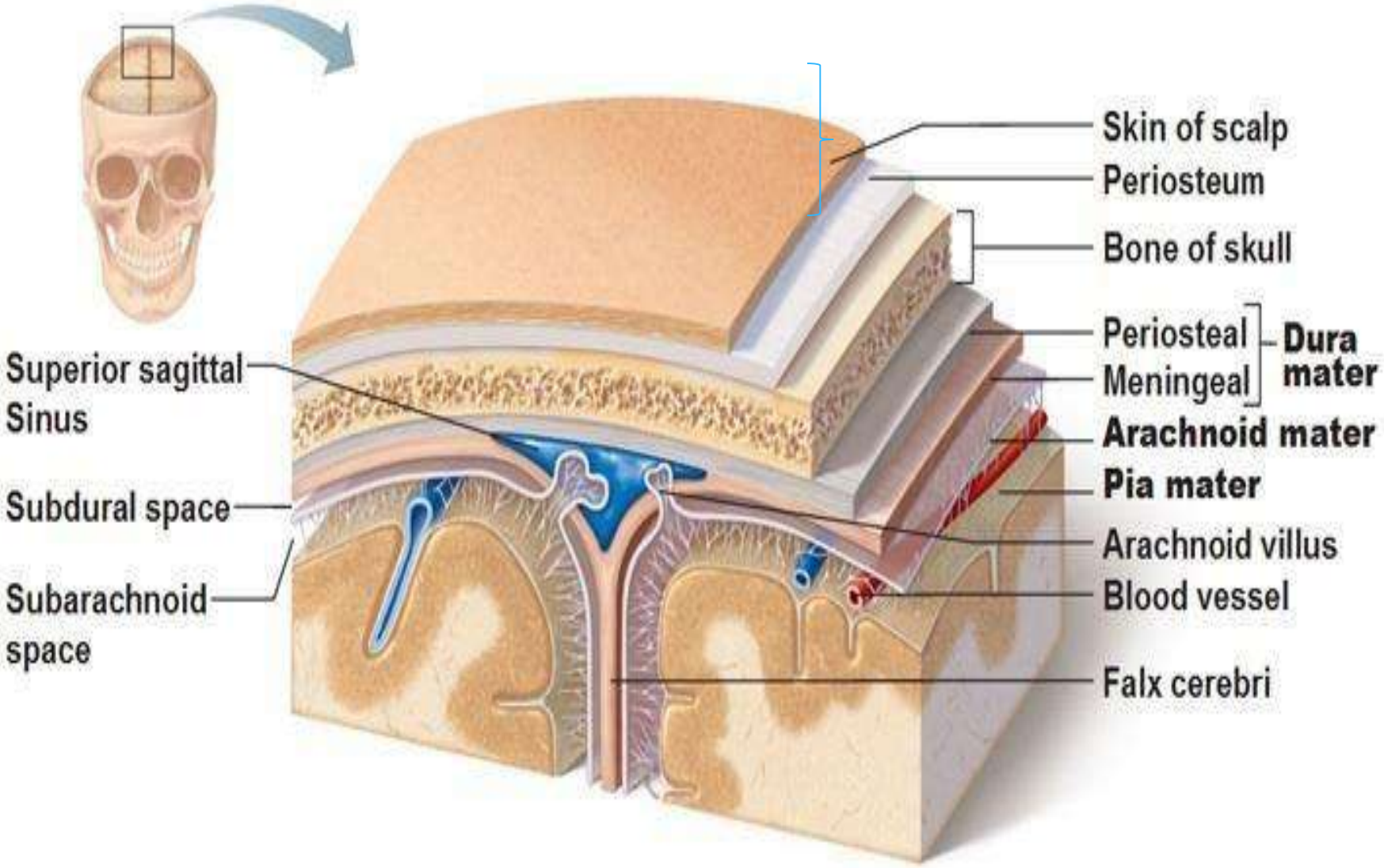
While the meningeal layer is continuous with the dura mater of the spinal cord, the periosteal layer does not extend through the foramen magnum (a large opening in the occipital bone of the skull) to become continuous with the dura mater of the spinal cord. These layers also provide tubular sheaths for the cranial nerves.

cranial cavity

Lect 1

Meninges


Scalp
Skull
Periosteal dura mater
Meningeal dura mater
Arachnoid mater
Subarachnoid space
Pia mater
Cerebral cortex


Skin of scalp
Periosteum
Bone of skull
Periosteal
Meningeal
Dura mater
Arachnoid mater
Pia mater
Arachnoid villus
Blood vessel
Falx cerebri
Superior sagittal Sinus
Subdural space
Subarachnoid space

The brain and spinal cord are enclosed in three protective membranes called *meninges*.

From without inwards these are:

(a) dura mater, (b) arachnoid mater, and (c) pia mater.

The dura mater is mesodermal in origin while arachnoid and pia mater are ectodermal in origin (derived from neural crests).

* **The dura mater is the thick outermost covering of the brain and spinal cord. The part enclosing the brain is called *cranial/cerebral dura*, and the part around the spinal cord, *the spinal dura*.**

* **It is very tough opaque inelastic membrane of fibrous tissue (Gk. *dura* = tough, *mater* = mother). It is also called *pachymeninx* (pachy = thick).**

* **The arachnoid mater (Gk. *arachnoid* = cobweb like, *mater* = mother) is a delicate avascular membrane deep to dura mater. Many thread-like trabeculae extend from it to the pia mater.**

* **The pia mater (Gk. *pia* = tender, *mater* = mother) is a thin transparent vascular membrane closely adherent to the surface of the brain and spinal cord.**

* **The arachnoid mater and pia mater together are termed *leptomeninges* (Gk. *lepto* = thin).**

* **The intracranial arrangement of these membranes differs from that in the vertebral canal and are therefore described separately.**

* **The spinal meninges are described later**

intracranial Meninges

Dura mater

* The dura mater in the cranium (cranial dura) consists of two layers:

* an outer *endosteal layer* and an inner *meningeal layer*.

*

These two layers are firmly adherent to each other everywhere except,

(a) where they split to enclose the venous sinuses, and

(b) where the inner layer is folded to form the dural septa.

* **The endosteal layer is attached to the inner surfaces of the cranial bones and is continuous through the sutural ligaments, and around the margins of the foramina with the periosteum on the external surface of the cranium.**

Clinical Correlation

The cranial dura is more firmly adherent to the base of skull than on the vault, hence, usually torn in fractures of the skull base. It also forms the part of the wall of the basal venous sinuses, hence **the fractures of skull base are often associated with bleeding from ear, nose, or into the pharynx**. Cerebral dura is usually stripped off from the cranial vault, when an extradural haematoma is formed between the bone and dura.

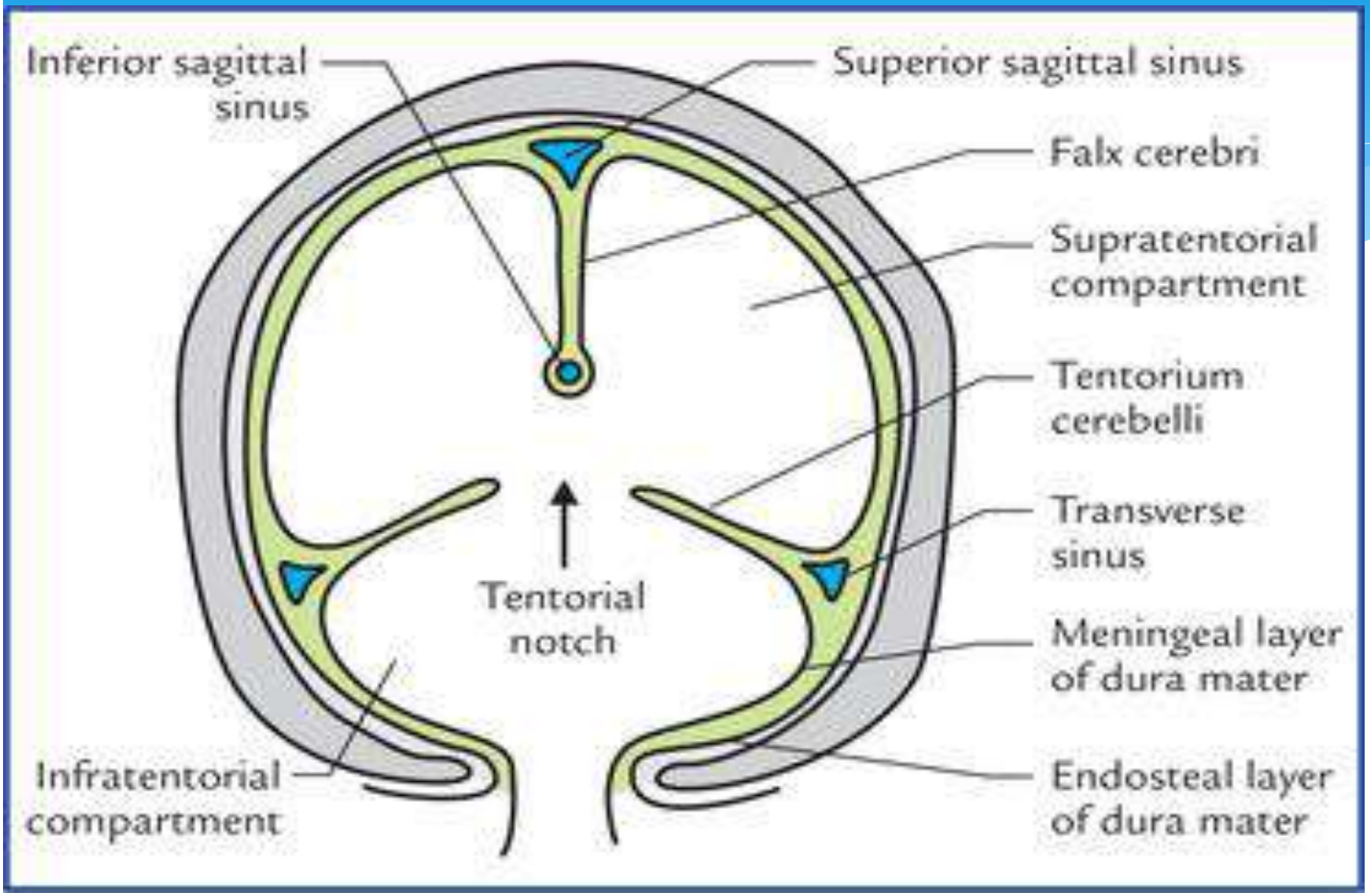
The meningeal layer is a strong fibrous membrane and becomes continuous with the spinal dura at the foramen magnum.

It ensheathes the cranial nerves in their osseous foramina and fuses externally with epineurium; the sheaths of the optic nerves fuse with the ocular sclera.

Dural septa or folds

The meningeal layer gets reduplicated (infolded) along certain lines and forms septa or folds between the parts of the brain.

* Schematic coronal section of skull showing division of cranial cavity into three compartments by falx cerebri and tentorium cerebelli. Each half of the supratentorial compartment contains the cerebral hemisphere, whereas the infratentorial compartment contains the cerebellum and brainstem


Inferior sagittal sinus
Superior sagittal sinus
Falx cerebri
Supratentorial compartment
Tentorium cerebelli
Transverse sinus
Tentorial notch
Meningeal layer of dura mater
Infratentorial compartment
Endosteal layer of dura mater

The four important dural septa are:

1. Falx cerebri *
2. Falx cerebelli *
3. Tentorium cerebelli *
4. Diaphragma sellae. *

Functions of dural septa

1. Dural septa divide the cranial cavity into compartments to separate the different parts of the brain and thus restrict their movements within the cranial cavity

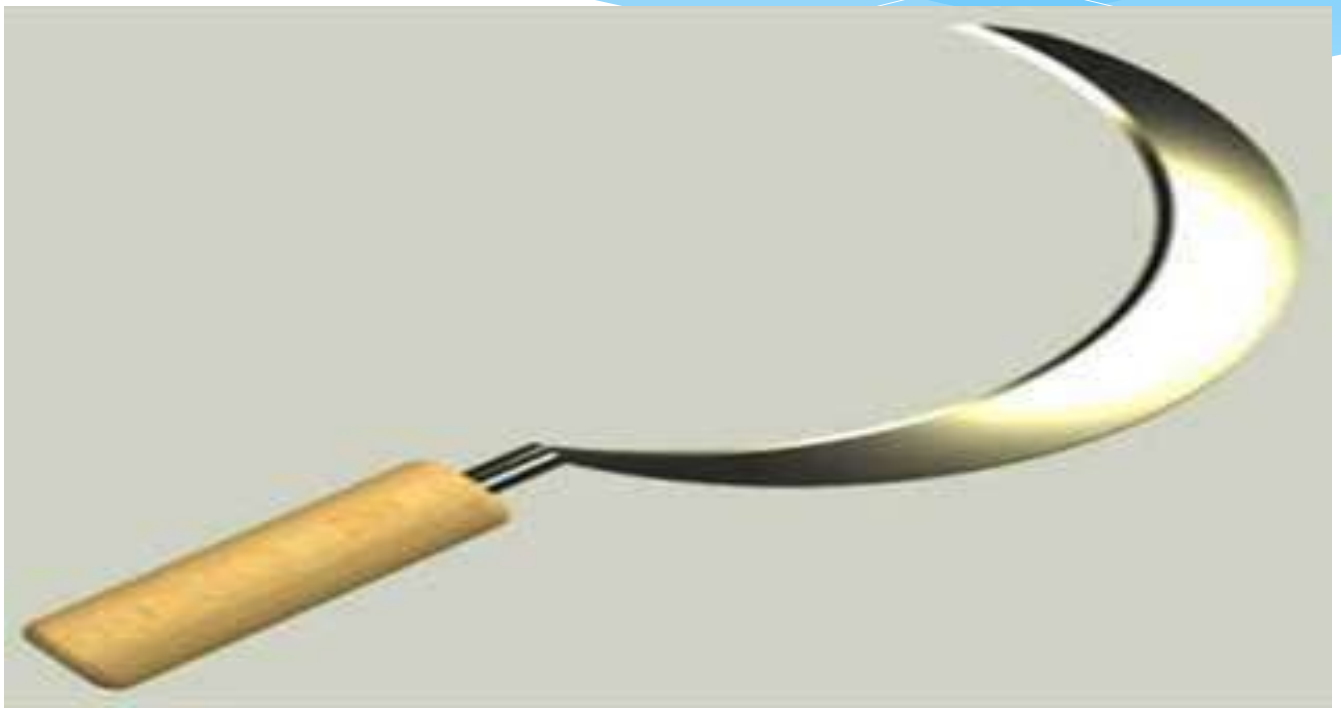
2. They enclose intracranial dural venous sinuses.

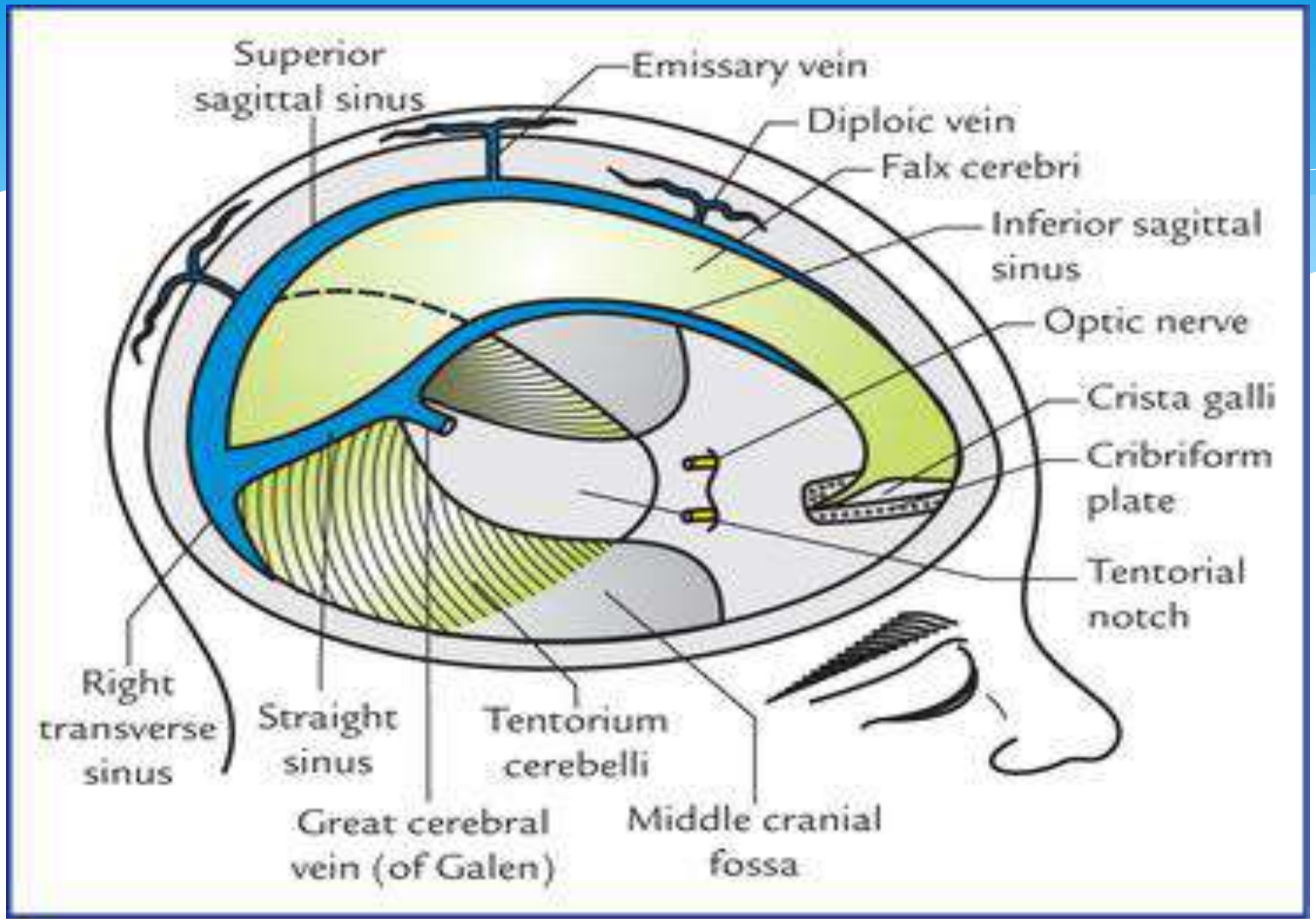
Falx Cerebri

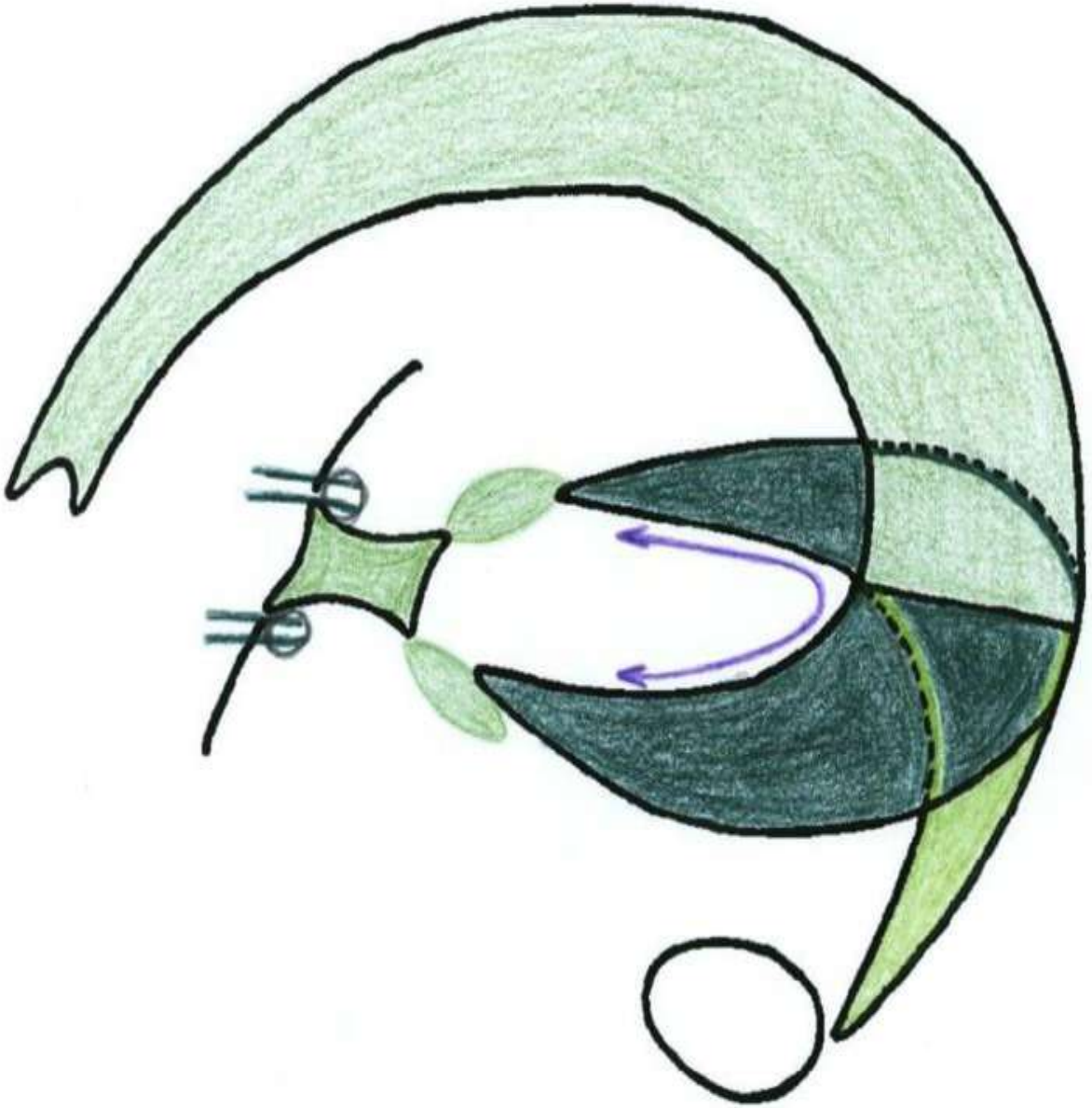
* Falx cerebri is a large sickle-shaped vertical fold of dura mater which dips into the longitudinal fissure, between the two cerebral hemispheres.

* Its narrow anterior end is attached to the crista galli and its broad posterior end to the upper surface of the tentorium cerebelli.

* Its convex upper border is attached to the vault of skull along the sagittal suture and its lower border is free and concave downwards.

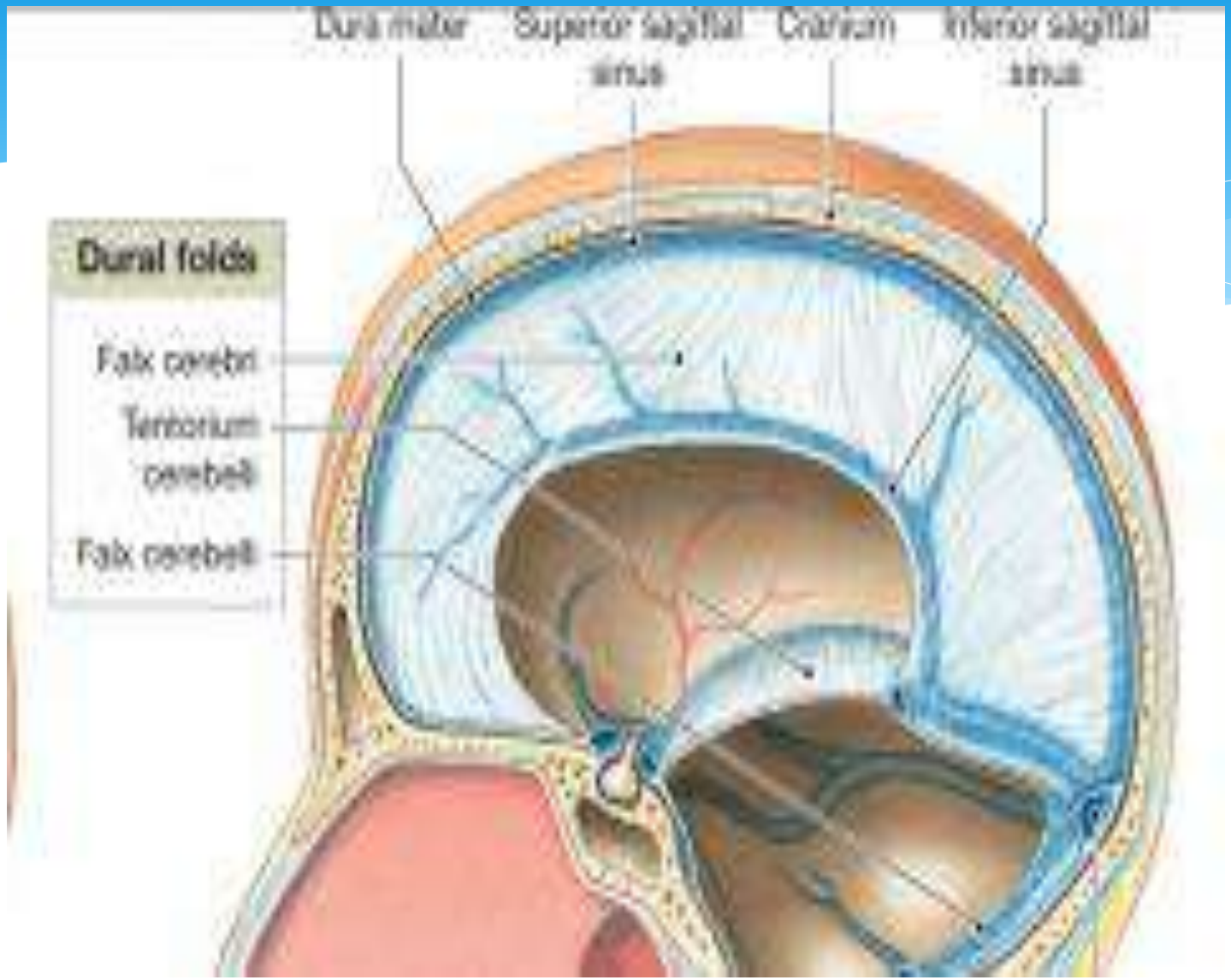



Superior sagittal sinus
Emissary vein
Diploic vein
Falx cerebri
Inferior sagittal sinus
Optic nerve
Crista galli
Cribriform plate
Tentorial notch
Right transverse sinus
Straight sinus
Great cerebral vein (of Galen)
Tentorium cerebelli
Middle cranial fossa



The falx cerebri encloses three dural venous sinuses, *viz*.

- ***Superior sagittal sinus,*** **along its upper attached border.** *
- ***Inferior sagittal sinus,*** **along its lower free border.** *
- ***Straight sinus,*** **along its line of attachment with the tentorium cerebelli.** *


Dural folds
Falx cerebri
Tentorium cerebelli
Falx cerebelli

Tentorium cerebelli

Tentorium cerebelli is tent-like semilunar fold of dura mater which forms the sloping roof of the posterior cranial fossa, between the cerebellum below and the occipital lobes of cerebral hemispheres above.

It prevents the cerebellum from being compressed by the heavy cerebrum.

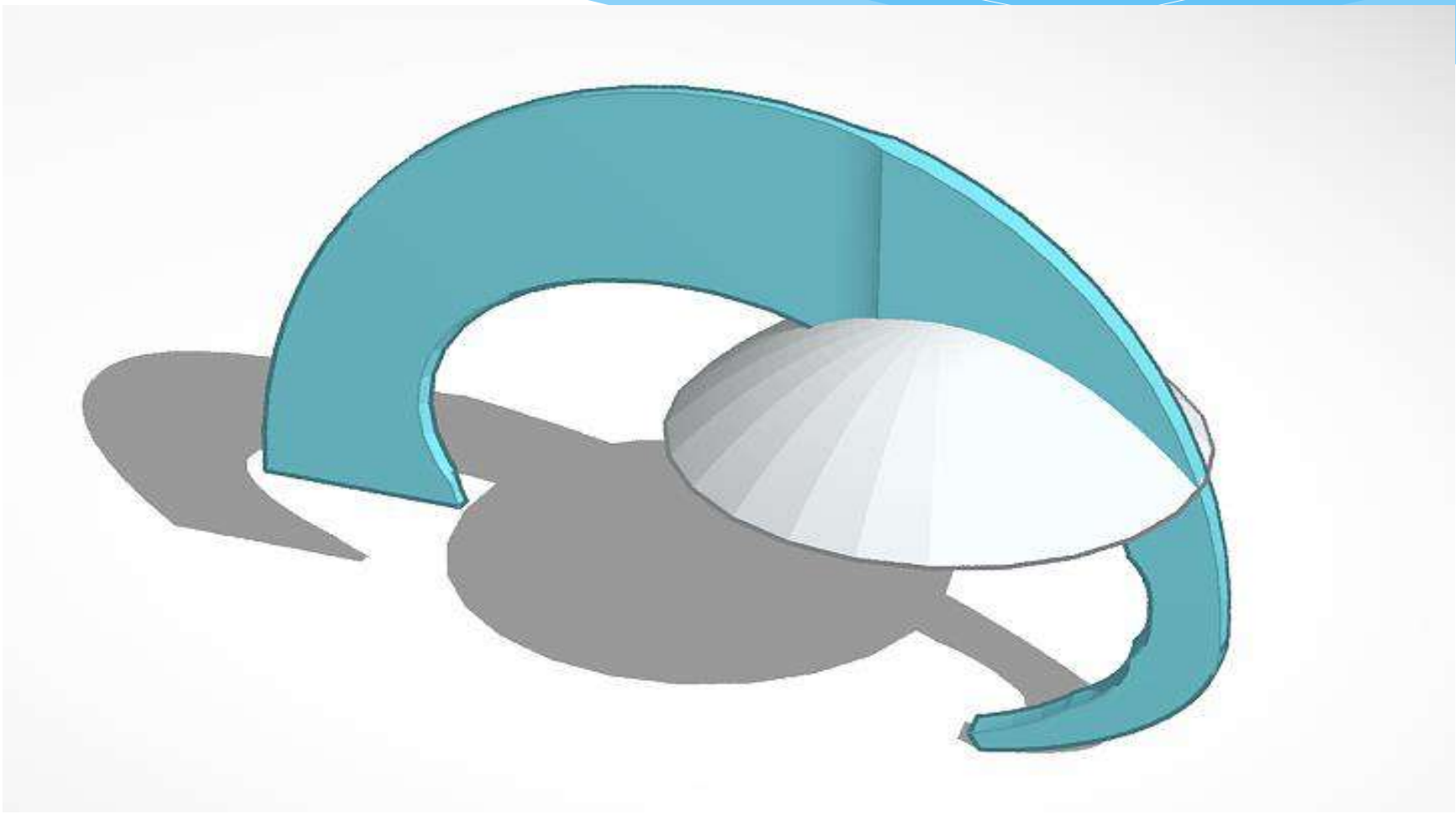
It has two borders: *

(a) an outer convex attached border, and *

(b) an inner concave free border. *

The inner border bounds an oval space, the tentorial * notch or the *door of tentorium* through which passes the midbrain to connect the hindbrain with the forebrain

3D design Tentorium Cerebelli and Fa



On each side, the anterior half of the outer border is attached anterolaterally to the superior border of the petrous temporal bone and posterior clinoid process,

and posterior half is attached posterolaterally to the lips of the transverse sulcus.

The inner free border is 'U'-shaped and its anterior ends are attached to the anterior clinoid processes.

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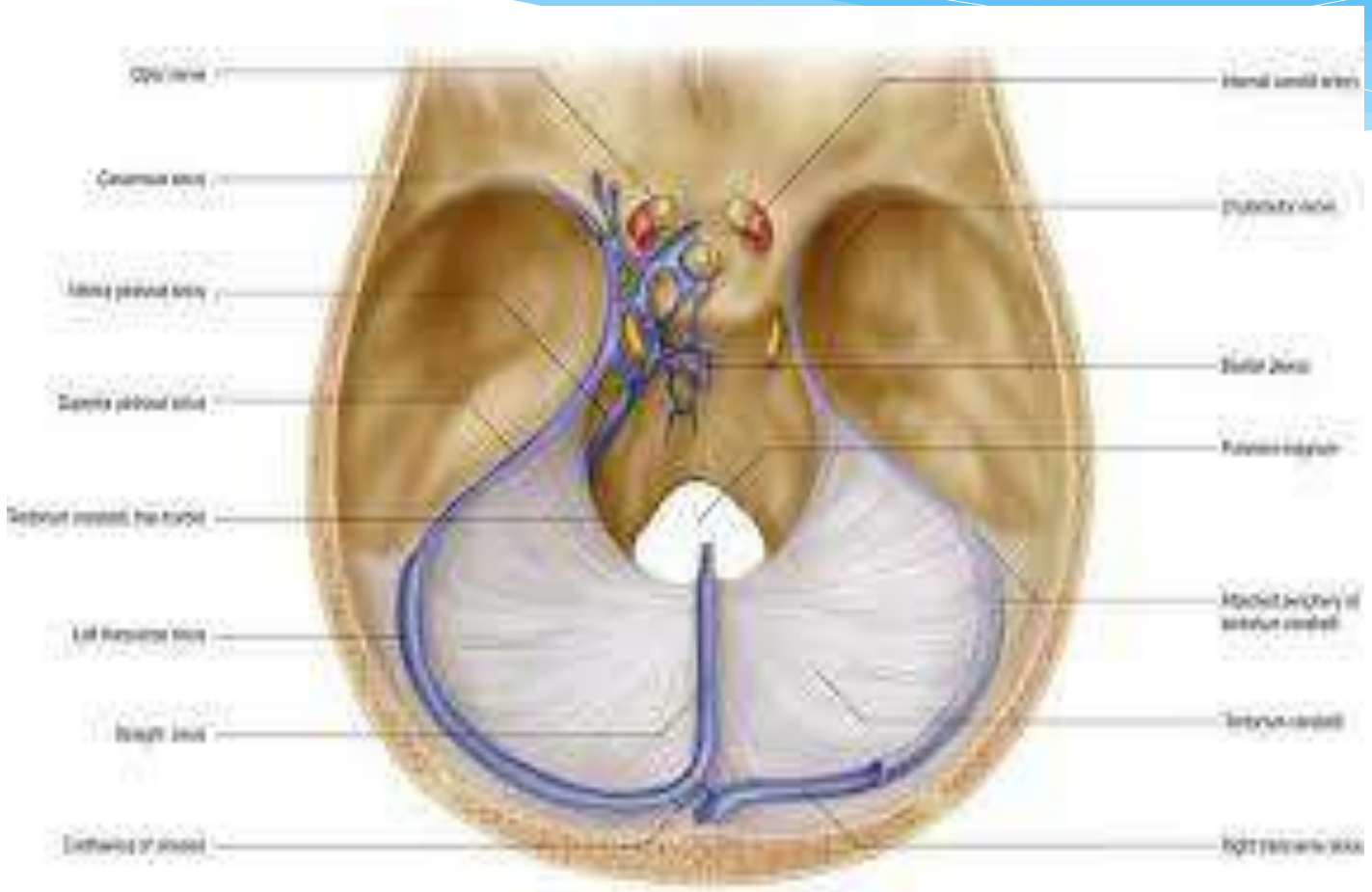
Tentorium cerebelli contains four dural venous sinuses, two on either side:

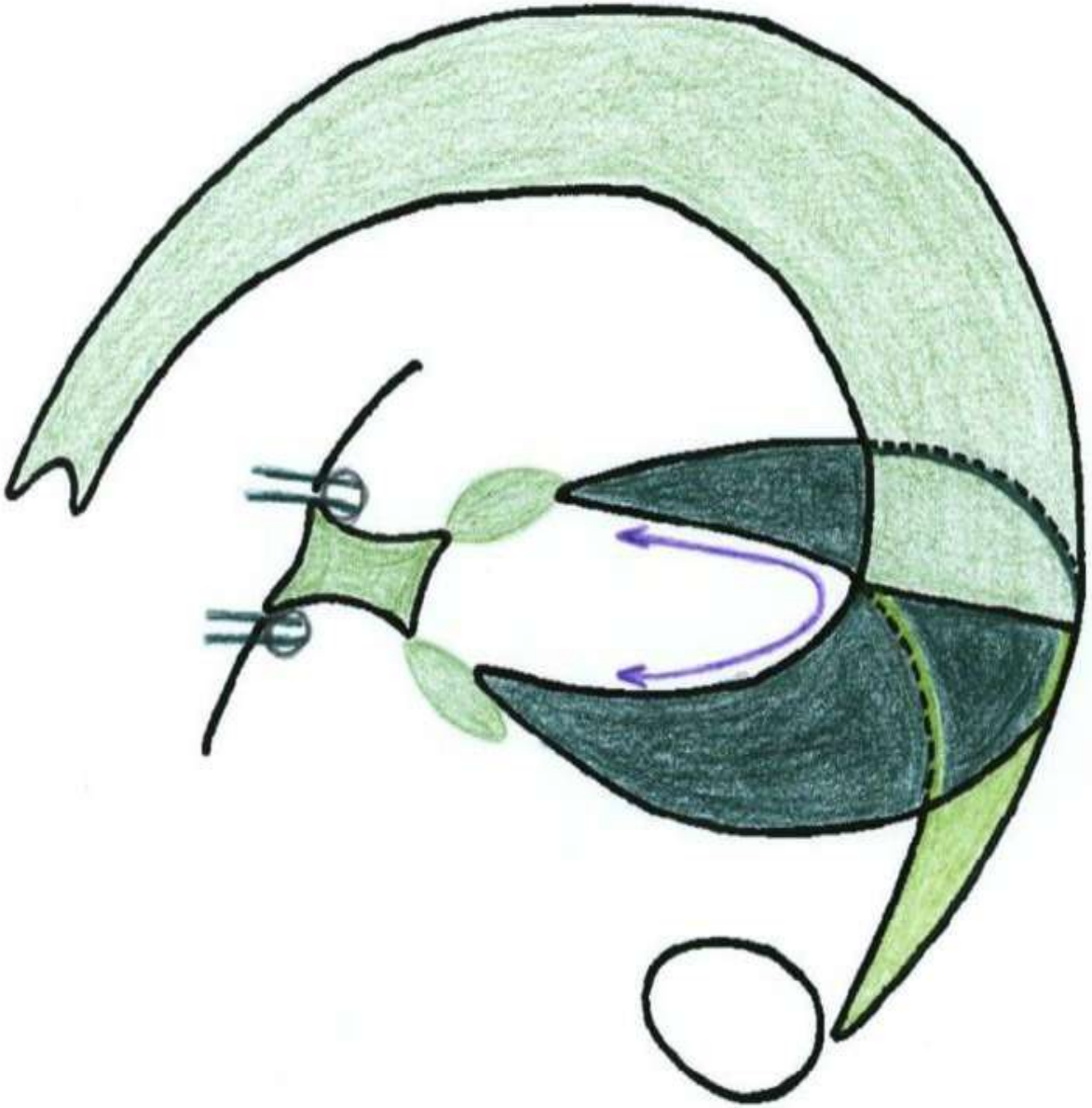
- Superior petrosal sinus, along the anterior half of its attached border.
- Transverse sinus, along the posterior half of its attached border



Falx cerebelli

Falx cerebelli is a small sickle-shaped fold of dura mater which intervenes between the two cerebellar hemispheres posteriorly.

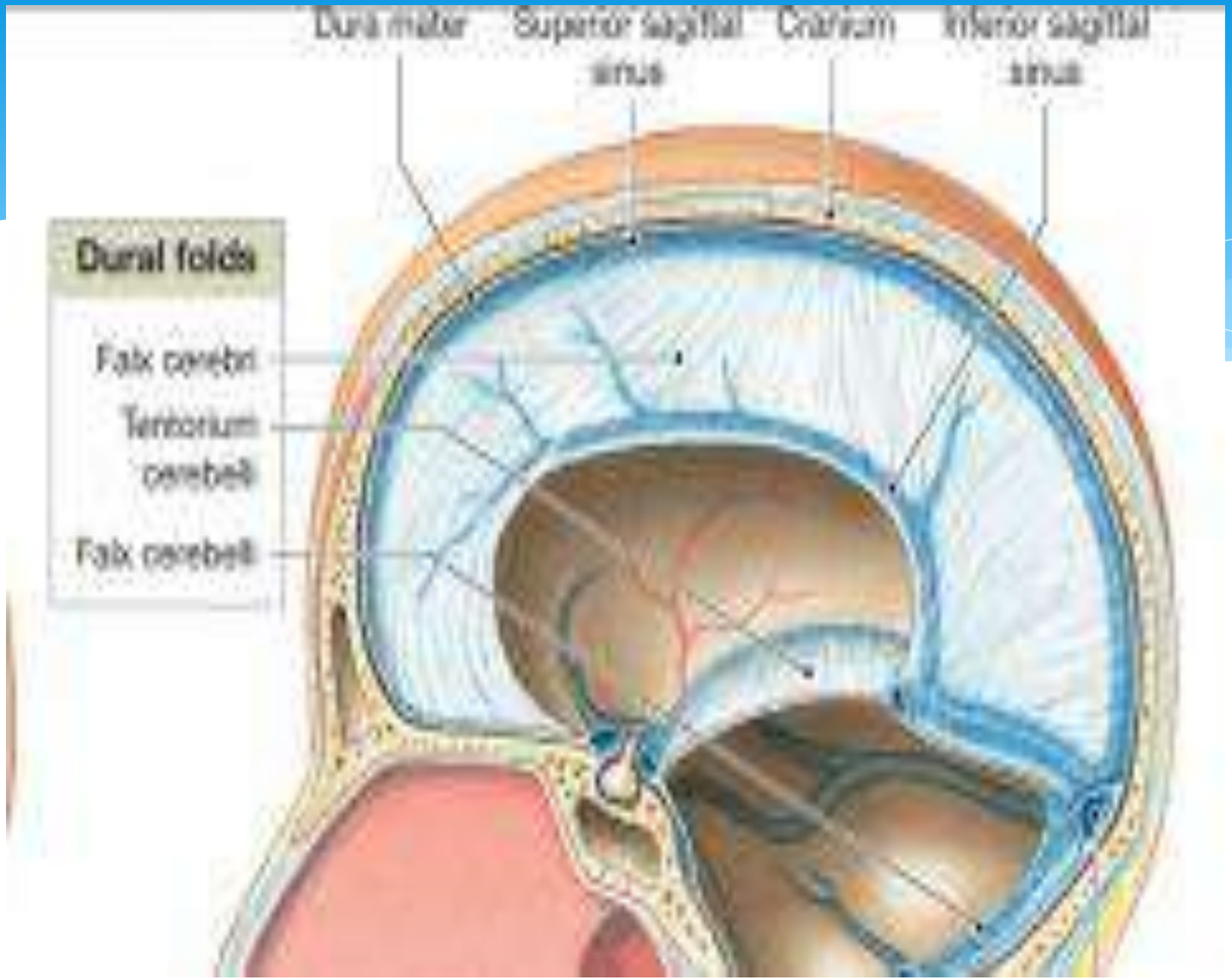
It is attached to the internal occipital crest by its outer border, and encloses the occipital venous sinus.

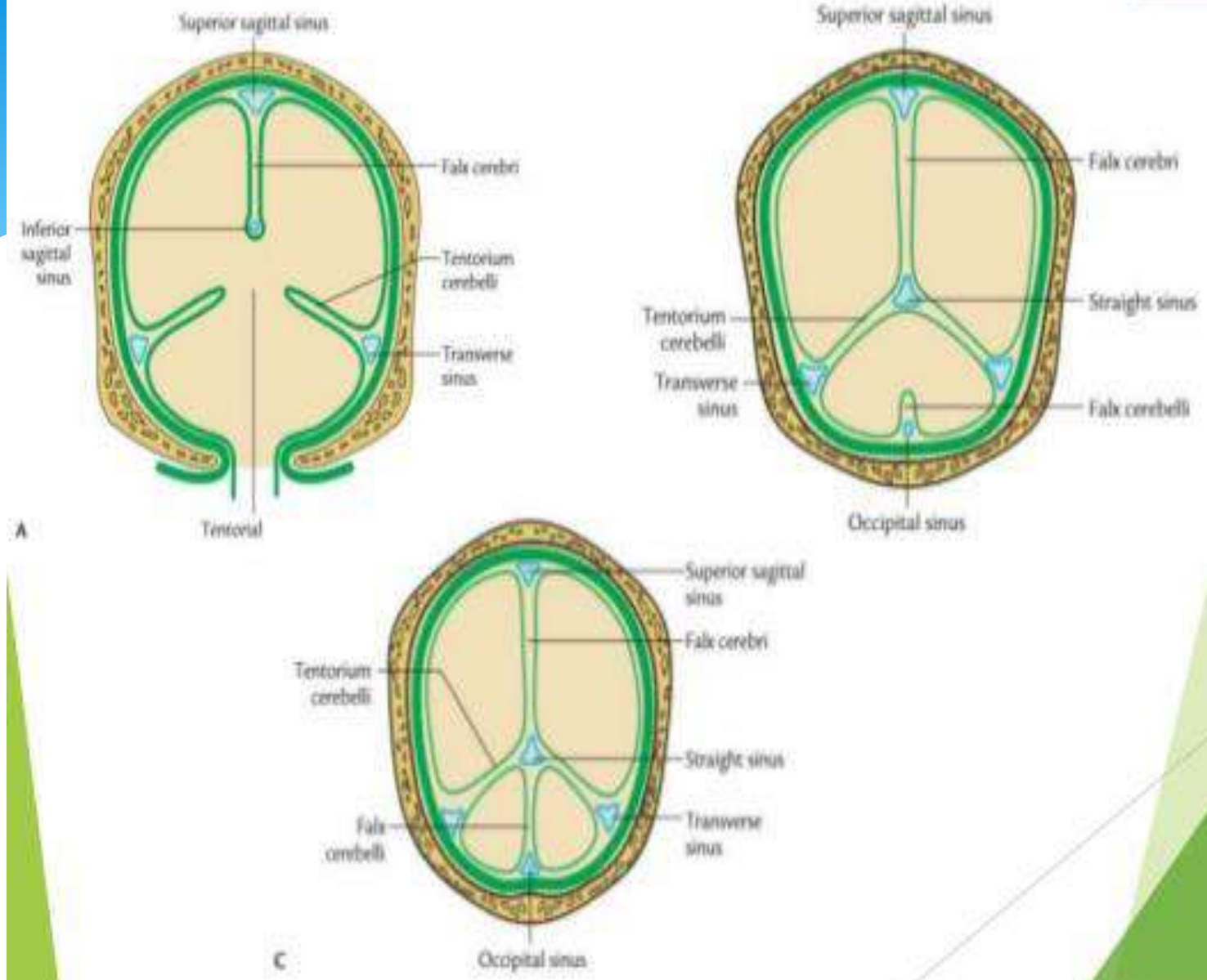


Diaphragma sellae (or tentorium hypophysii)

* Diaphragma sellae is a small circular fold of dura mater which roofs the pituitary fossa/sella turcica.

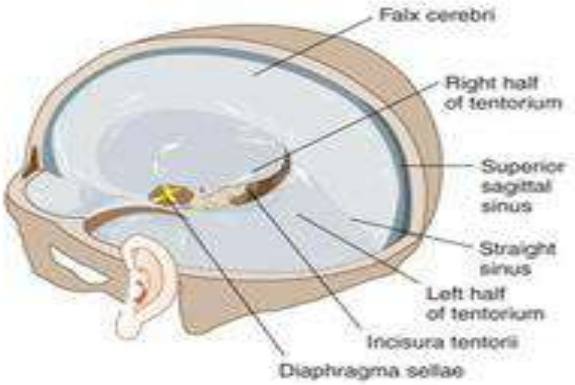
* It has an aperture in its centre to provide passage for the stalk of the pituitary gland.


Dural folds
Falx cerebri
Tentorium cerebelli
Falx cerebelli


Superior sagittal sinus
Falx cerebri
Inferior sagittal sinus
Tentorium cerebelli
Transverse sinus
Tentorial
A
Superior sagittal sinus
Falx cerebri
Straight sinus
Tentorium cerebelli
Transverse sinus
Falx cerebelli
Occipital sinus
Superior sagittal sinus
Falx cerebri
Tentorium cerebelli
Straight sinus
Falx cerebelli
Transverse sinus
Occipital sinus
C

The Cranial Meninges (*Cont.*)

- Dural Folds
  - Falx cerebri
  - Tentorium cerebelli
  - Falx cerebelli



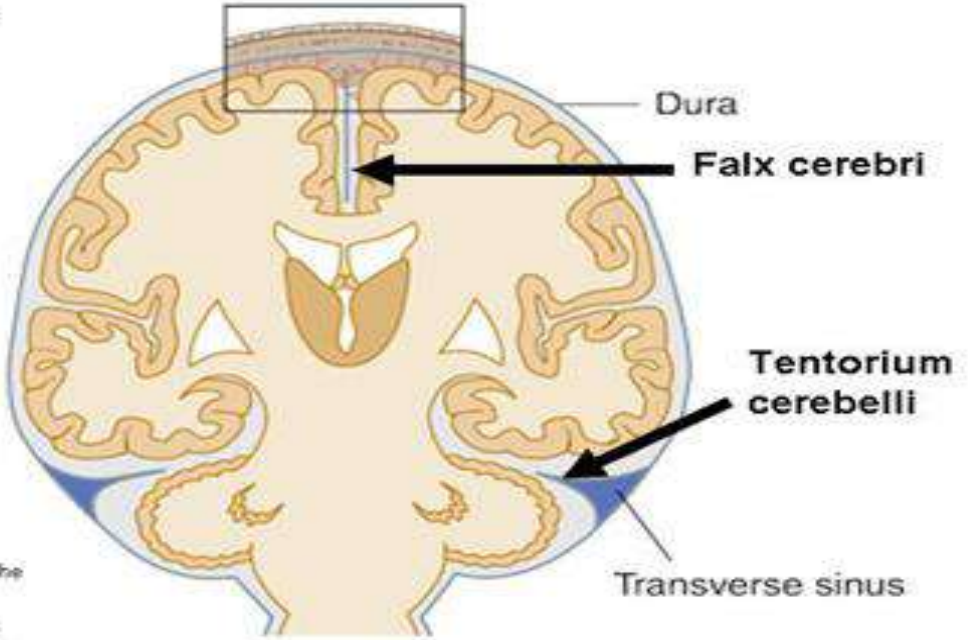


Figure 11-5 & 6. (5) Schematic illustration of a coronal section of the brain. Enlargement of the top. (6) Schematic illustration of dural folds. In: Waxman SG. *Clinical Neuroanatomy*, 26th ed. http://www.accessphysiotherapy.com. Accessed October 20, 2009.

Arterial supply of dura mater

The dura is supplied by numerous branches of the internal carotid, ascending pharyngeal, maxillary, occipital and vertebral arteries.

N.B. Middle meningeal artery is the largest of the meningeal arteries and from clinical point of view is the most important for it is often damaged in head injuries.

Clinical Correlation
middle meningeal artery

The *middle meningeal artery*, a branch of **maxillary artery** enters the cranial cavity through the **foramen spinosum** to lie between the endosteal and meningeal layers of dura mater.

Its **anterior** and **posterior** branches, along with accompanying meningeal veins (between the arteries and bone) stand out prominently as if in relief on the external surface of the dura mater to **groove and supply bones** of the cranial vault.

The **anterior (frontal)** branch crosses the *pterion*, on its inner aspect and the **posterior (parietal)** branch ascends backwards towards the lambda. A fracture of thin **squamous temporal bone** may cause a *middle meningeal haemorrhage* from the artery or vein, producing an extradural haematoma.

Nerve supply of dura mater

The nerve supply of dura mater is derived mainly from three sources:

1. Three divisions of trigeminal nerve
2. First three cervical spinal nerves
3. Cervical sympathetic trunk.

The **supratentorial dura** is supplied by the meningeal branches from the three divisions of the trigeminal nerve:

1. In the anterior cranial fossa by meningeal branches of the anterior and posterior ethmoidal nerves.

2. In the middle cranial fossa by meningeal branches of maxillary and mandibular nerves.

- The **infratentorial dura** is supplied by ascending meningeal branches of upper three cervical nerves.

Clinical Correlation

* The stimulation of sensory nerve endings in the dura mater due to stretching causes pain and is the basis of certain forms of headache. Pain arising from supratentorial dura is referred to the forehead while pain arising from infratentorial dura is referred to the back of the neck and occiput. The role of the autonomic supply of the cranial dura mater is uncertain.

* **N.B**. The brain itself, the arachnoid mater, and the pia mater do not have sensory nerve endings. These are restricted only to the dura mater and cerebral vessels.

Dural venous sinuses

* The dural venous sinuses are formed in following two ways: (a) by separation of the two layers of cerebral dura, and (b) by reduplication of the meningeal layer of dura

* The dural venous sinuses are lined by endothelium which becomes continuous with the endothelial lining of the veins.

Characteristic features

- Have no valves, hence the blood can flow in either direction in the sinuses,
- Are devoid of smooth muscle fibres in their walls,
- **Drain finally into the internal jugular veins**,
- Have cerebral, diploic and some meningeal veins as their tributaries,
- Communicate via valveless emissary veins with the extracranial veins through skull foramina.

Classification

The dural venous sinuses are classified into two types, unpaired and paired (Table).

Table 1

Classification of dural venous sinuses

Classification of dural venous sinuses

Classification of dural venous sinuses

Unpaired

- Superior sagittal sinus
- Inferior sagittal sinus
- Straight sinus
- Occipital sinus
- Anterior intercavernous sinus
- Posterior intercavernous sinus

Paired

- Sphenoparietal sinuses
- Cavernous sinuses
- Superior petrosal sinuses
- Inferior petrosal sinuses
- Transverse sinuses
- Sigmoid sinuses

Base of Skull, Internal Aspect

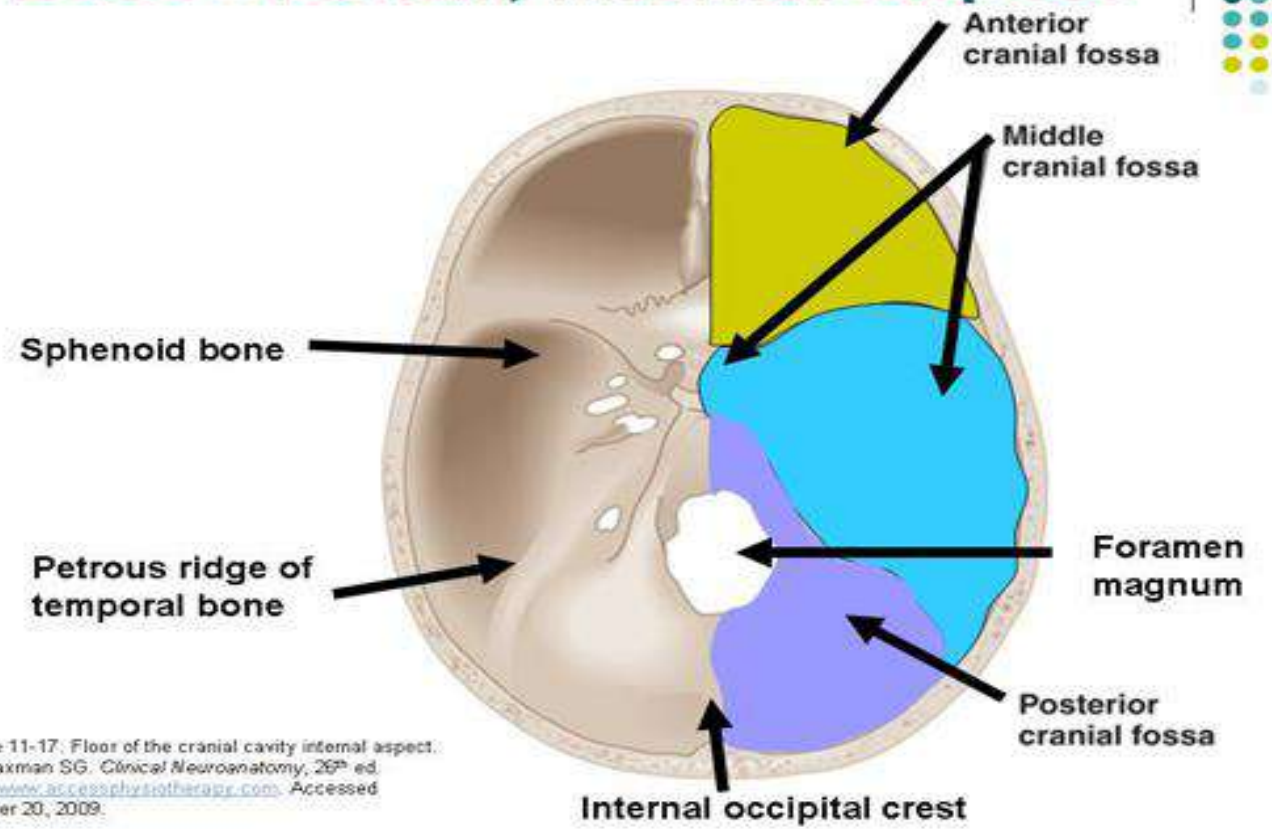


Figure 11-17. Floor of the cranial cavity internal aspect. In: Waxman SG. *Clinical Neuroanatomy*, 26th ed. http://www.accessphysiotherapy.com. Accessed October 20, 2009.

Revision

- **Falx cerebri:** The largest infolding, the falx cerebri is found in the longitudinal cerebral fissure, which divides the two hemispheres of the cerebrum.

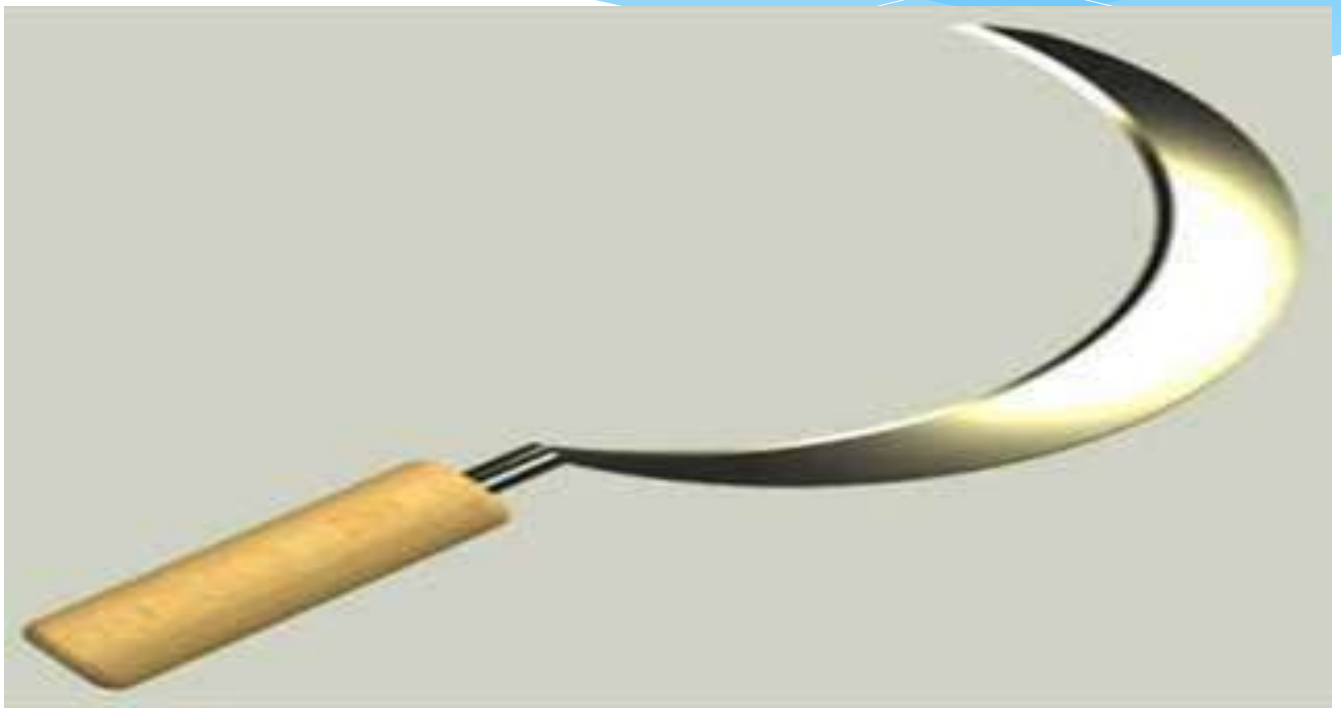
- **Tentorium cerebelli:** This infolding separates the occipital lobes of the cerebrum from the cerebellum. The falx cerebri connects to the tentorium cerebelli at the midline and helps to hold it in place, except for the anterior part, which is left free, making a gap called the tentorial notch.

- **Falx cerebelli:** This vertical infolding is below the tentorium cerebelli. It helps to separate the cerebellar hemispheres.

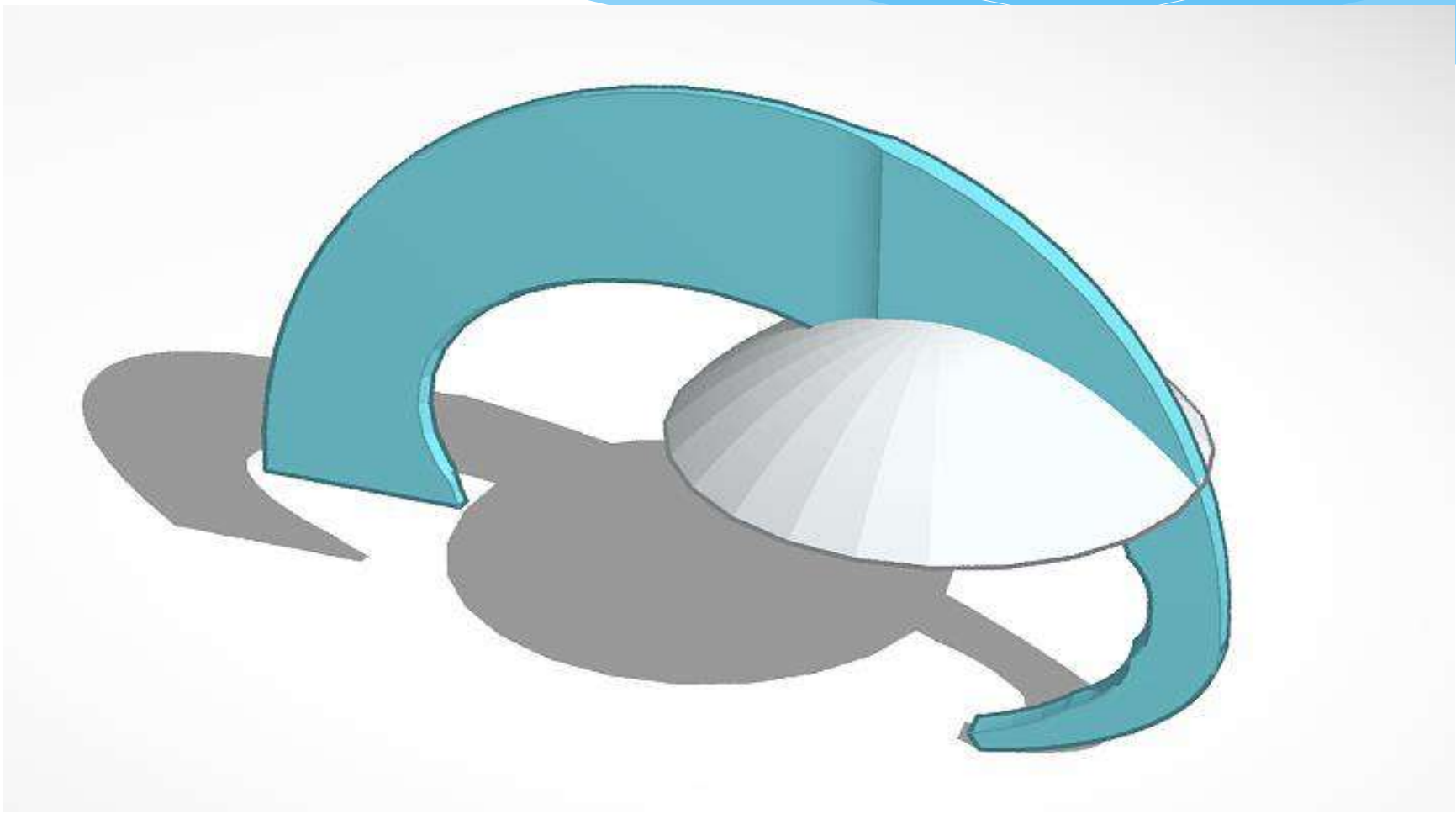
- **Diaphragma sellae:** This smaller infolding forms a roof over the pituitary gland.

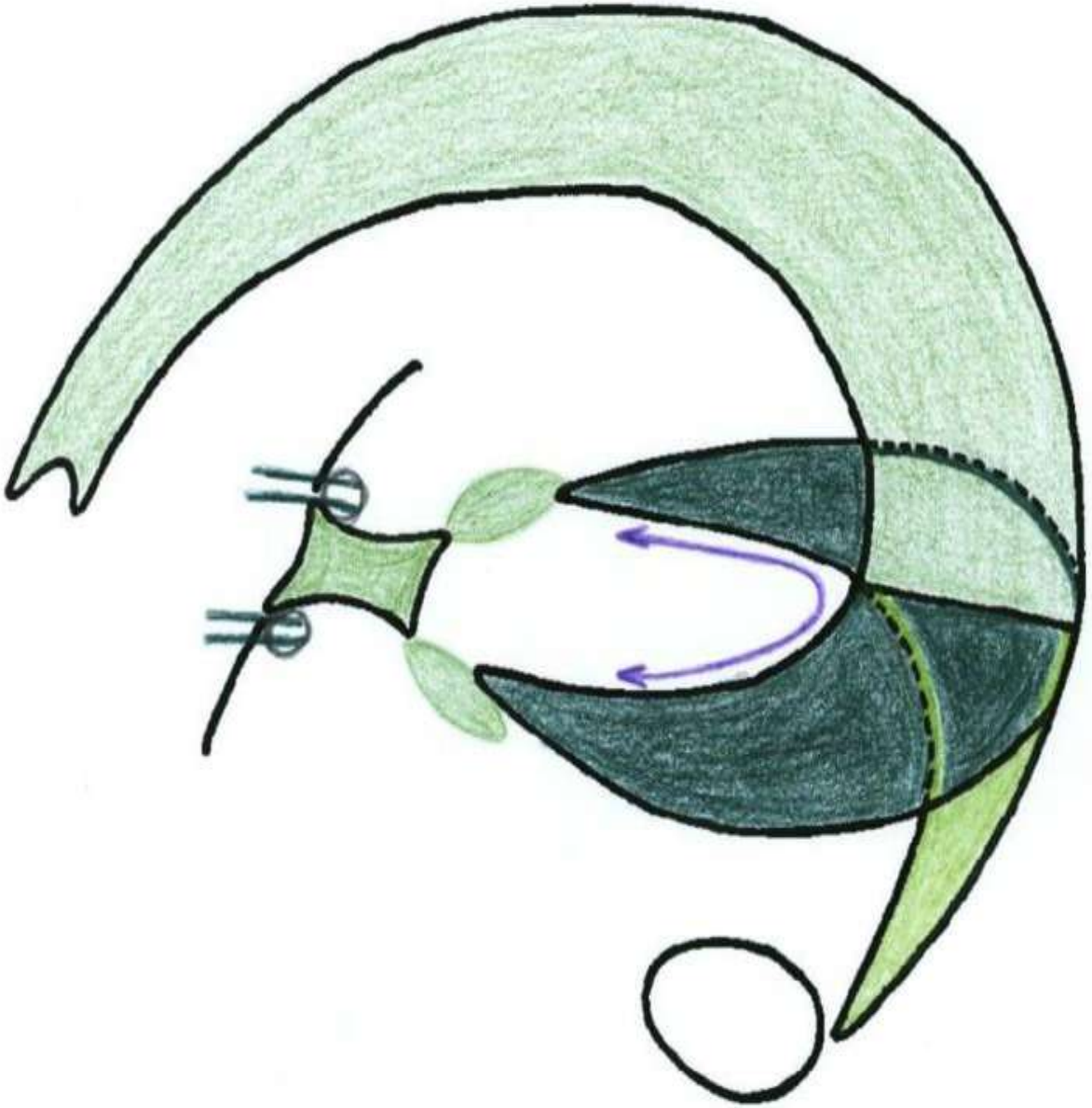
Fold	Shape	Venous sinuses enclosed
Falx cerebri	Sickle-shaped	Superior sagittal, inferior sagittal and straight sinuses
Tentorium cerebelli	Tent-shaped (semilunar)	Transverse and superior petrosal sinuses
Falx cerebelli	Sickle-shaped	Occipital sinus
Diaphragma sellae	Horizontal fold	Anterior and posterior intercavernous sinuses

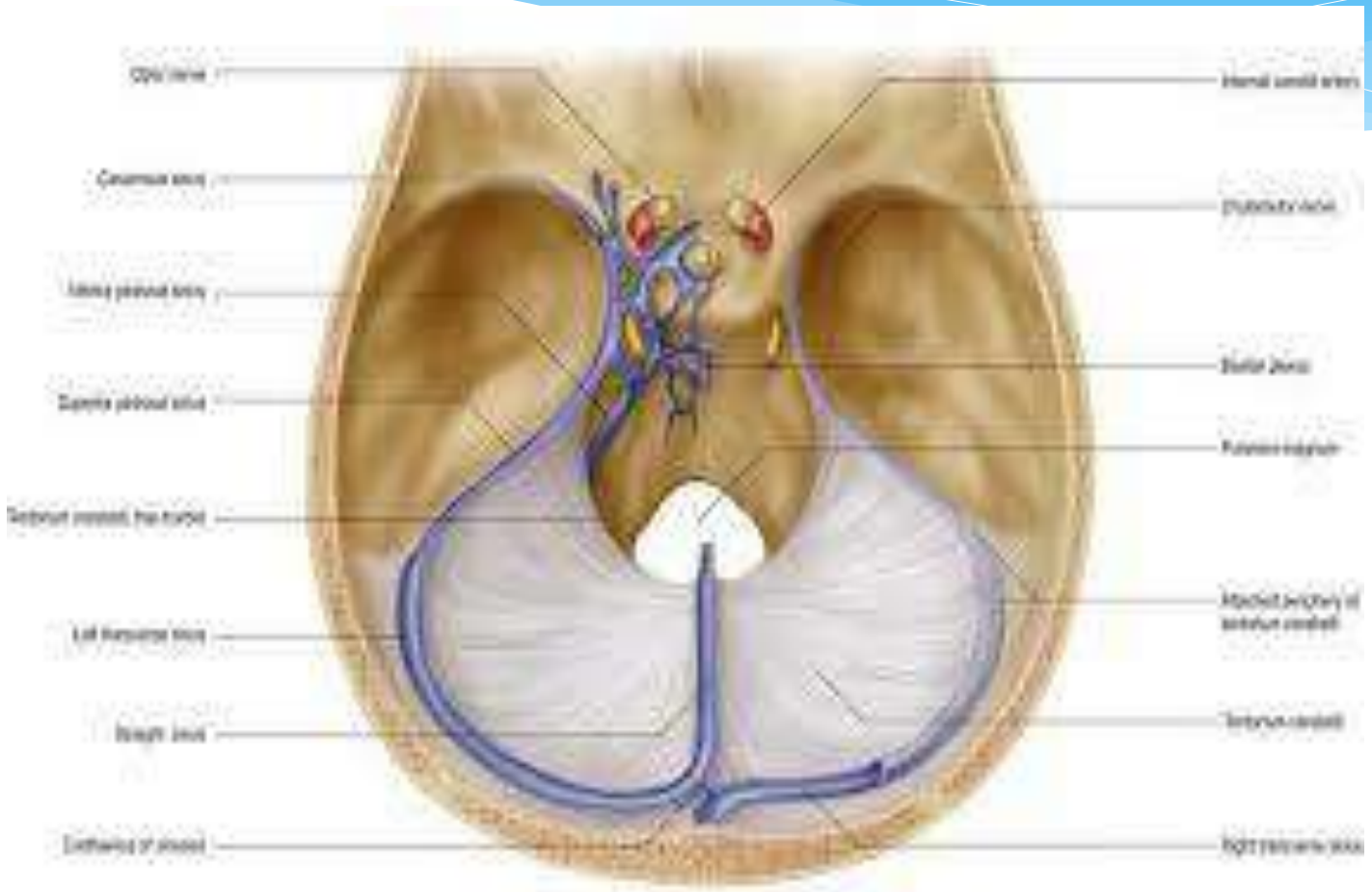
Shapes of dural folds and e

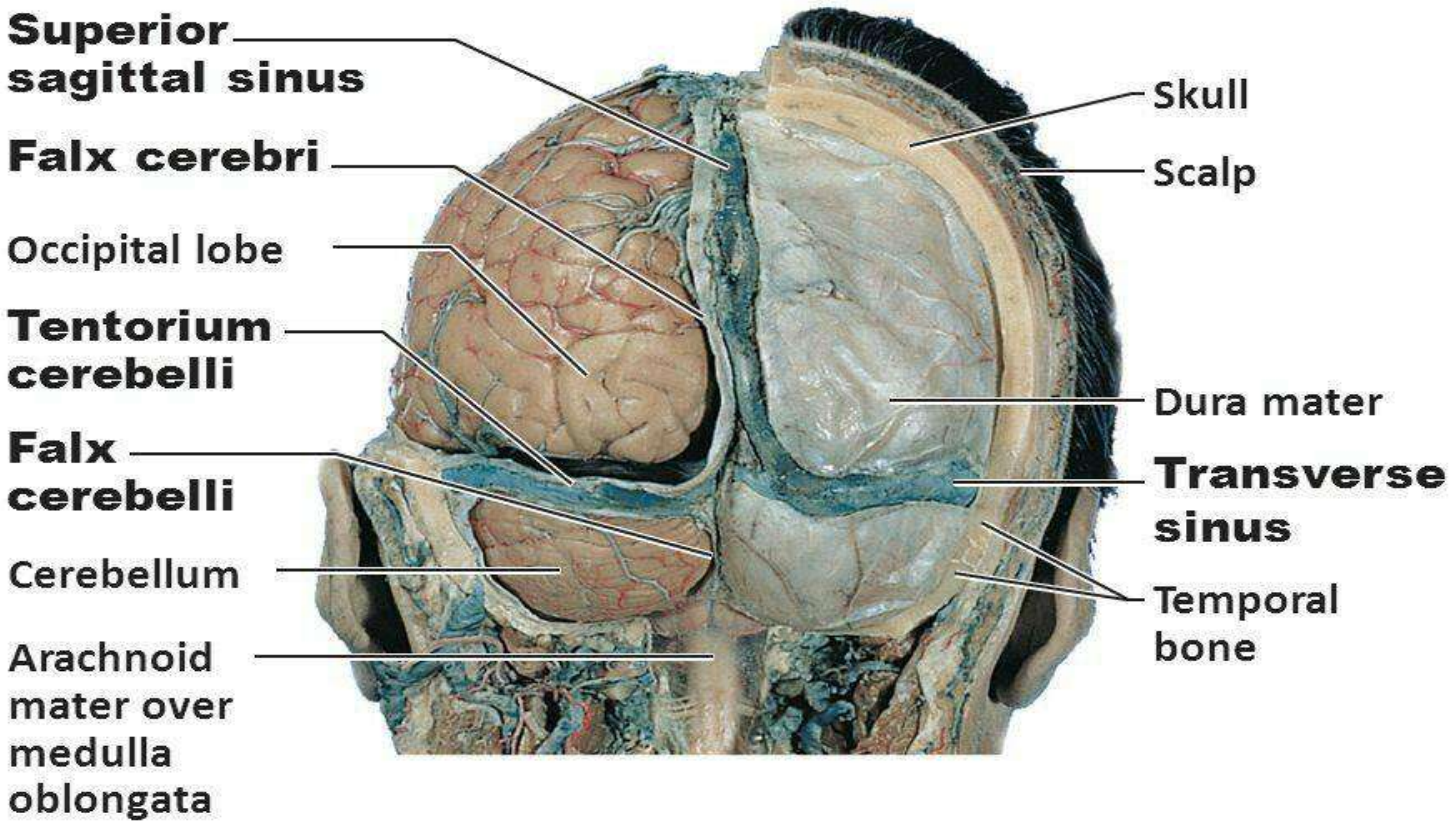


3D design Tentorium Cerebelli and Fa

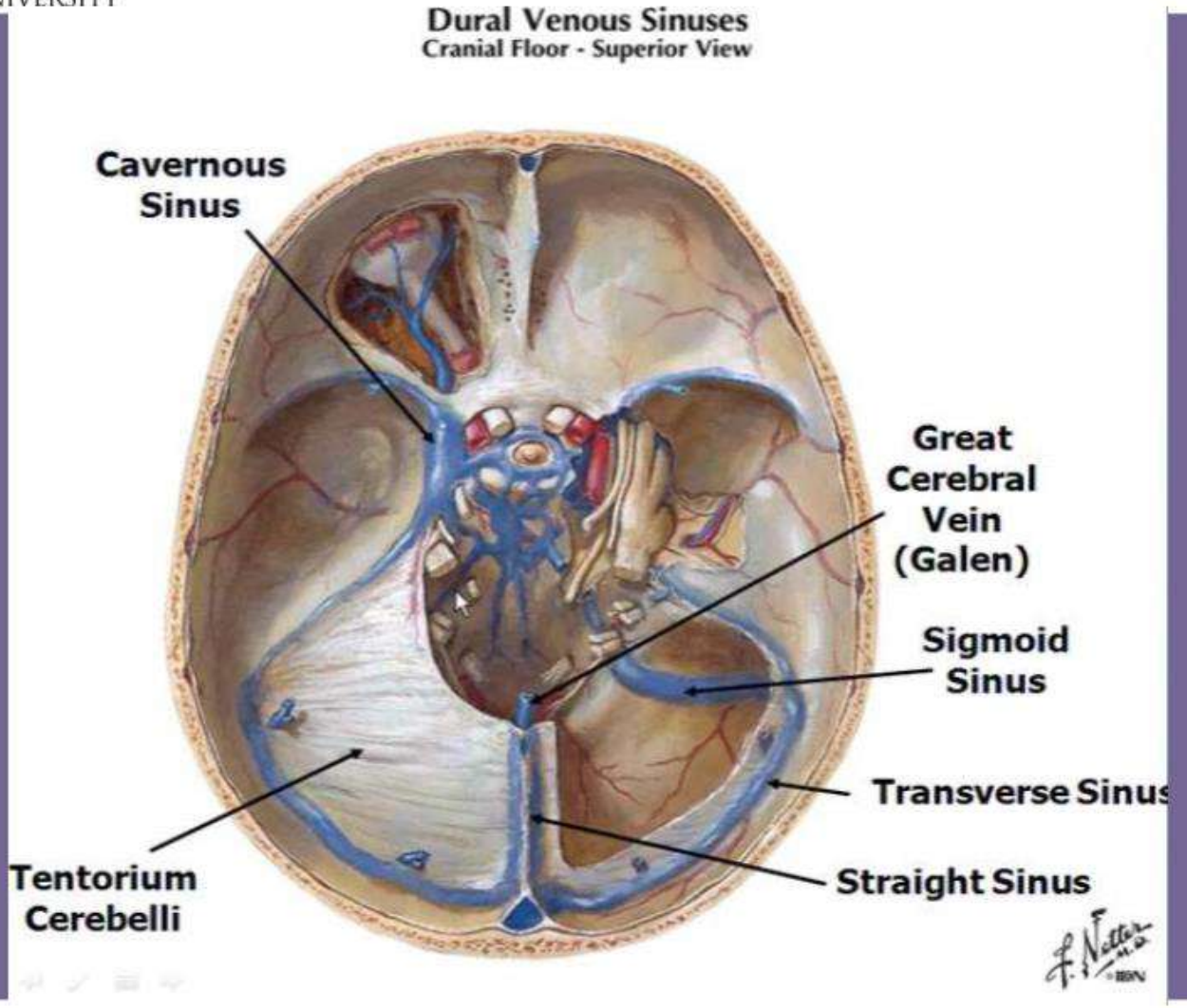


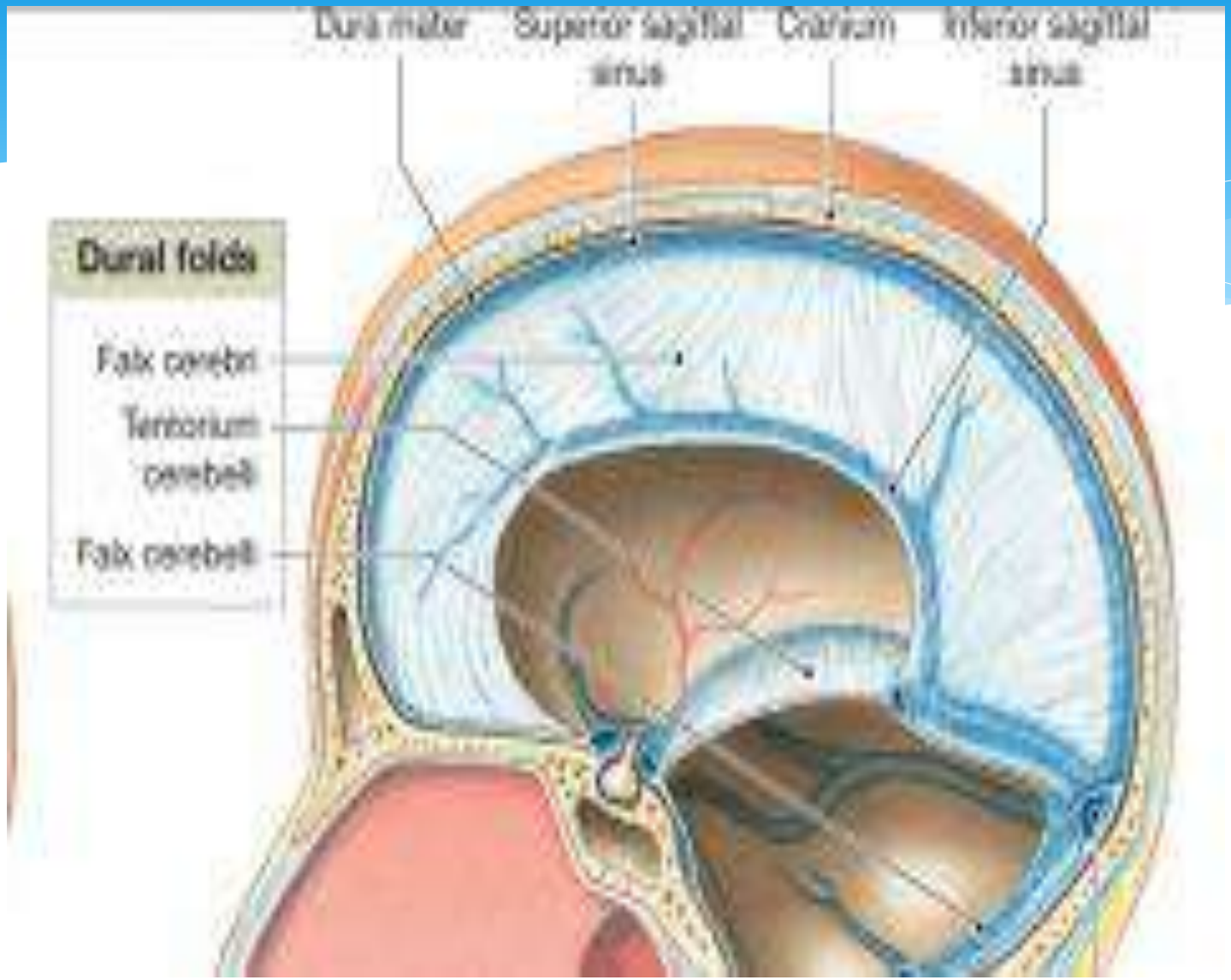


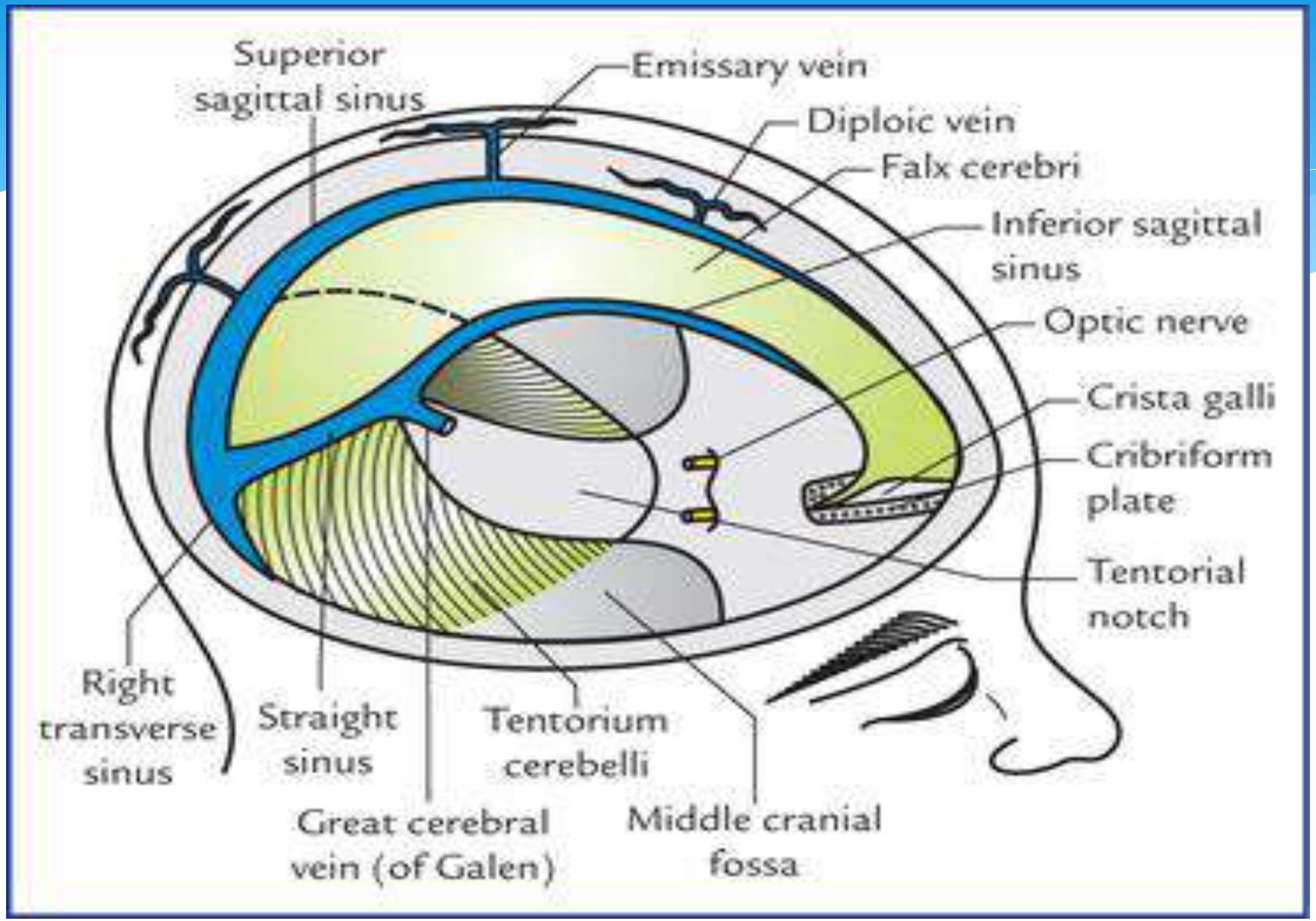



Superior sagittal sinus
Falx cerebri
Occipital lobe
Tentorium cerebelli
Falx cerebelli
Cerebellum
Arachnoid mater over medulla oblongata
Skull
Scalp
Dura mater
Transverse sinus
Temporal bone

DES MOINES UNIVERSITY




Dural folds
Falx cerebri
Tentorium cerebelli
Falx cerebelli


Superior sagittal sinus
Emissary vein
Diploic vein
Falx cerebri
Inferior sagittal sinus
Optic nerve
Crista galli
Cribriform plate
Tentorial notch
Right transverse sinus
Straight sinus
Great cerebral vein (of Galen)
Tentorium cerebelli
Middle cranial fossa

THE DURAL VENOUS SINUSES

* The dural infoldings form spaces between the two layers of the dura mater. These spaces are called dural venous sinuses, and they collect blood from veins on the surface of the brain. Blood from the sinuses empties into the internal jugular veins. The sinuses include the following:

- **Superior sagittal sinus:** Formed in the superior part of the falx cerebri, this sinus runs from the crista galli of the ethmoid bone.

- **Inferior sagittal sinus:** This sinus runs along the bottom of the falx cerebri to the straight sinus.

- **Straight sinus:** This dural venous sinus is formed where the inferior sagittal sinus merges with the great cerebral vein. It follows the place where the tentorium cerebelli attaches to the falx cerebri and joins the confluence of sinuses.

Transverse sinuses: The transverse sinuses run laterally from the confluence of sinuses where the tentorium cerebelli attaches to the occipital bones. Where they reach the temporal bone they become the sigmoid sinuses.

- **Sigmoid sinuses:** These sinuses run along an S-shaped course and pass through the jugular foramen, which is located at the base of the occipital and temporal bones. From there, they become the internal jugular veins.

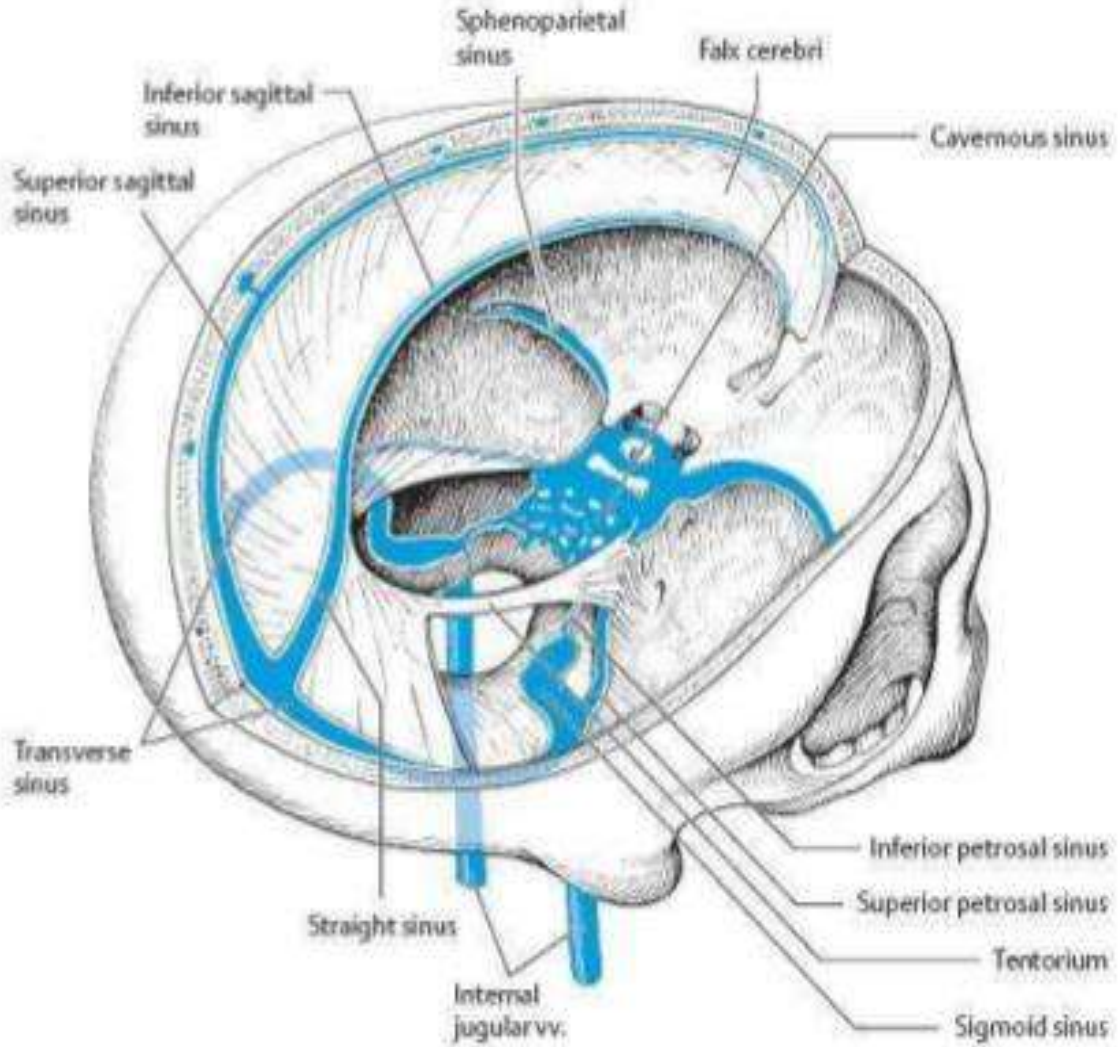
- **Occipital sinus:** The occipital sinus runs along the falx cerebelli up to the confluence of sinuses.

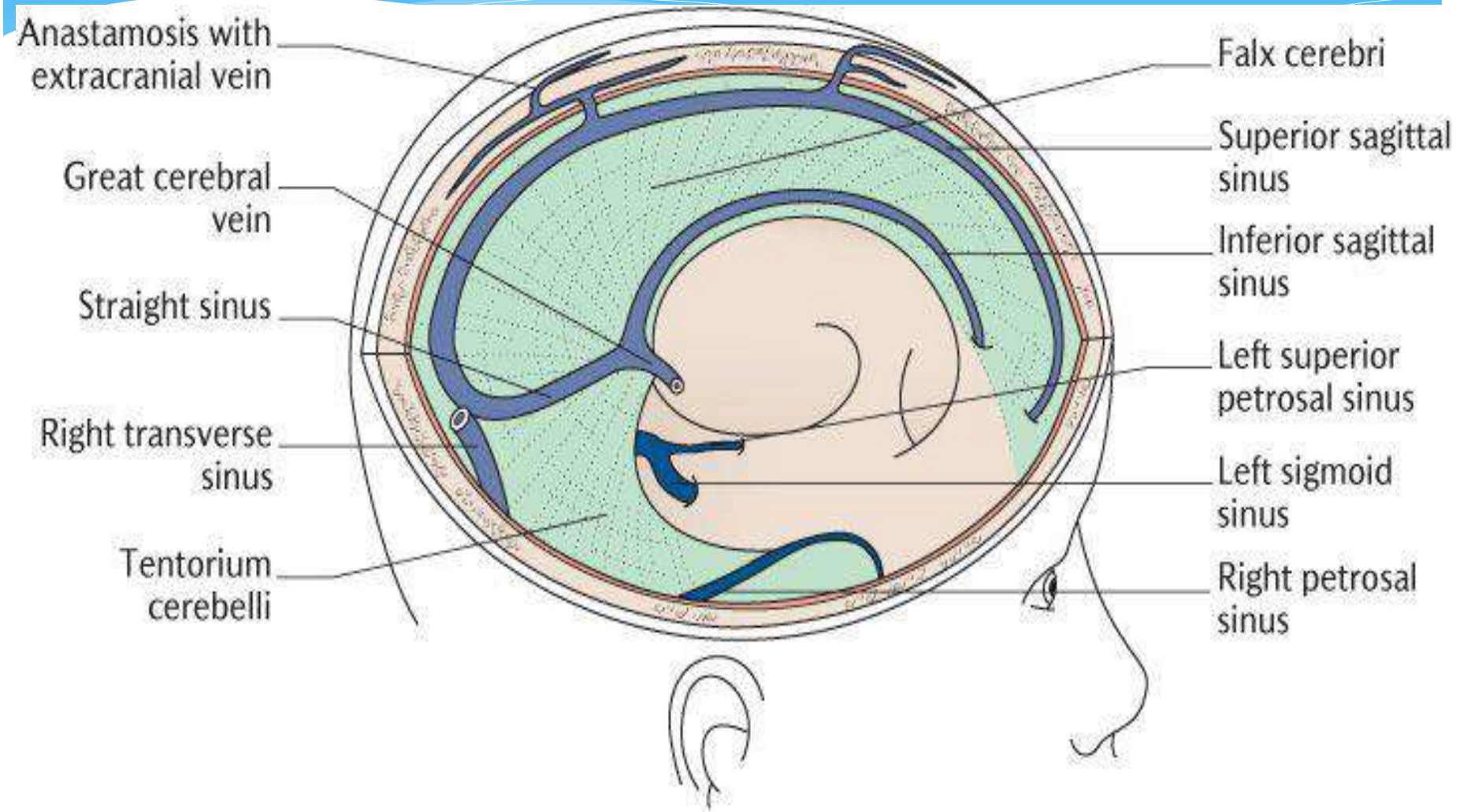
- **Cavernous sinuses:** Found on each side of the sella turcica of the sphenoid bone, the cavernous sinuses drain into the superior and inferior petrosal sinuses.

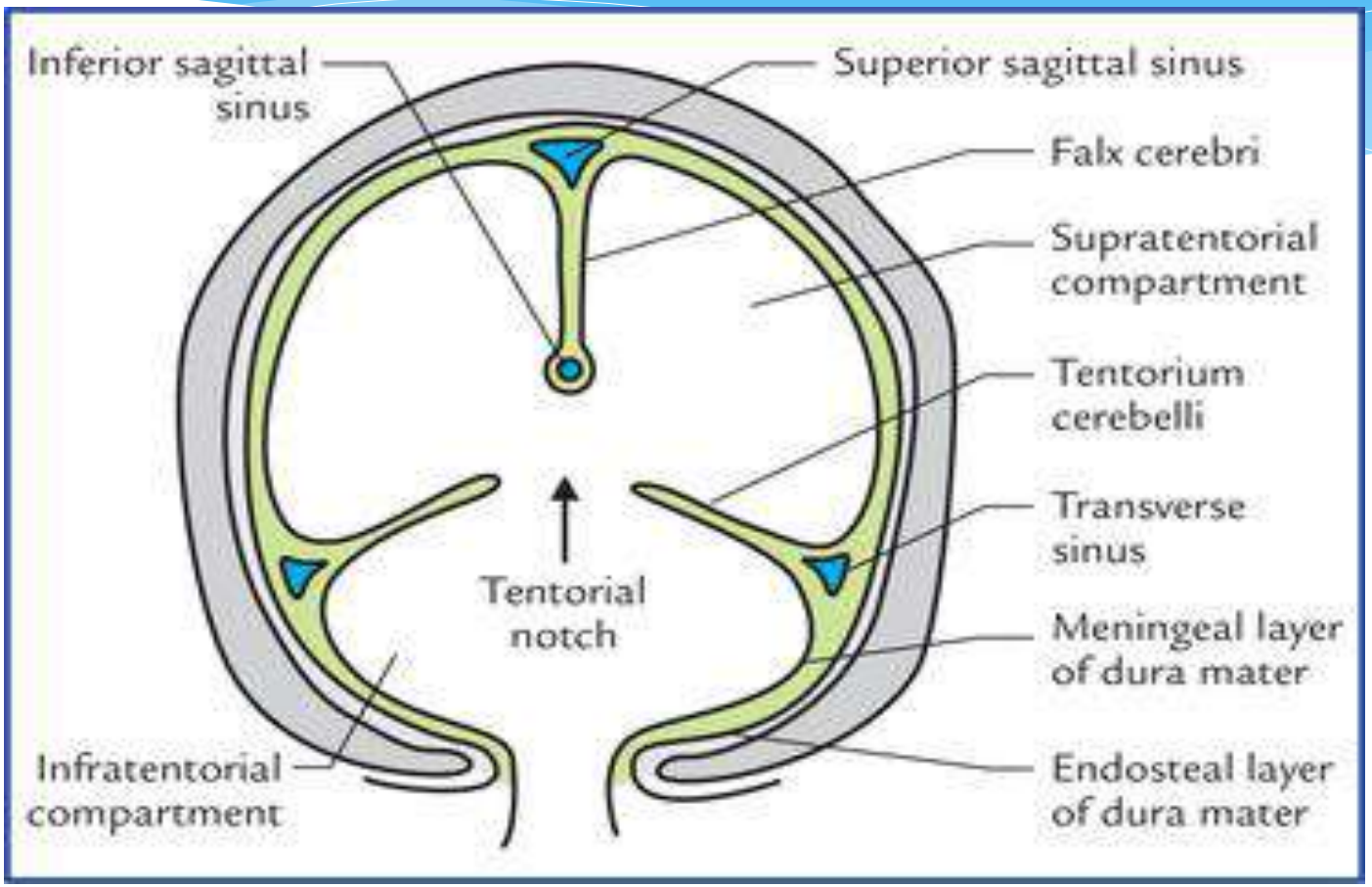
- **Superior petrosal sinuses:** These sinuses continue from the cavernous sinuses to the transverse sinuses.

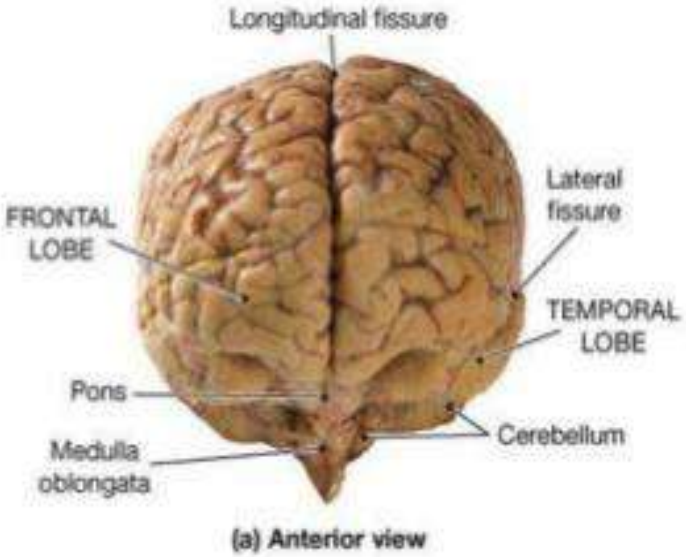
- **Inferior petrosal sinuses:** Running from the posterior part of the cavernous sinuses, these sinuses empty into the internal jugular veins.

* Arachnoid granulations protrude from the arachnoid mater into the dural venous sinuses. They move cerebrospinal fluid from the subarachnoid space to the venous system. Emissary veins connect the dural venous sinuses with veins that run outside of the cranium.
* The dura mater receives arterial blood from the middle meningeal artery. The frontal branch runs deep to the pterion and then moves posteriorly toward the top of the cranium. The parietal branch runs posteriorly and superiorly along the cranium. The meningeal arteries are accompanied by veins of the same name. The dura mater is innervated by the cranial nerves.

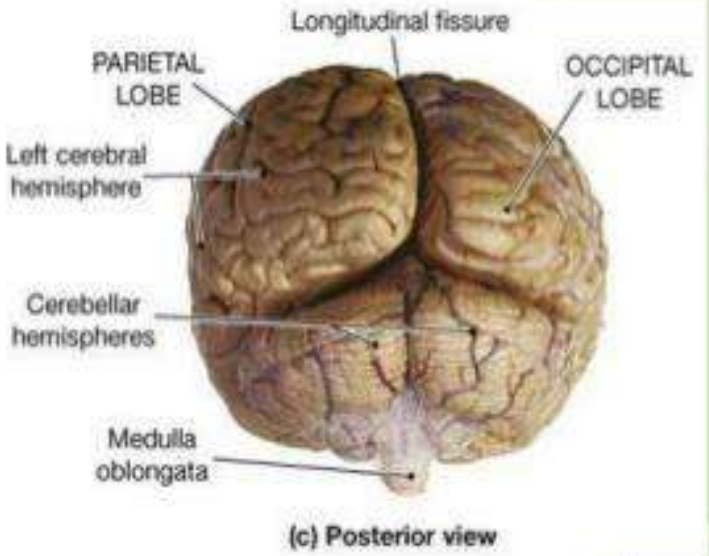

Sphenoparietal sinus
Falx cerebri
Inferior sagittal sinus
Cavernous sinus
Superior sagittal sinus
Transverse sinus
Inferior petrosal sinus
Superior petrosal sinus
Tentorium
Straight sinus
Internal jugular vv.
Sigmoid sinus


Anastamosis with extracranial vein
Great cerebral vein
Straight sinus
Right transverse sinus
Tentorium cerebelli
Falx cerebri
Superior sagittal sinus
Inferior sagittal sinus
Left superior petrosal sinus
Left sigmoid sinus
Right petrosal sinus


Inferior sagittal sinus
Superior sagittal sinus
Falx cerebri
Supratentorial compartment
Tentorium cerebelli
Transverse sinus
Tentorial notch
Meningeal layer of dura mater
Infratentorial compartment
Endosteal layer of dura mater



(a) Anterior view



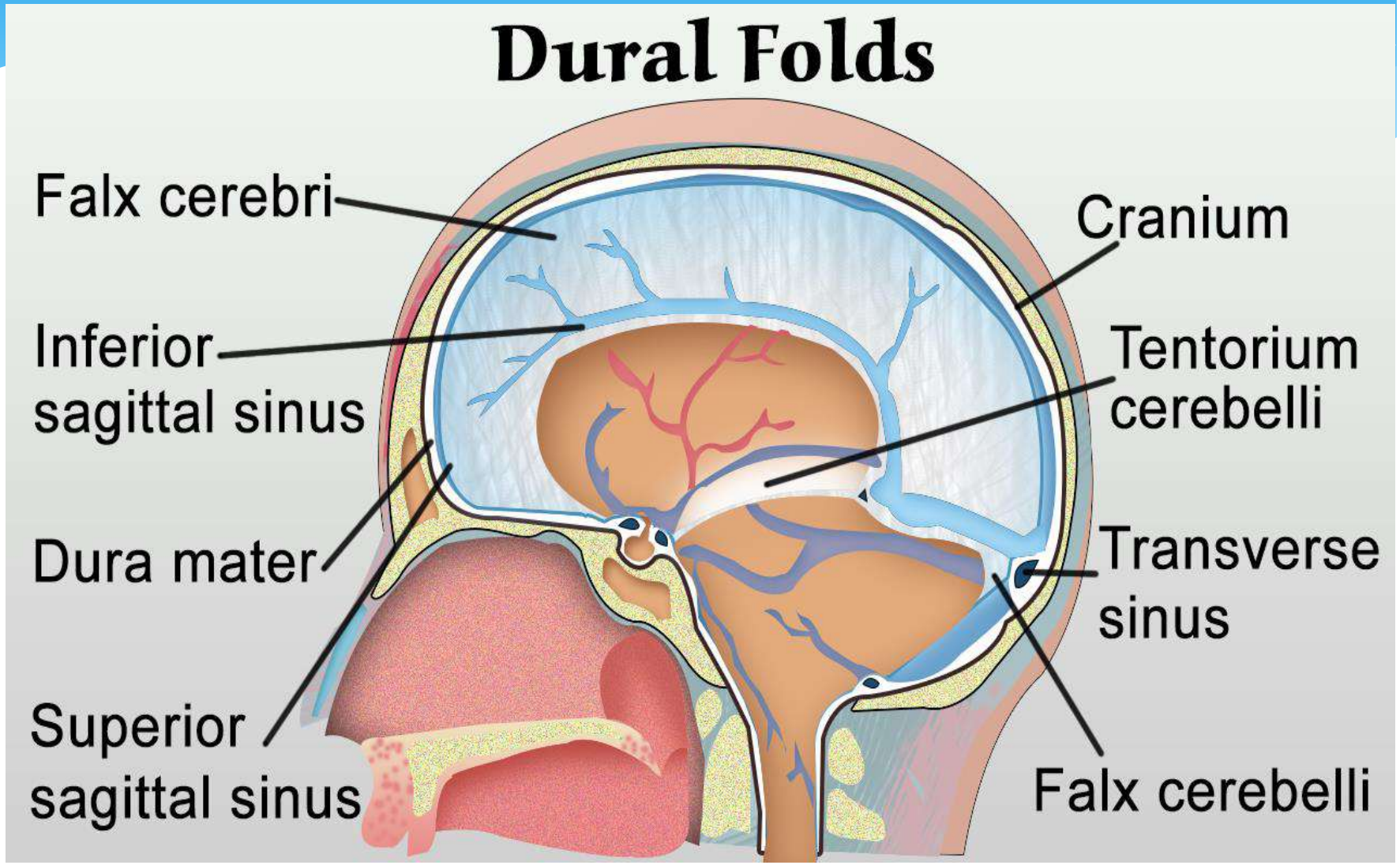
(c) Posterior view

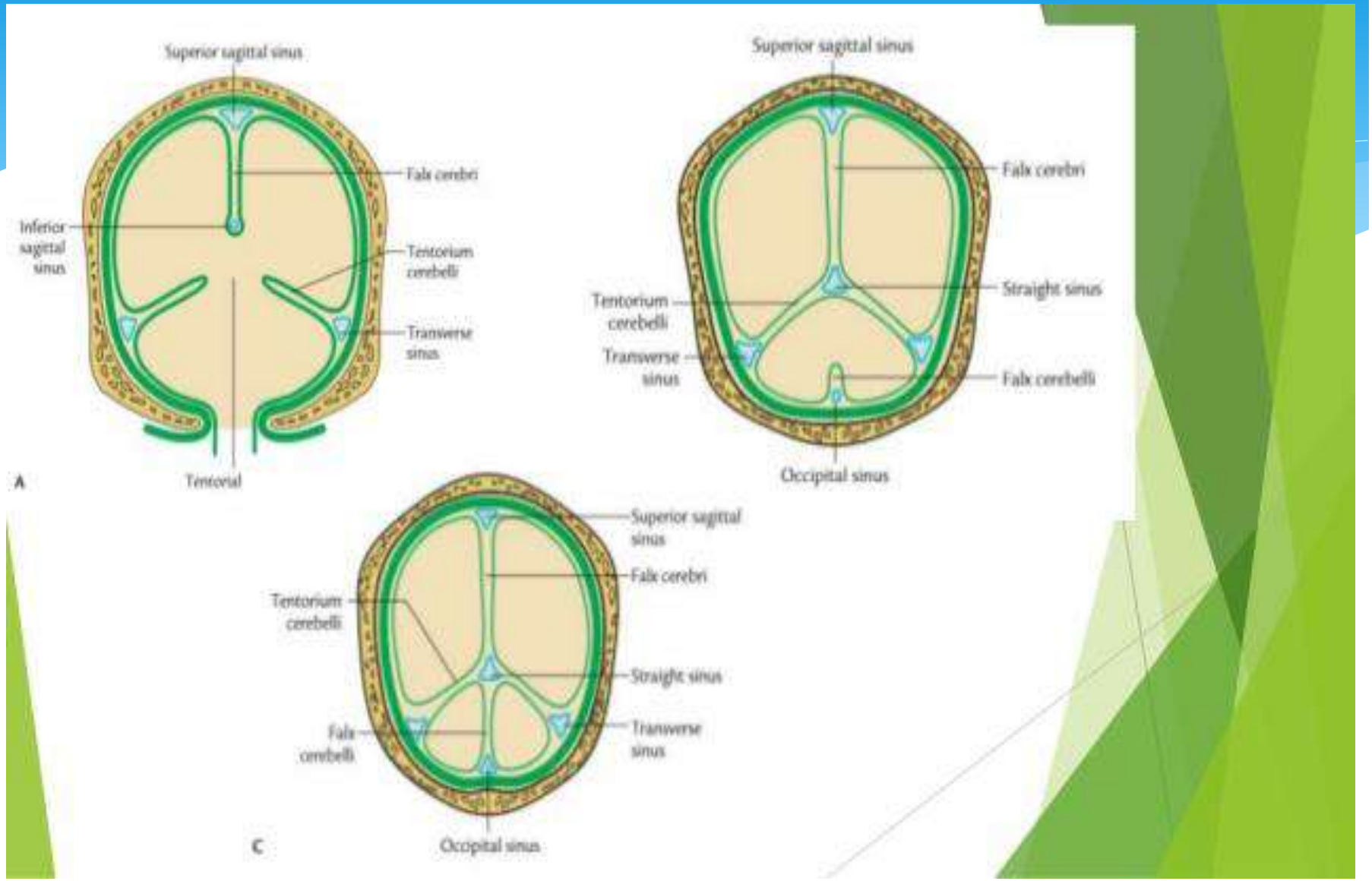
DURAL FOLDS

- At places, the meningeal layer is folded on itself to form dural folds(dural septa).

- Falx cerebri
- Tentorium cerebelli
- Falx cerebelli
- Diaphragma sella

Dural Folds


Falx cerebri
Inferior sagittal sinus
Dura mater
Superior sagittal sinus
Cranium
Tentorium cerebelli
Transverse sinus
Falx cerebelli

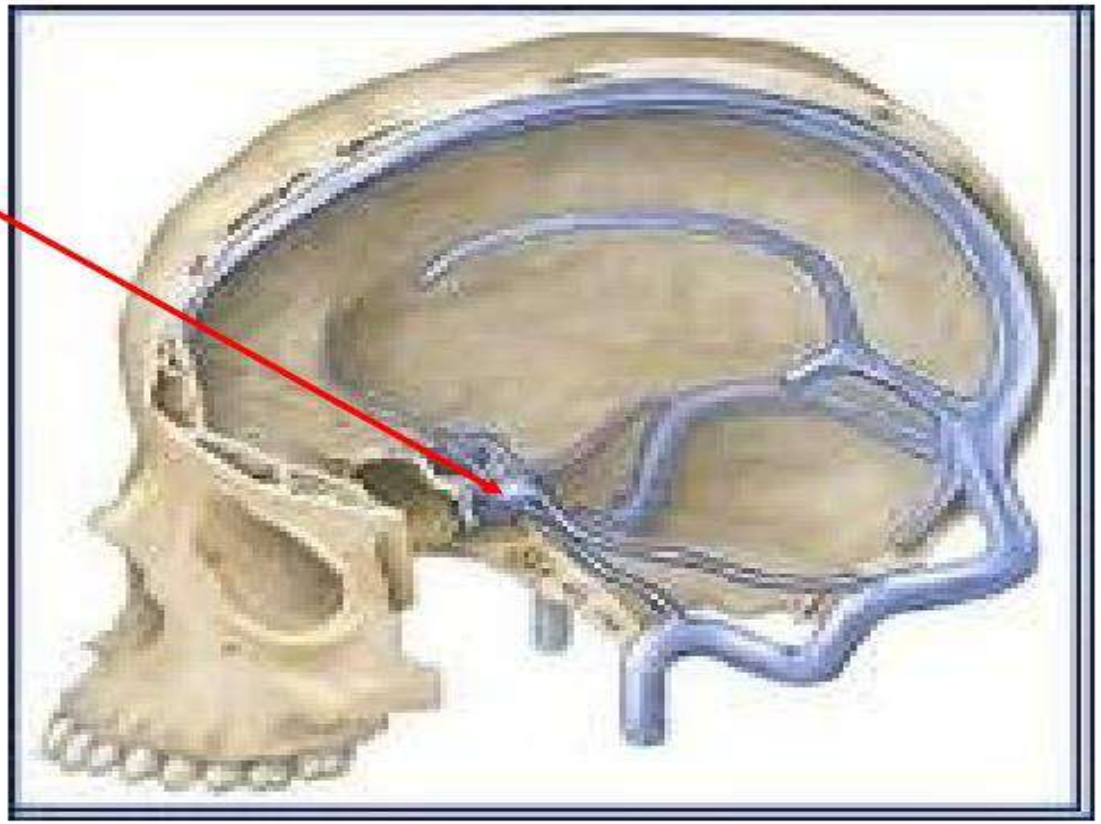

Superior sagittal sinus
Falx cerebri
Inferior sagittal sinus
Tentorium cerebelli
Transverse sinus
Tentorial
A
Superior sagittal sinus
Falx cerebri
Tentorium cerebelli
Straight sinus
Transverse sinus
Falx cerebelli
Occipital sinus
Superior sagittal sinus
Falx cerebri
Tentorium cerebelli
Straight sinus
Falx cerebelli
Transverse sinus
C
Occipital sinus

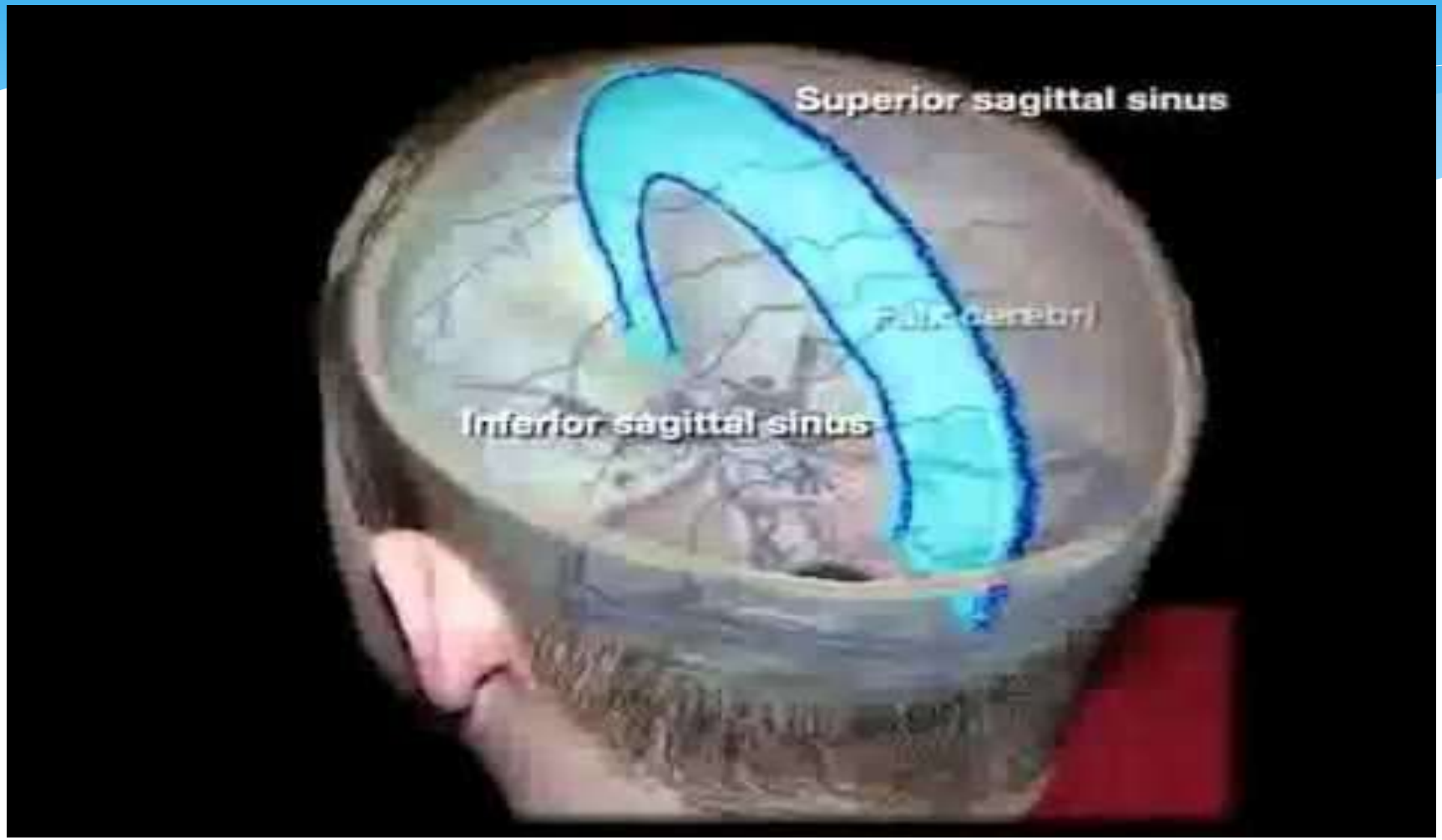
dural folds & dural sinuses
youtube

https://www.youtube.com/watch?v=1hOVRwJQndI *

Dural venous sinuses

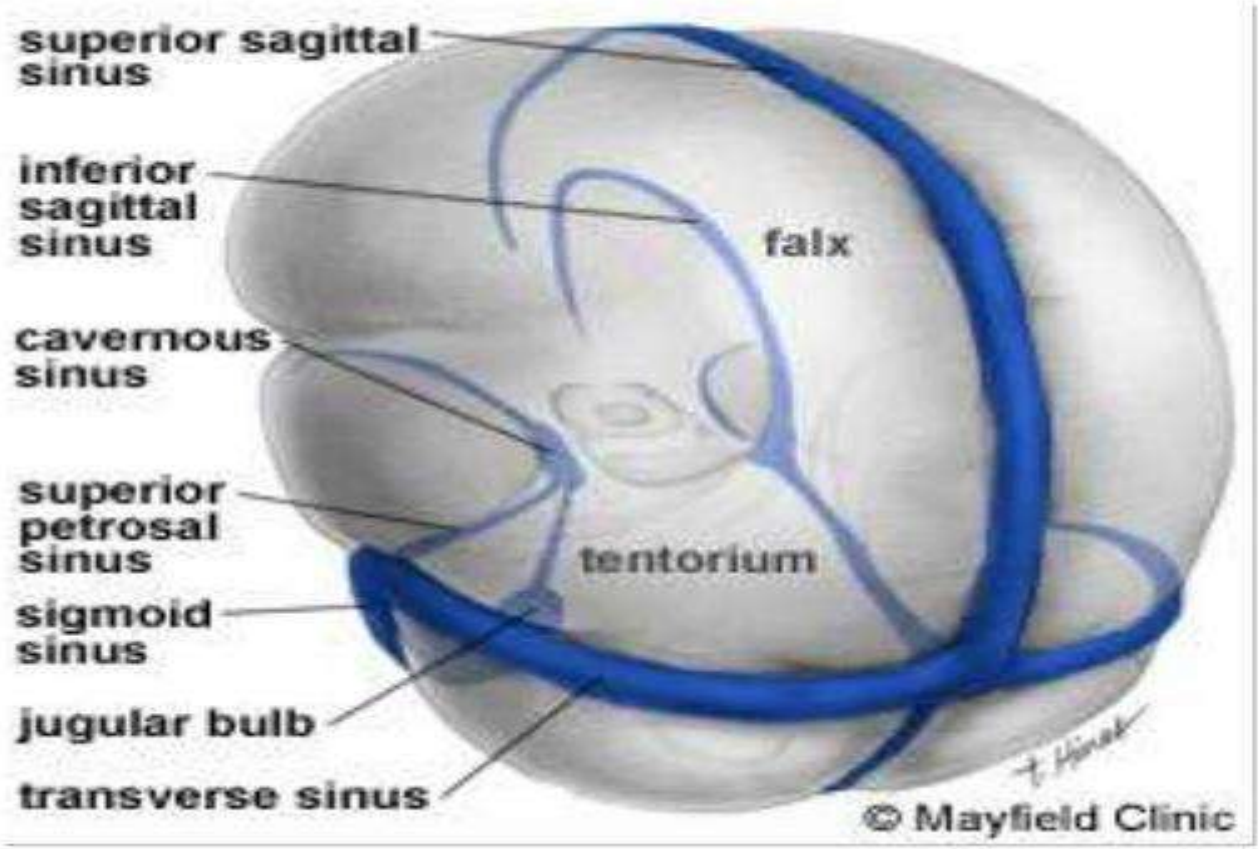
Cavernous sinus

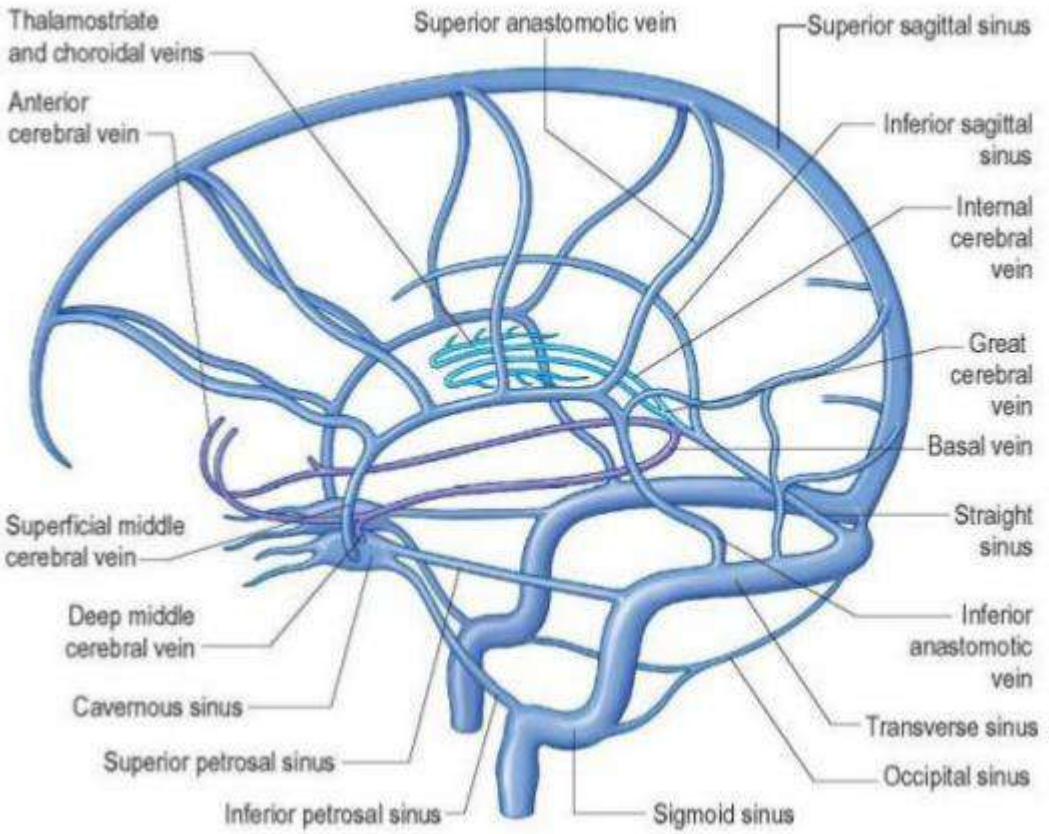



Superior sagittal sinus
Inferior sagittal sinus

Superior Sagittal Sinus

K

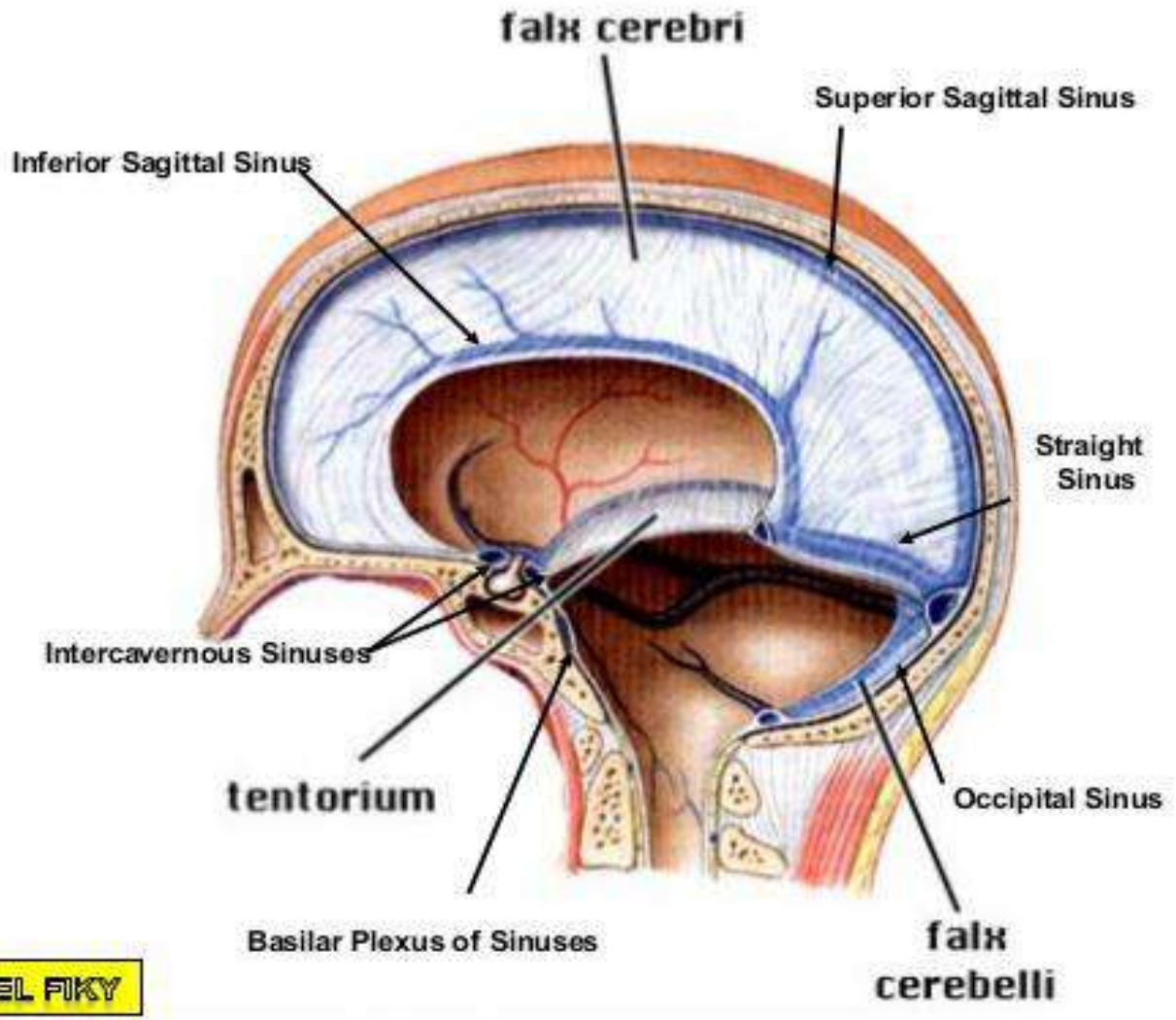

superior sagittal sinus
inferior sagittal sinus
falx
cavernous sinus
superior petrosal sinus
tentorium
sigmoid sinus
jugular bulb
transverse sinus
© Mayfield Clinic


Thalamostriate and choroidal veins
Superior anastomotic vein
Superior sagittal sinus
Anterior cerebral vein
Inferior sagittal sinus
Internal cerebral vein
Great cerebral vein
Basal vein
Straight sinus
Superficial middle cerebral vein
Deep middle cerebral vein
Inferior anastomotic vein
Cavernous sinus
Transverse sinus
Superior petrosal sinus
Occipital sinus
Inferior petrosal sinus
Sigmoid sinus

Clinical Correlation

The superior sagittal sinus communicates with the veins of scalp, diploic veins and sometimes with the veins of the nose. As a result the infection from these areas can spread to the sinus producing thrombosis of superior sagittal sinus

Single Dural Venous Sinuses



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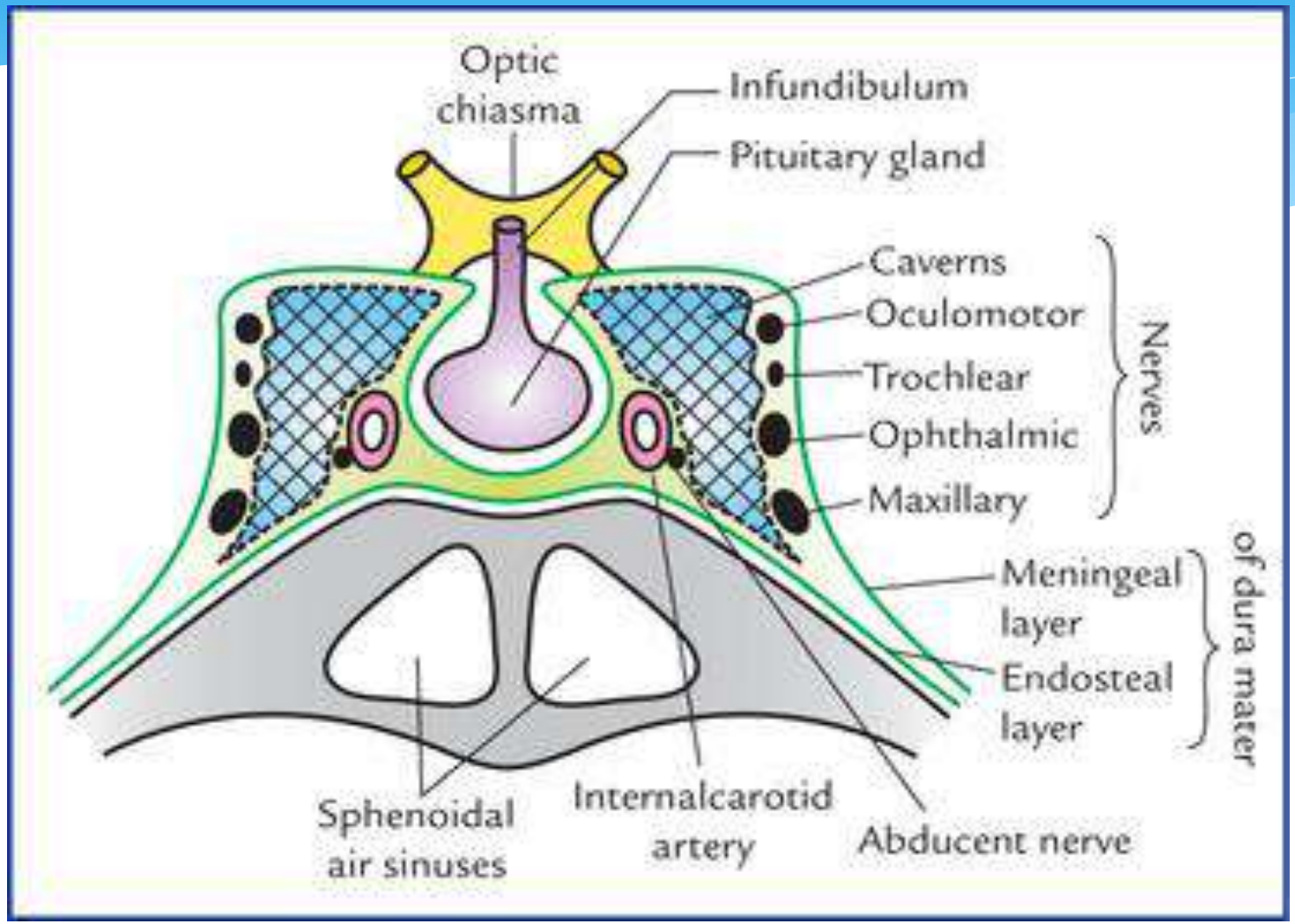
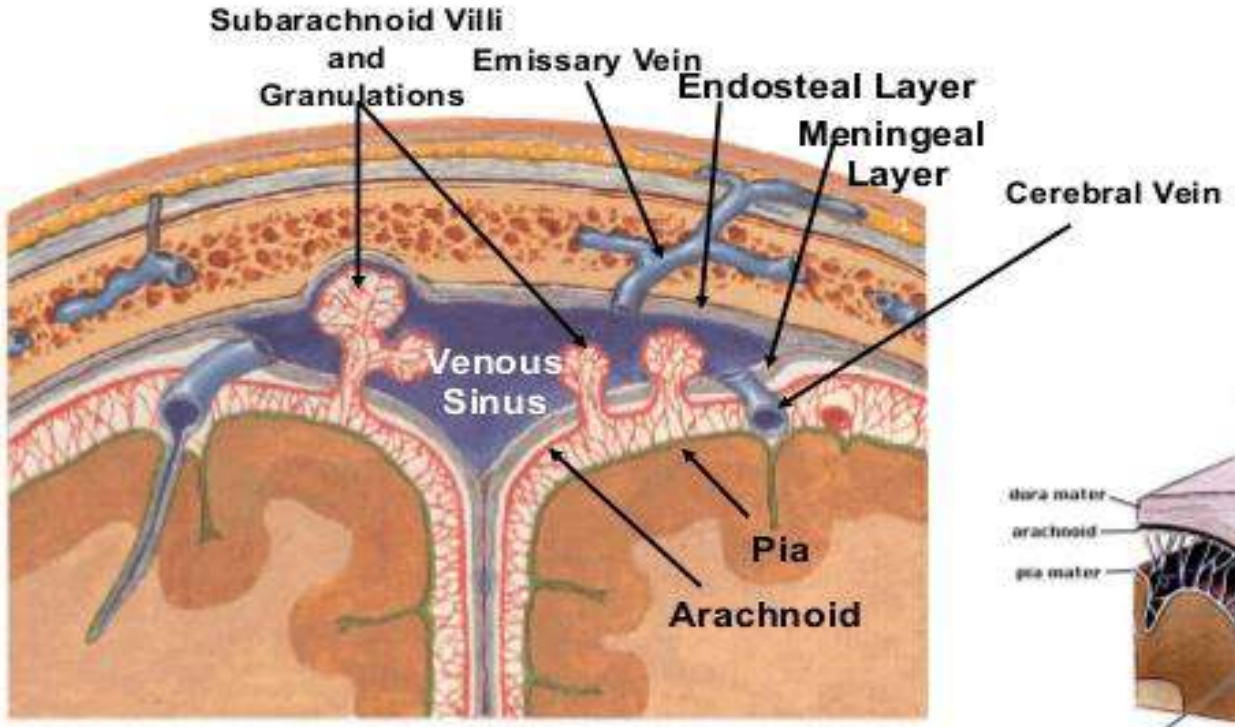

Optic chiasma
Infundibulum
Pituitary gland
Caverns
Oculomotor
Trochlear
Ophthalmic
Maxillary
Nerves
Meningeal layer
Endosteal layer
of dura mater
Sphenoidal air sinuses
Internalcarotid artery
Abducent nerve

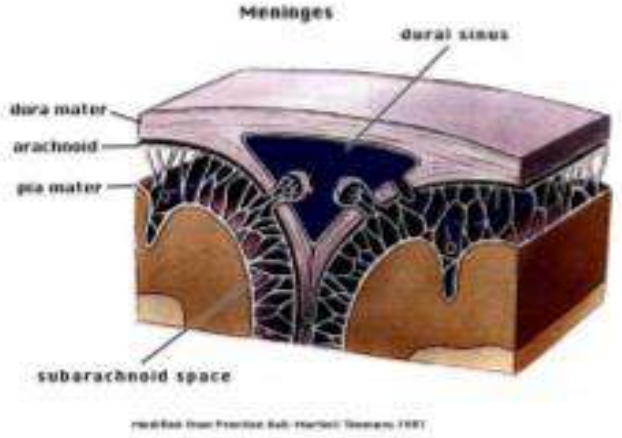
Dural Venous Sinuses

Definition: Are venous spaces between the two layers of the dura. Classification: They are classified into paired and unpaired sinuses.

Unpaired sinuses	Paired sinuses
1)Superior sagittal 2) Inferior sagittal 3) Straight. 4) Occipital 5)Three intercavernous 6) Basilar plexus of sinuses	(1)Sphenoparietal (2) Cavernous (3) Superior petrosal (4) Inferior petrosal. (5) Transverse (6) Sigmoid

Coronal Section





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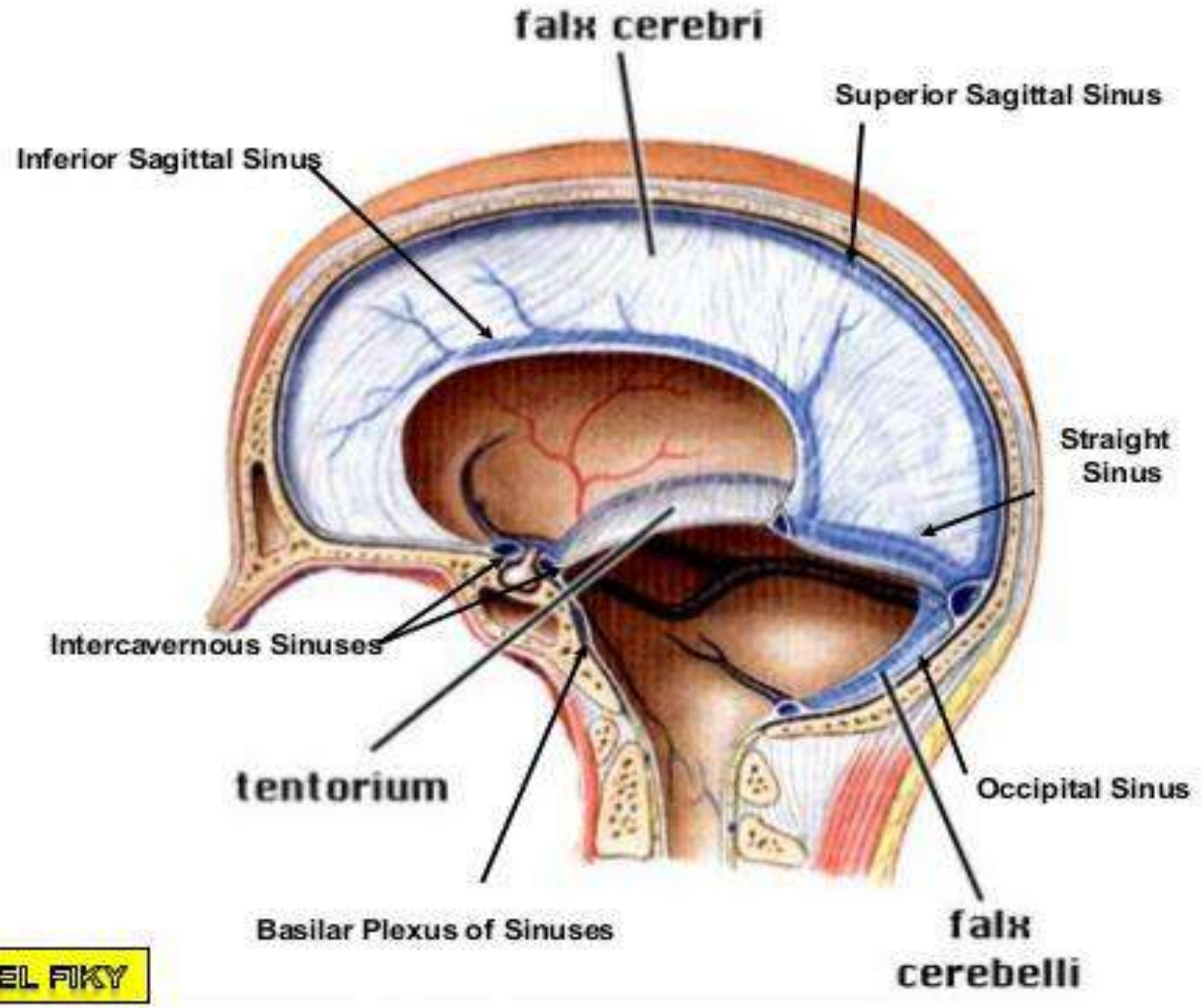
Single Dural Venous Sinuses



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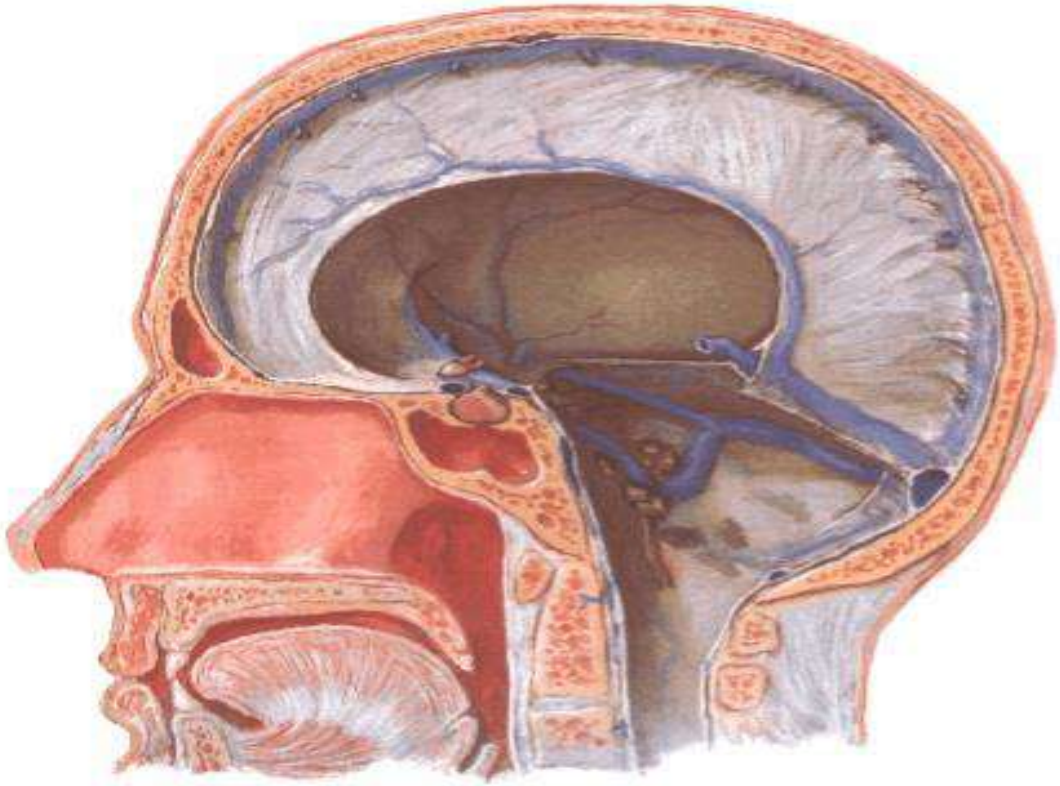

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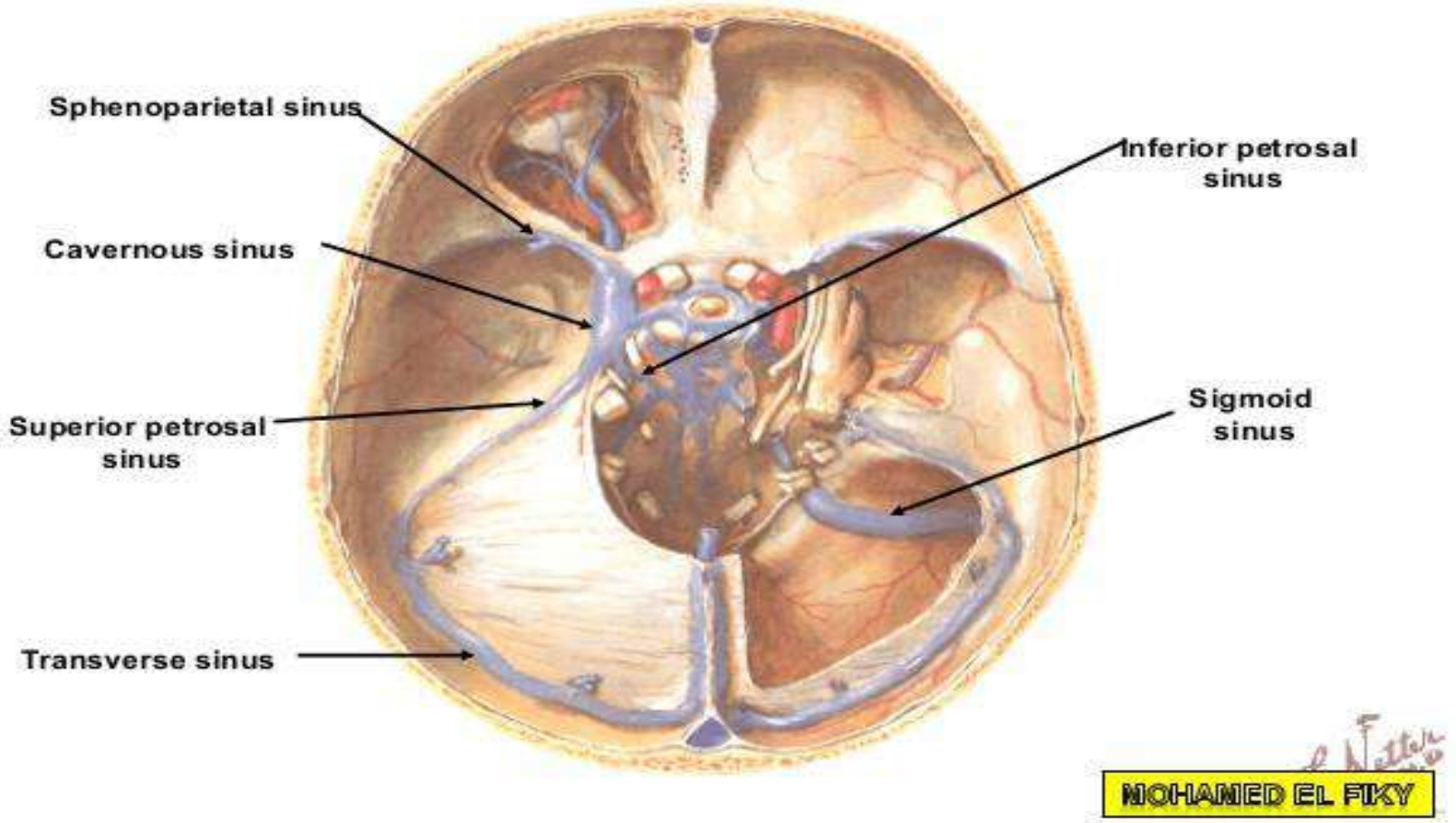
Paired Dural Venous Sinuses

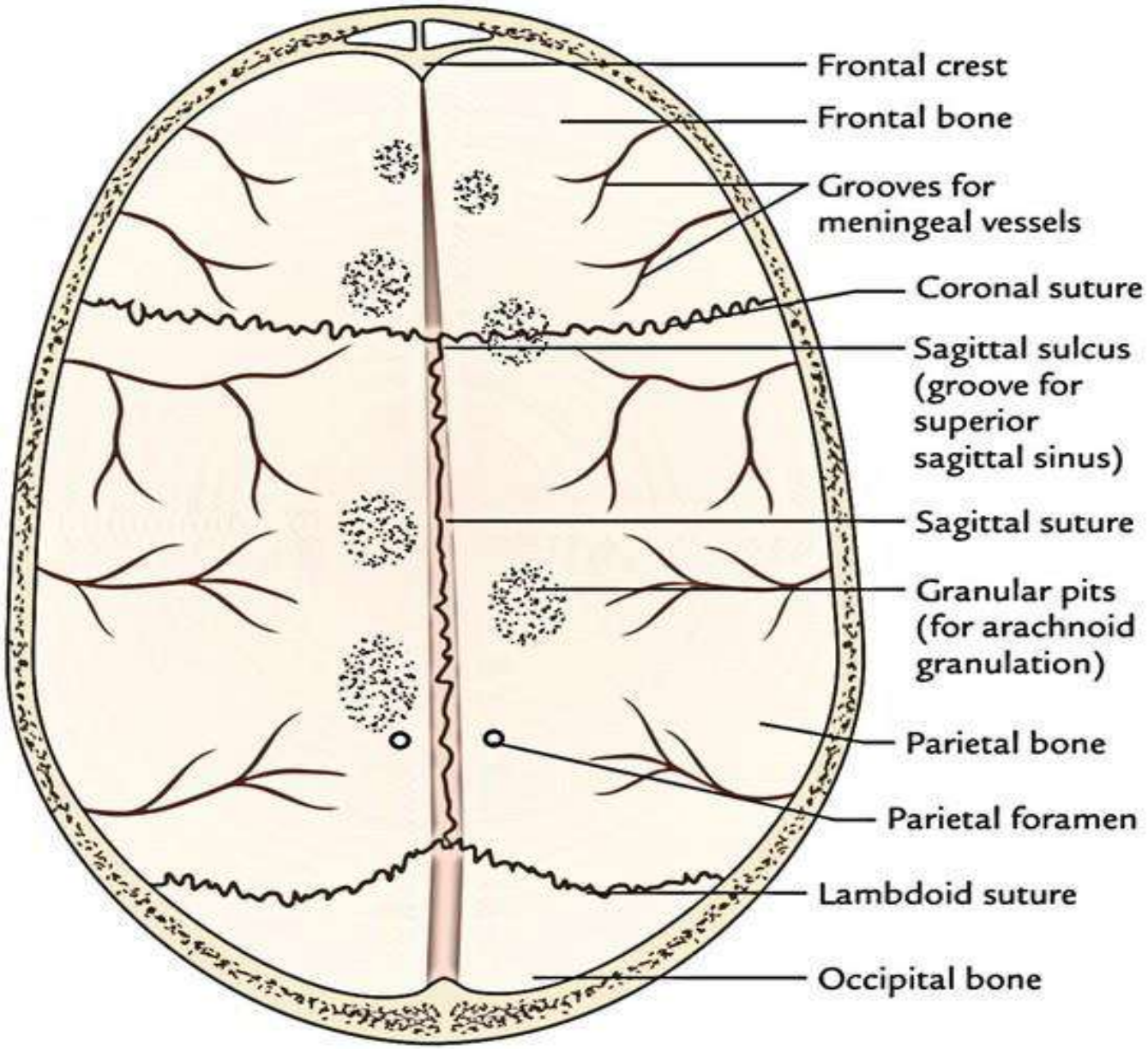


1- Superior Sagittal Sinus

Site: Occupies the upper convex margin of the falx cerebri.
Beginning: Begins anteriorly at the foramen caecum.
Course: Runs upwards and backwards, making a groove on the inferior surface of the vault of the skull.
Termination: At the internal occipital protuberance by becoming one of the transverse sinuses usually the right.
Lumen: Becomes progressively larger from before backwards and is triangular in cross section. Direction of blood flow: From before backwards.

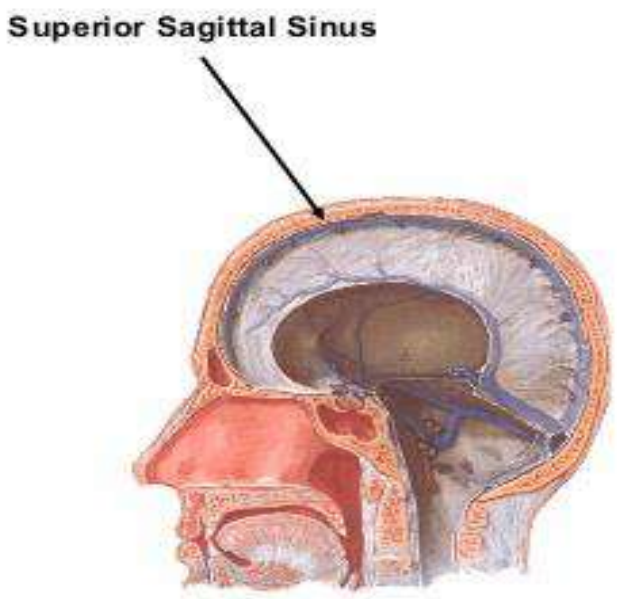
Tributaries:

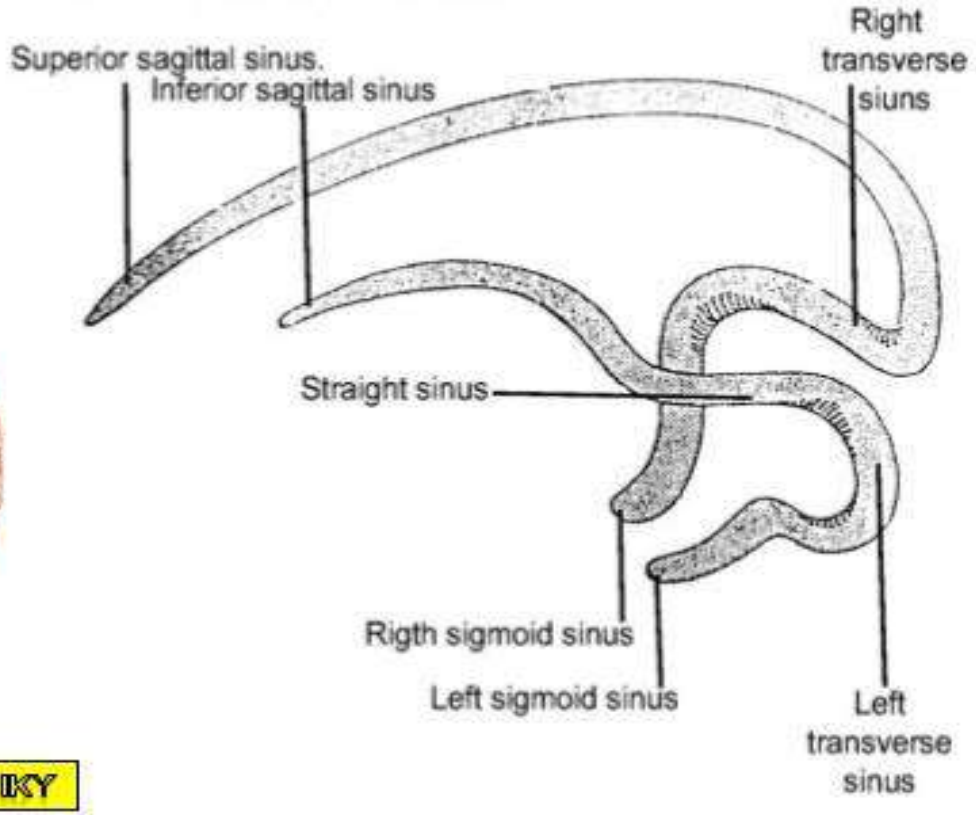
(1) Superior cerebral veins.
(2) Parietal emissary veins: connecting it with the veins of the scalp,
(3) Emissary vein: passing through the foramen caecum to connect it with the veins of the


Frontal crest
Frontal bone
Grooves for meningeal vessels
Coronal suture
Sagittal sulcus (groove for superior sagittal sinus)
Sagittal suture
Granular pits (for arachnoid granulation)
Parietal bone
Parietal foramen
Lambdoid suture
Occipital bone

Termination of Superior Sagittal Sinus

with the veins of the nose.





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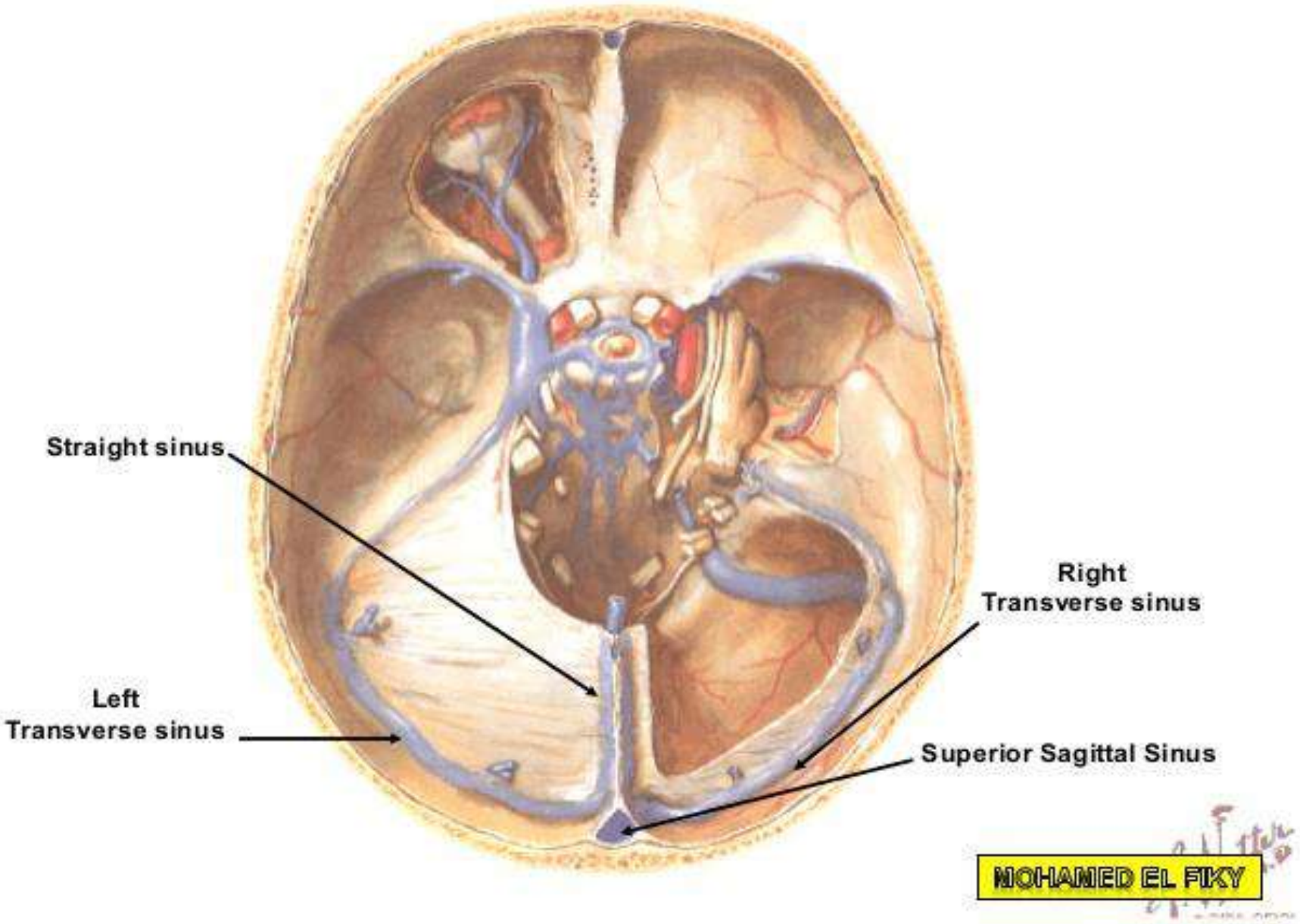
Straight sinus
Right
Transverse sinus
Left
Transverse sinus
Superior Sagittal Sinus
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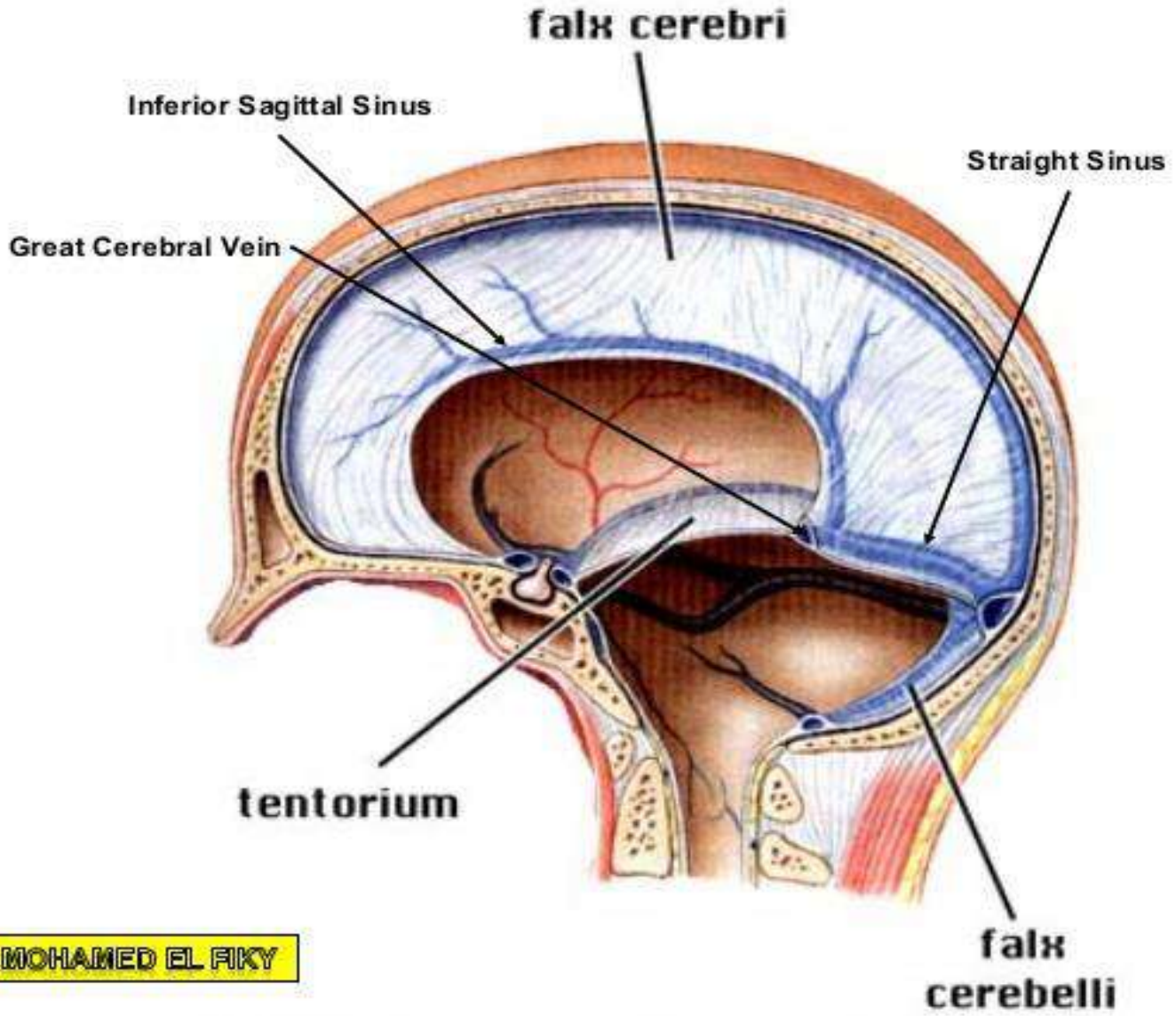
2- Inferior Sagittal Sinus

Site: Enclosed in the posterior 2/3 of the lower concave free margin of the falx cerebri.
Termination: Ends at the middle of the anterior free margin of tentorium cerebelli by joining the great cerebral vein to form the straight sinus.

3- The Straigt Sinus

Site: In the median plane within the junction of the falx cerebri and tentorium cerebelli.
Formation: By the union of the inferior sagittal sinus with the great cerebral vein.
Termination: Ends at the internal occipital protuberance by becoming one of the transverse sinuses, usually the left


falx cerebri
Inferior Sagittal Sinus
Straight Sinus
Great Cerebral Vein
tentorium
falx cerebelli
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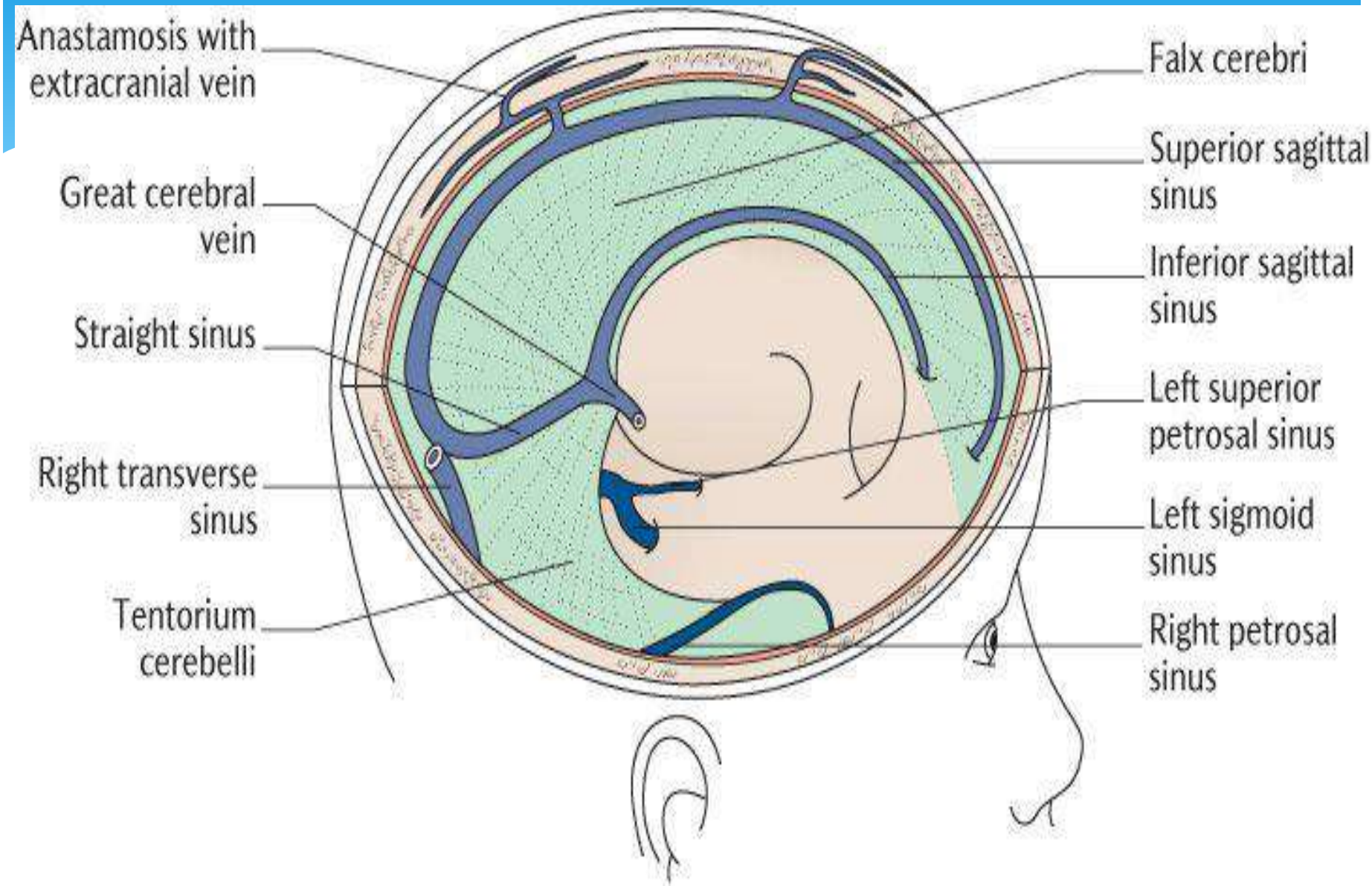

Anastamosis with extracranial vein
Great cerebral vein
Straight sinus
Right transverse sinus
Tentorium cerebelli
Falx cerebri
Superior sagittal sinus
Inferior sagittal sinus
Left superior petrosal sinus
Left sigmoid sinus
Right petrosal sinus

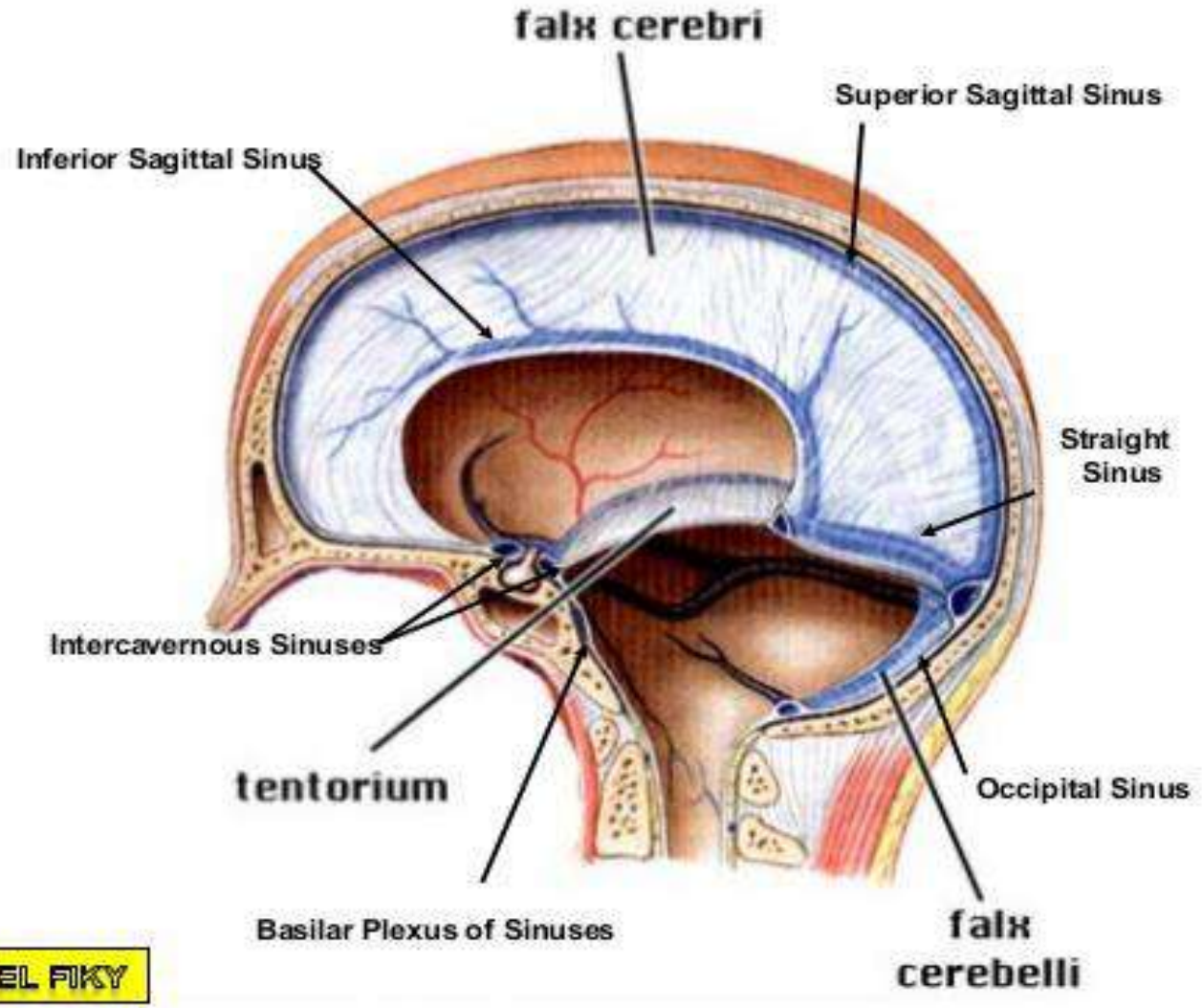
4- The Occipital Sinus

Site : Lies in the attached margin of falx cerebelli.
Beginning: Near the foramen magnum.
Termination: In the confluence of sinuses.

(5) Intercavernous sinuses

Number three.
Site: (1) The anterior: in the anterior margin of the diaphragma sellae.
(2) The posterior: in the posterior margin of the diaphragma sellae.
(3) The middle: below the hypophysis. .
Communications: connects the cavernous sinuses of the two sides.

Single Dural Venous Sinuses



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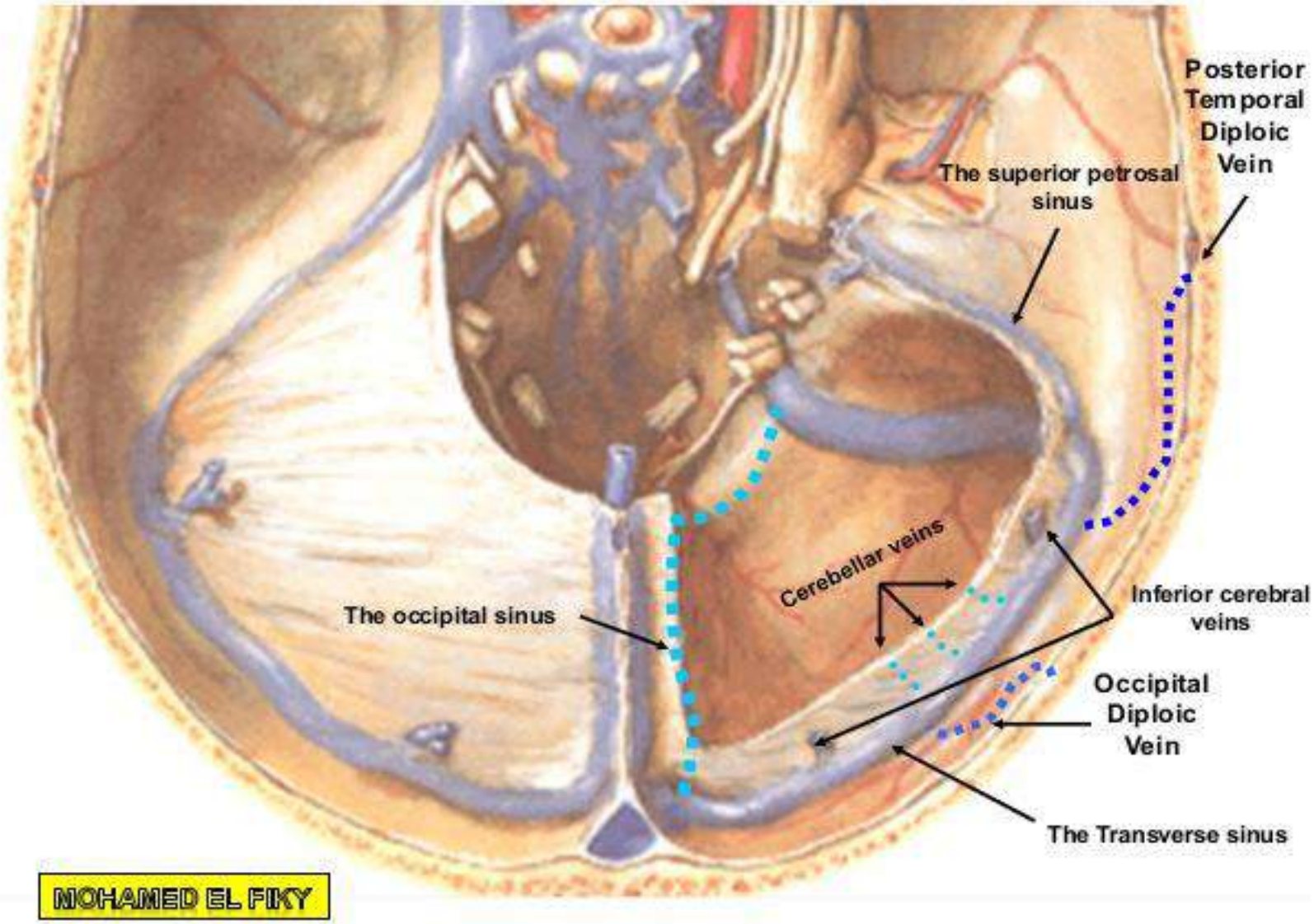
Posterior Temporal Diploic Vein
The superior petrosal sinus
Cerebellar veins
Inferior cerebral veins
The occipital sinus
Occipital Diploic Vein
The Transverse sinus
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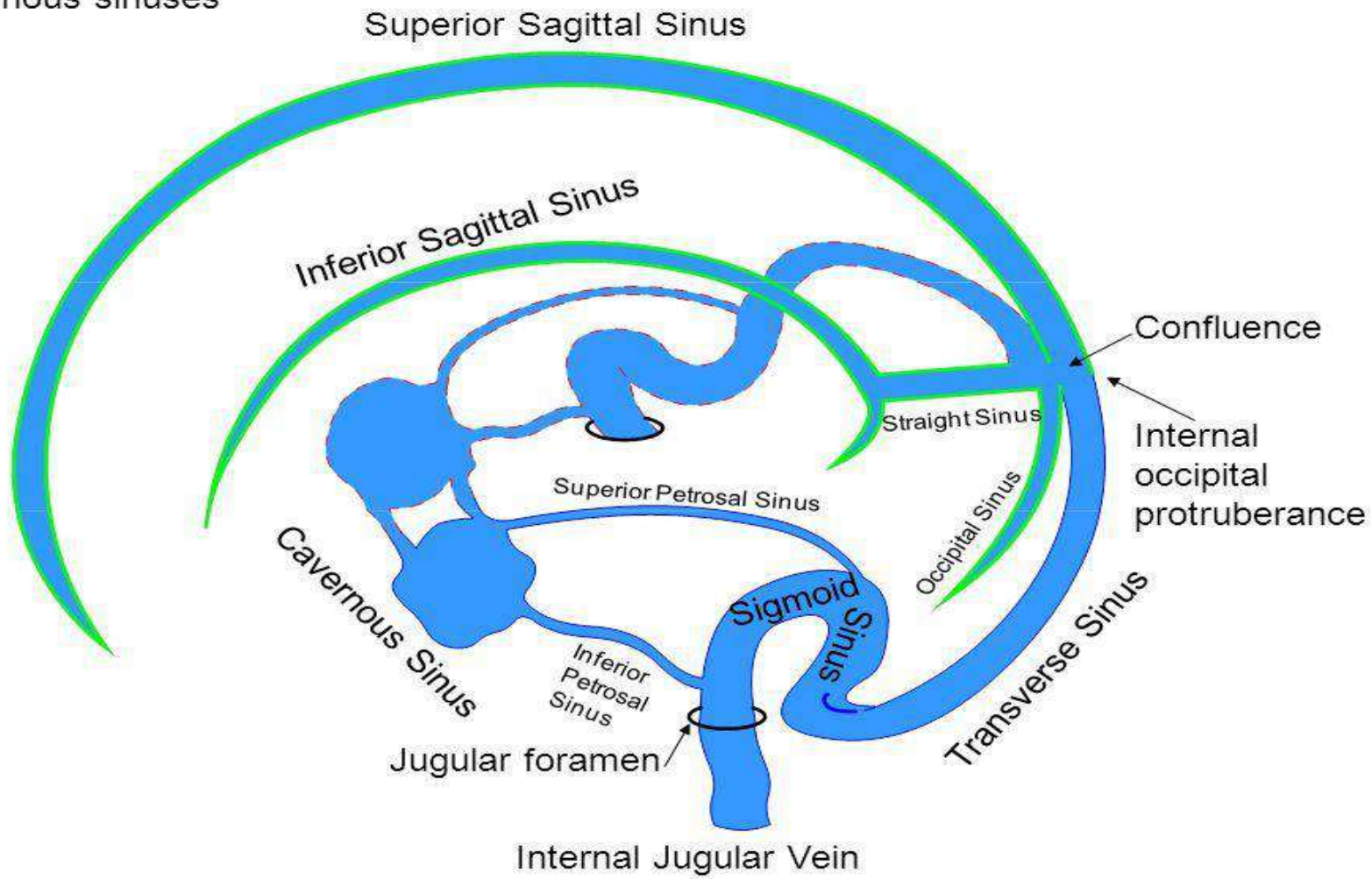
Venous sinuses

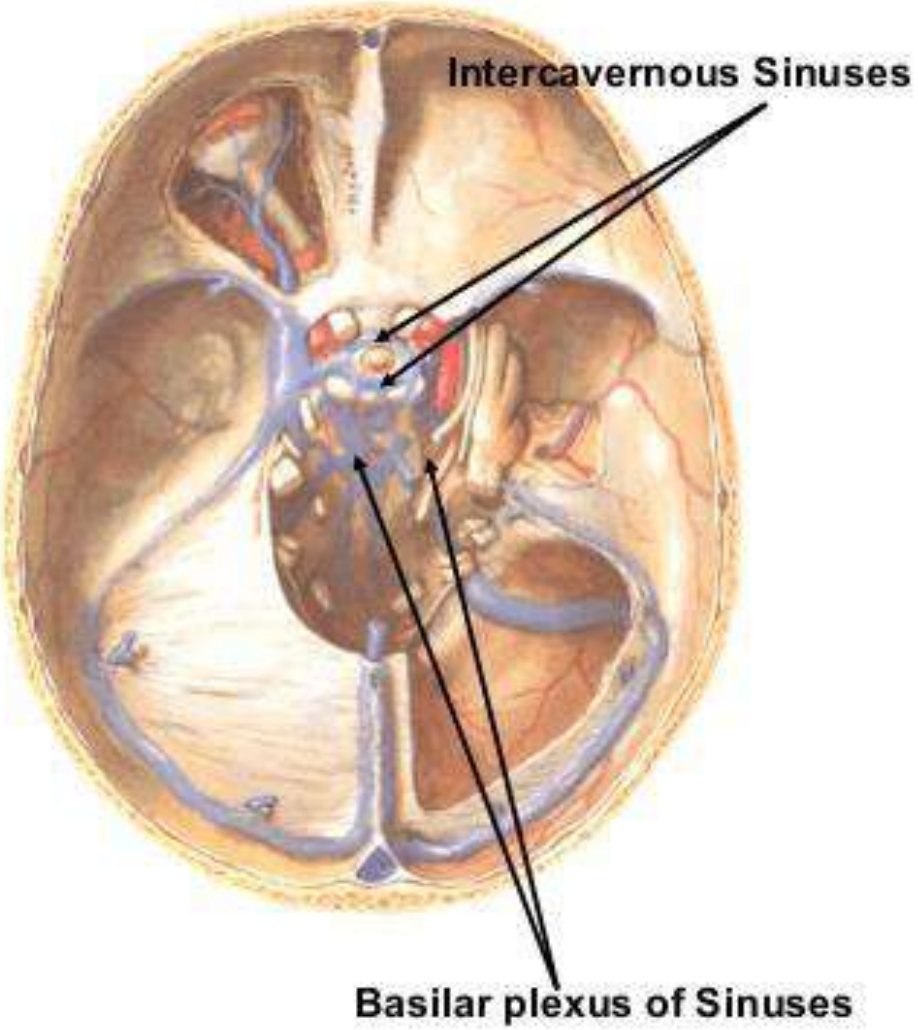


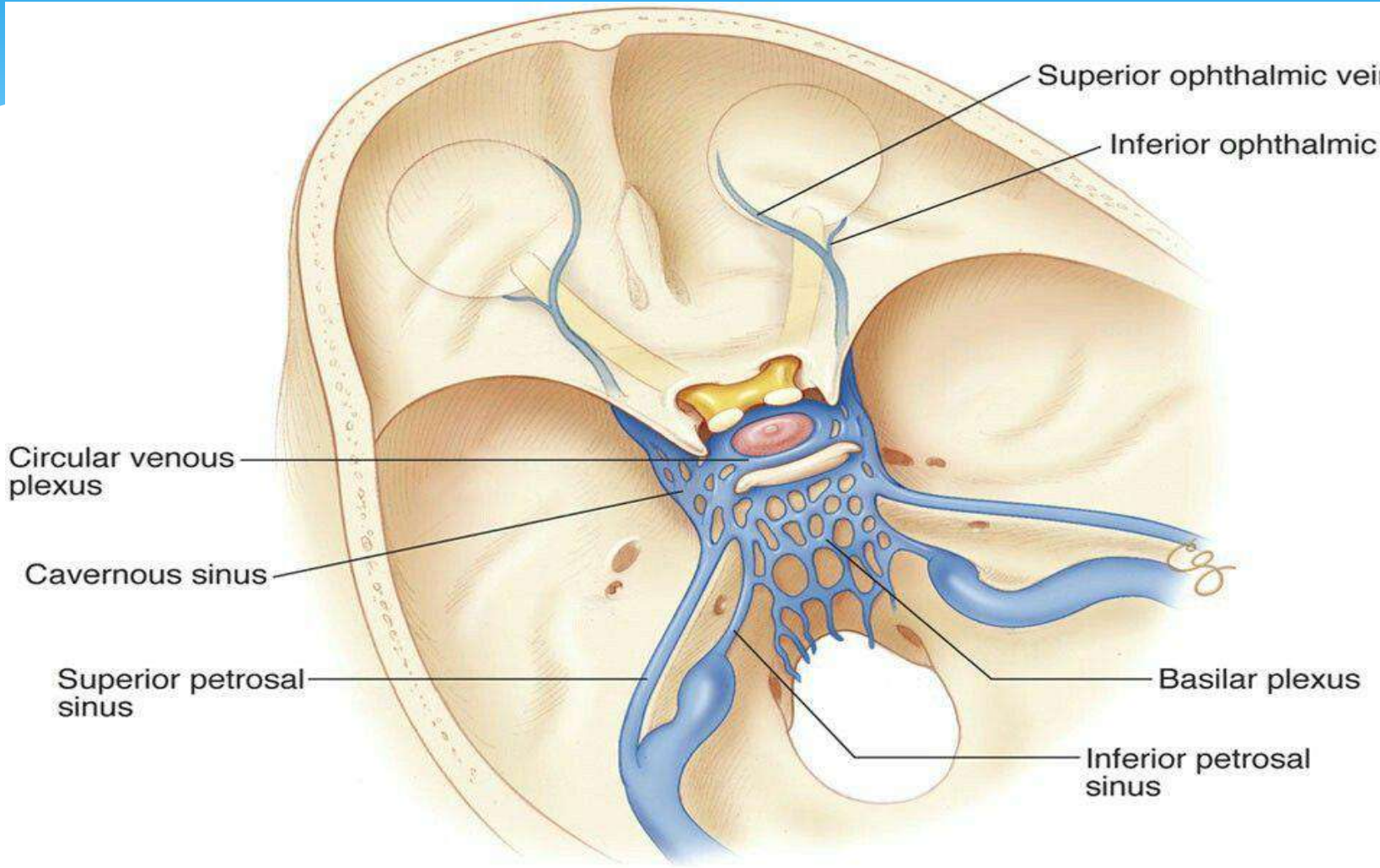
6- Basilar Plexus of Sinuses

Site: over the basilar part of the occipital bone.

Formation: formed of several interconnecting venous channels between the two layers of the dura.

Communications: connects the inferior petrosal sinuses of the two sides.




Superior ophthalmic vein
Inferior ophthalmic vein
Circular venous plexus
Cavernous sinus
Superior petrosal sinus
Basilar plexus
Inferior petrosal sinus

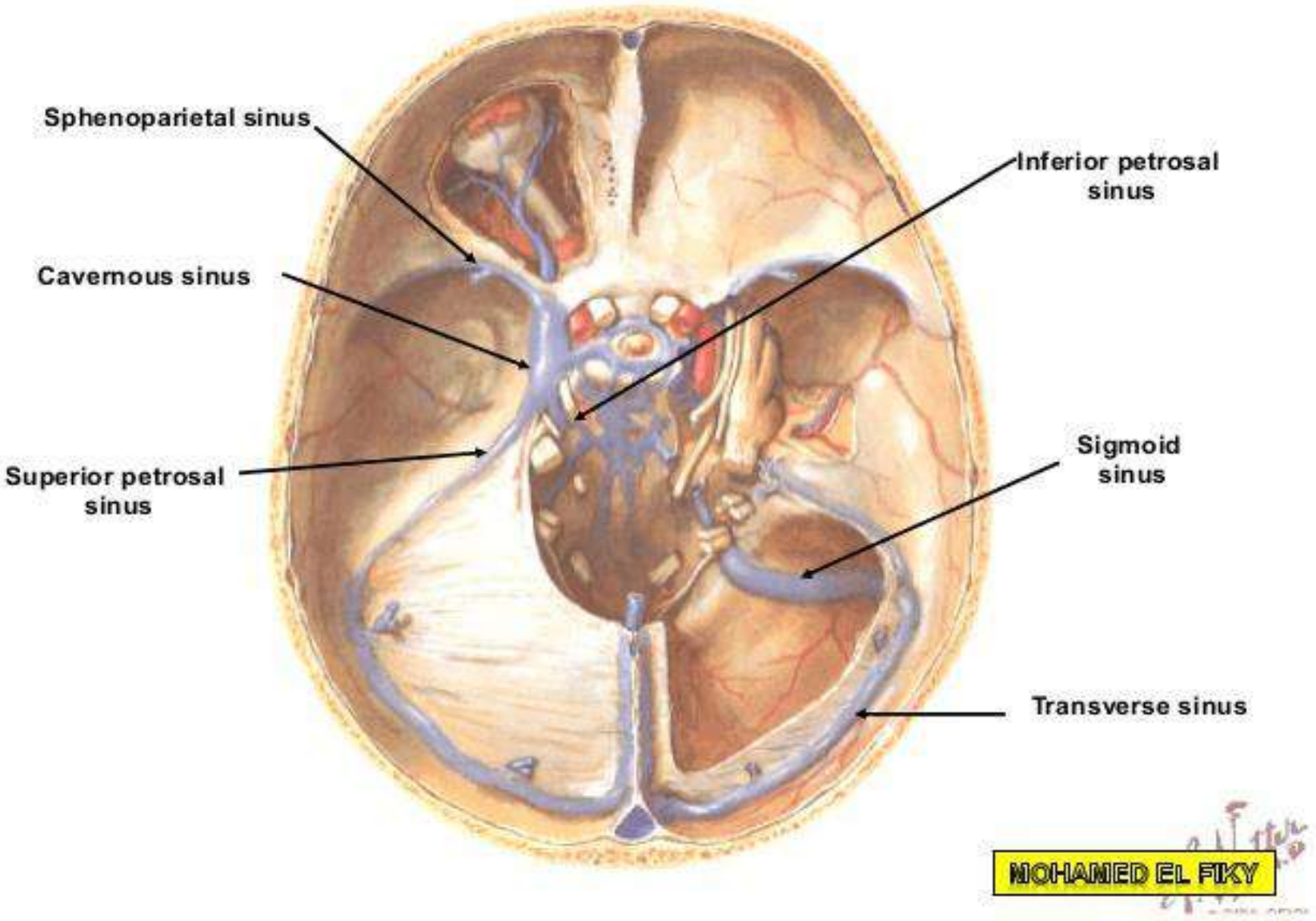
II- Paired Sinuses

1- Sphenoparietal Sinus

Site: Lies along the posterior free margin of the lesser wing of the sphenoid.
Termination: In the cavernous sinus.

2- Cavernous Sinus

Introduction: It is a large venous space between the two layers of the dura. It is called cavernous because of its spongy structure.
Site: In the middle cranial fossa, on either sides of the body of the sphenoid.


Sphenoparietal sinus
Inferior petrosal sinus
Cavernous sinus
Superior petrosal sinus
Sigmoid sinus
Transverse sinus
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Extent: From the medial end of the superior orbital fissure anteriorly to the apex of the petrous temporal posteriorly.

Size: It is about 2 cm long, and 1 cm wide.

Relations:

(a) Superiorly: optic chiasma

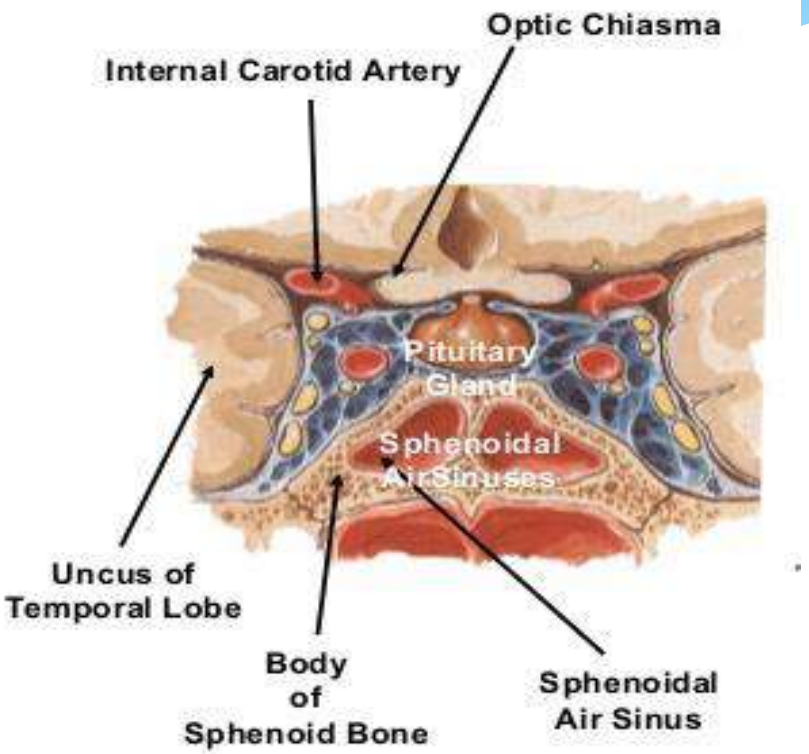
(b) Inferiorly sphenoidal air sinus.

(c) Medially: hypophysis cerebri.

(d) Laterally: temporal lobe.

(e) Anteriorly: superior orbital fissure.

(f) Posteriorly: apex of petrous temporal.



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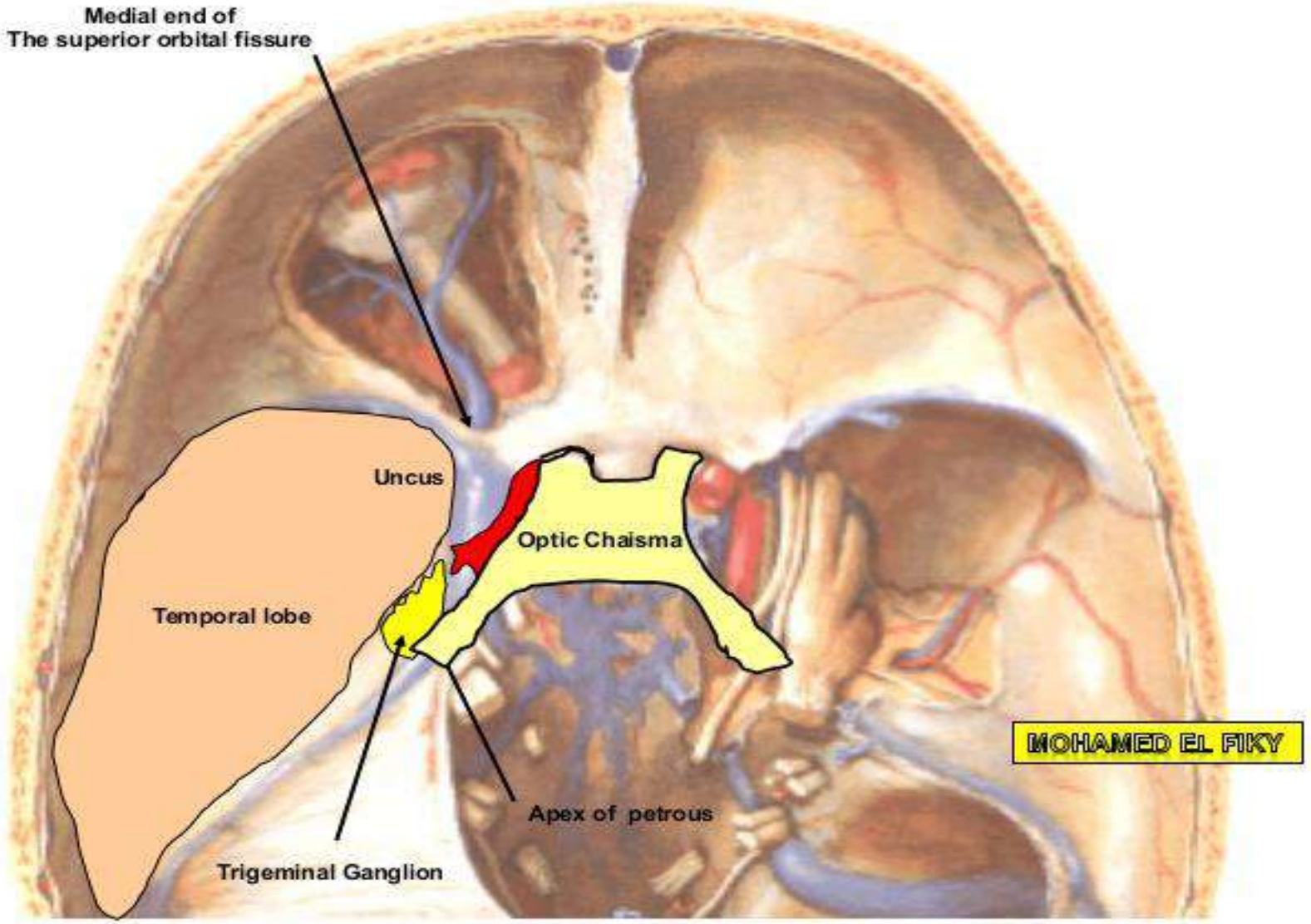
Medial end of
The superior orbital fissure
Uncus
Optic Chaisma
Temporal lobe
Apex of petrous
Trigeminal Ganglion
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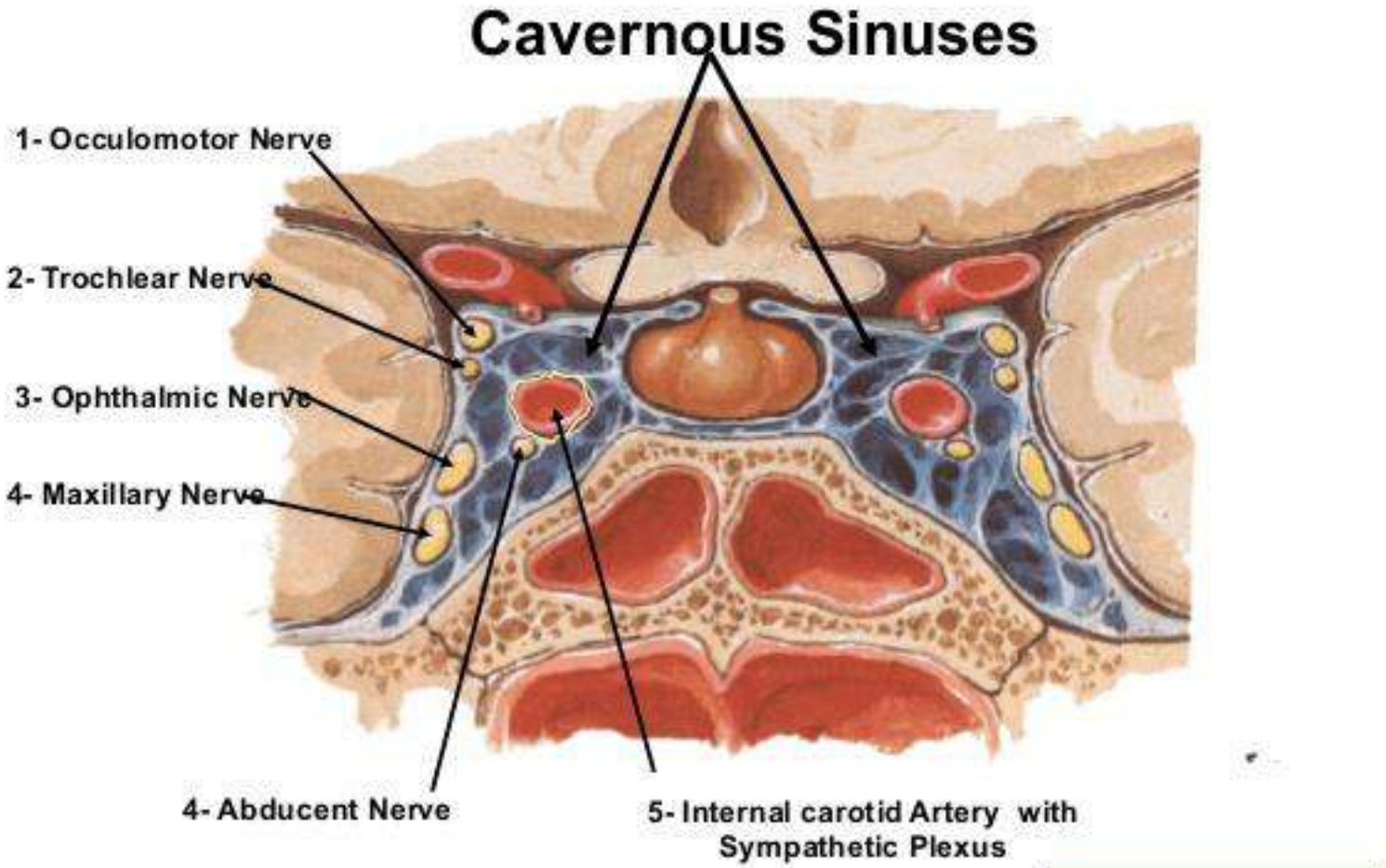
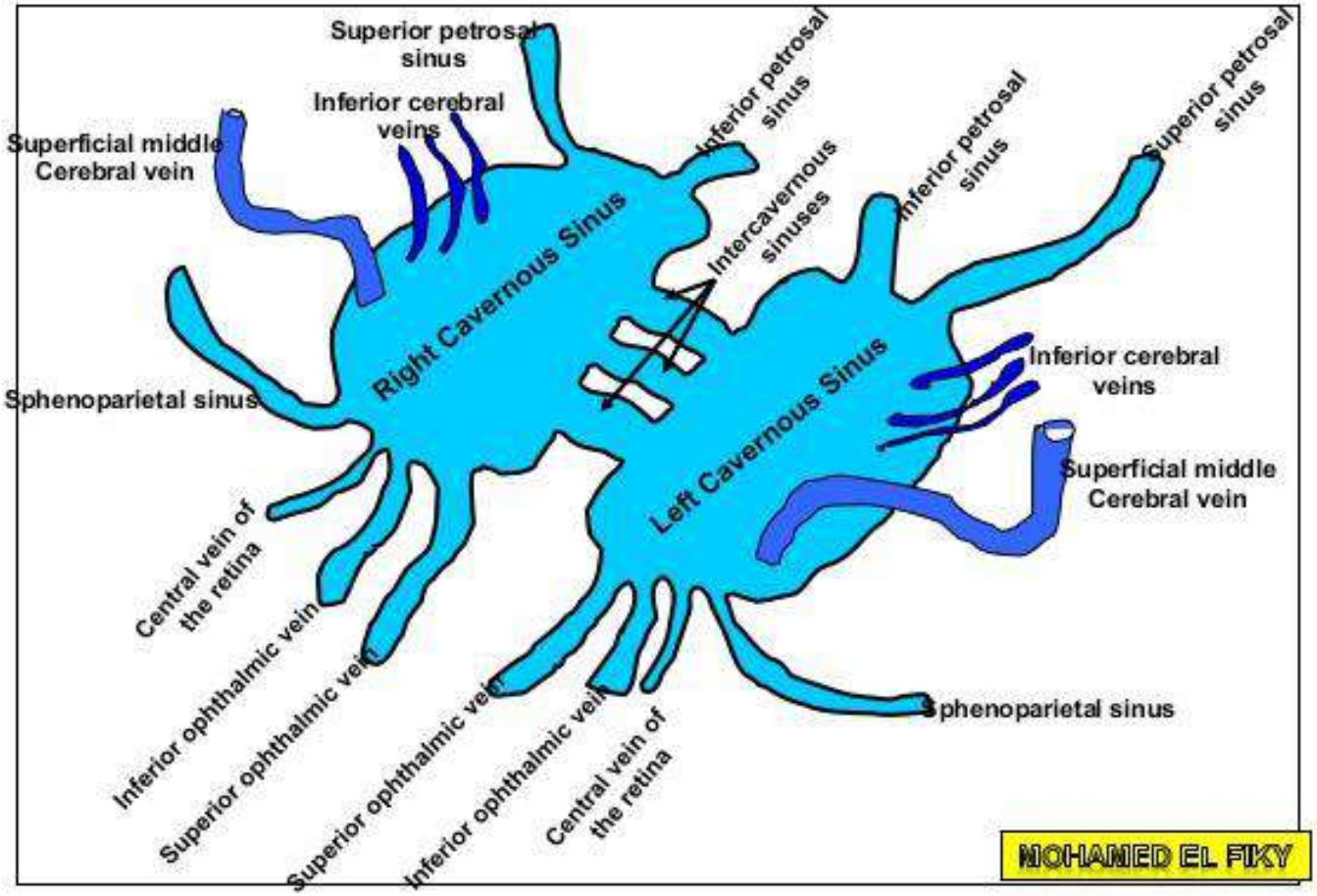
Contents of Cavernous Sinus



Tributaries of Cavernous Sinus



Tributaries of Cavernous Sinus

(A) Anteriorly: receives :

(1) Superior ophthalmic vein: connecting it with the facial vein.

(2) Branch or whole of inferior, ophthalmic vein.

(3) Central vein of the retina: may 'drain either into the superior
ophthalmic vein or into the cavernous sinus.

(B) Posteriorly: receives:

(1) Superior petrosal sinus: connecting it with the transverse sinus.

(2) Inferior petrosal sinus: connecting it with the internal jugular vein.

(C) Superiorly: receives :

(1) Superficial middle cerebral vein.

(2) Inferior cerebral veins from the temporal lobe.

(D) Inferiorly: Communicates with the venous plexus outside the skull by emissary veins, which pass through:

(1) Foramen lacerum: to connect it with the pharyngeal plexus.

(2) Foramen ovale or emissary sphenoidal foramen: to connect with the pterygoid plexus of veins.

(E) Medially: the two sinuses communicate with each other through the intercavernous sinuses.

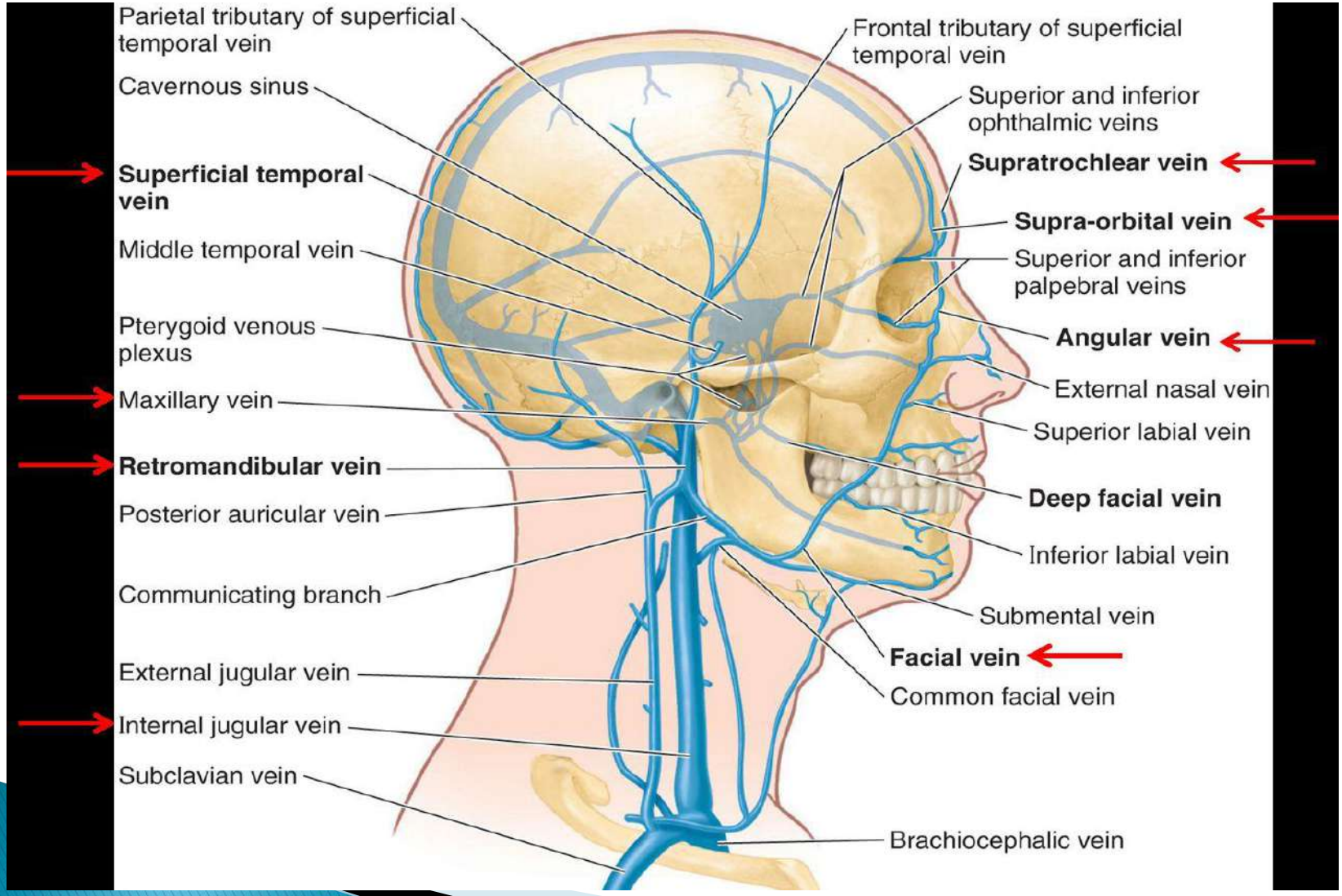
4- Superior Petrosal Sinus

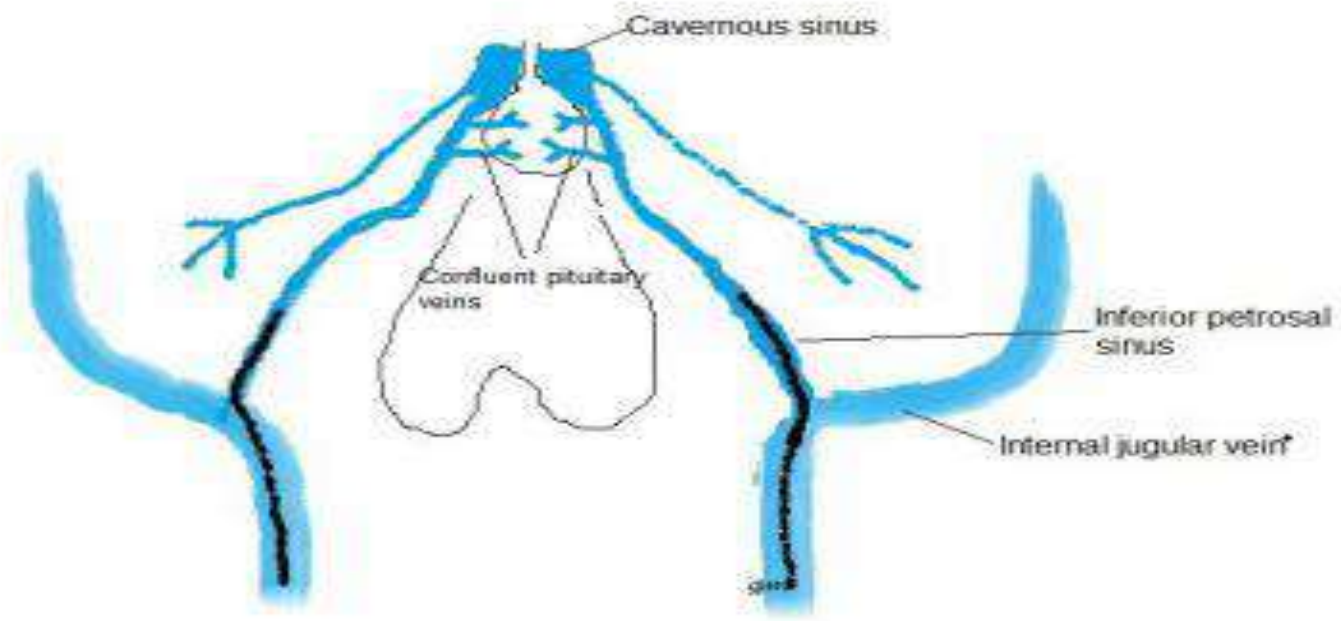
Beginning: Posterior end of the cavernous sinus.
Site: Lies along the upper border, of petrous temporal in the attached margin of the tentorium cerebelli.
Termination: In the transverse sinus.

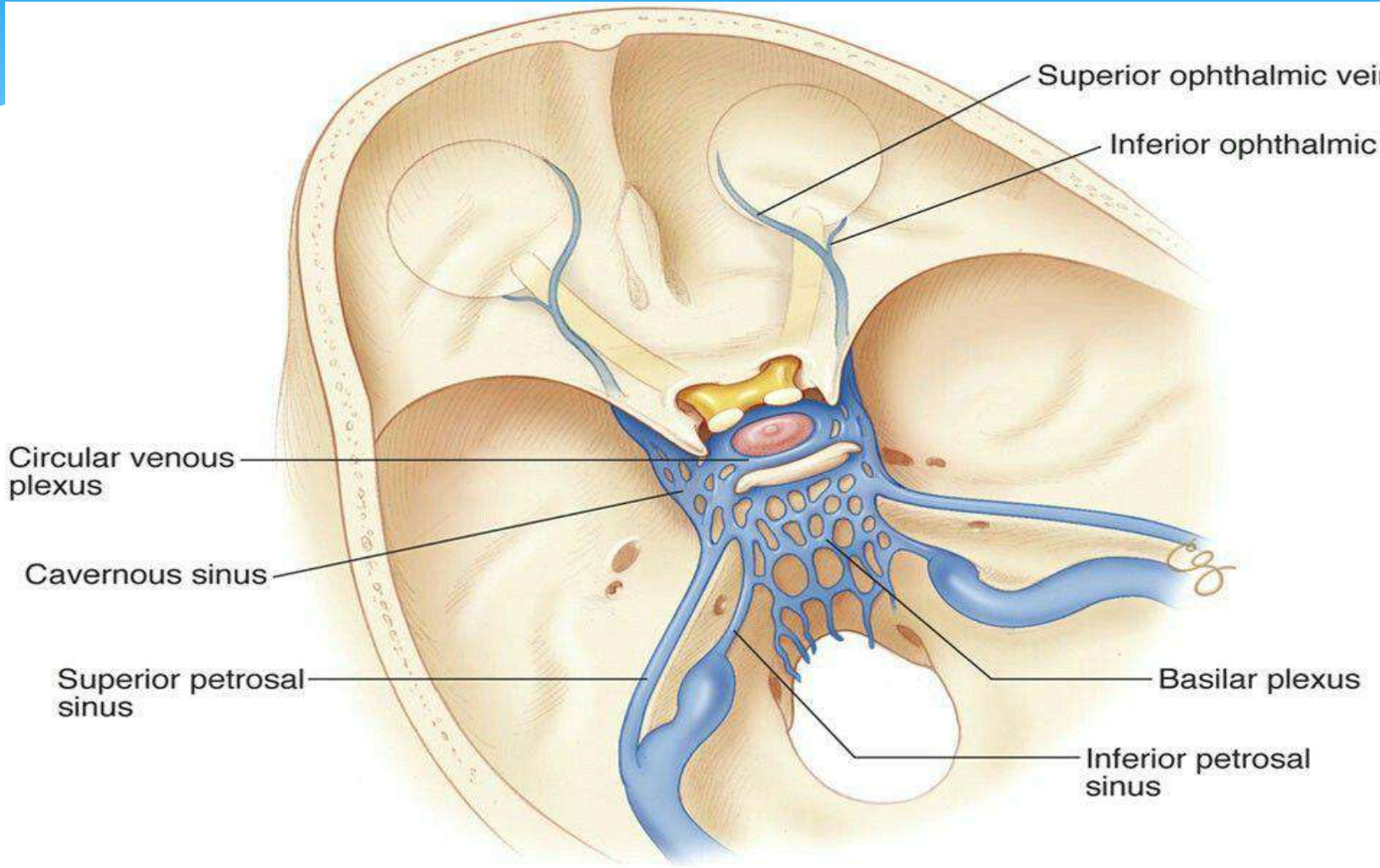
5- Inferior Petrosal Sinus

Beginning: Posterior end of the cavernous sinus.
Site: Lies in the petro-occipital fissure, then passes through the anterior compartment of jugular foramen.
Termination: Into the internal jugular vein.

revision


Parietal tributary of superficial temporal vein
Cavernous sinus
Superficial temporal vein
Middle temporal vein
Pterygoid venous plexus
Maxillary vein
Retromandibular vein
Posterior auricular vein
Communicating branch
External jugular vein
Internal jugular vein
Subclavian vein
Frontal tributary of superficial temporal vein
Superior and inferior ophthalmic veins
Supratrochlear vein
Supra-orbital vein
Superior and inferior palpebral veins
Angular vein
External nasal vein
Superior labial vein
Deep facial vein
Inferior labial vein
Submental vein
Facial vein
Common facial vein
Brachiocephalic vein


Cavernous sinus
Confluent pituitary veins
Inferior petrosal sinus
Internal jugular vein


Superior ophthalmic vein
Inferior ophthalmic vein
Circular venous plexus
Cavernous sinus
Superior petrosal sinus
Basilar plexus
Inferior petrosal sinus

5- Transverse Sinus

Origin:

(a) The right sinus is usually the continuation of the superior sagittal sinus, and the left one is a continuation of the straight sinus.

(b) The reverse of the above arrangement may happen.

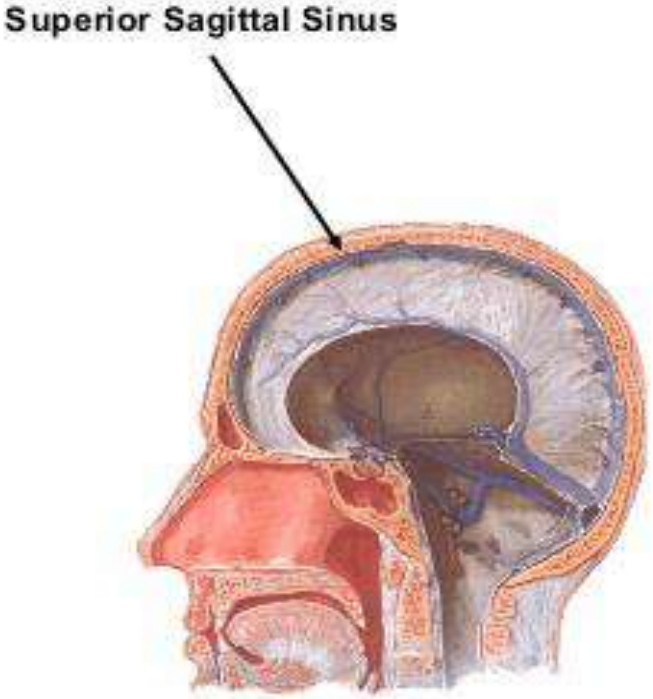
(c) From the ***confluence of sinuses*** which, is formed by the meeting of superior sagittal, straight and the two transverse sinuses.

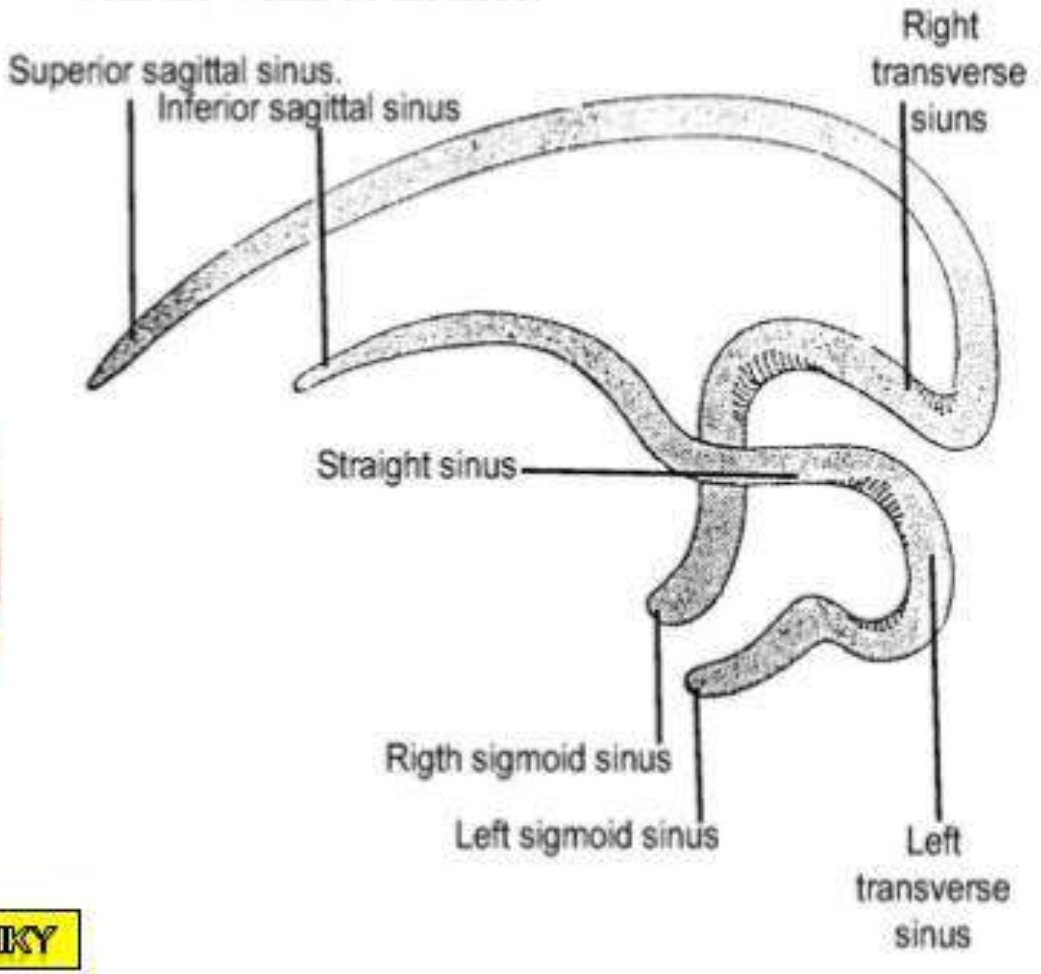
Site: Along the transverse sulcus in the attached margin of the tentorium cerebelli,

Termination: Ends by becoming the sigmoid sinus.

Termination of Superior Sagittal Sinus

with the veins of the nose.





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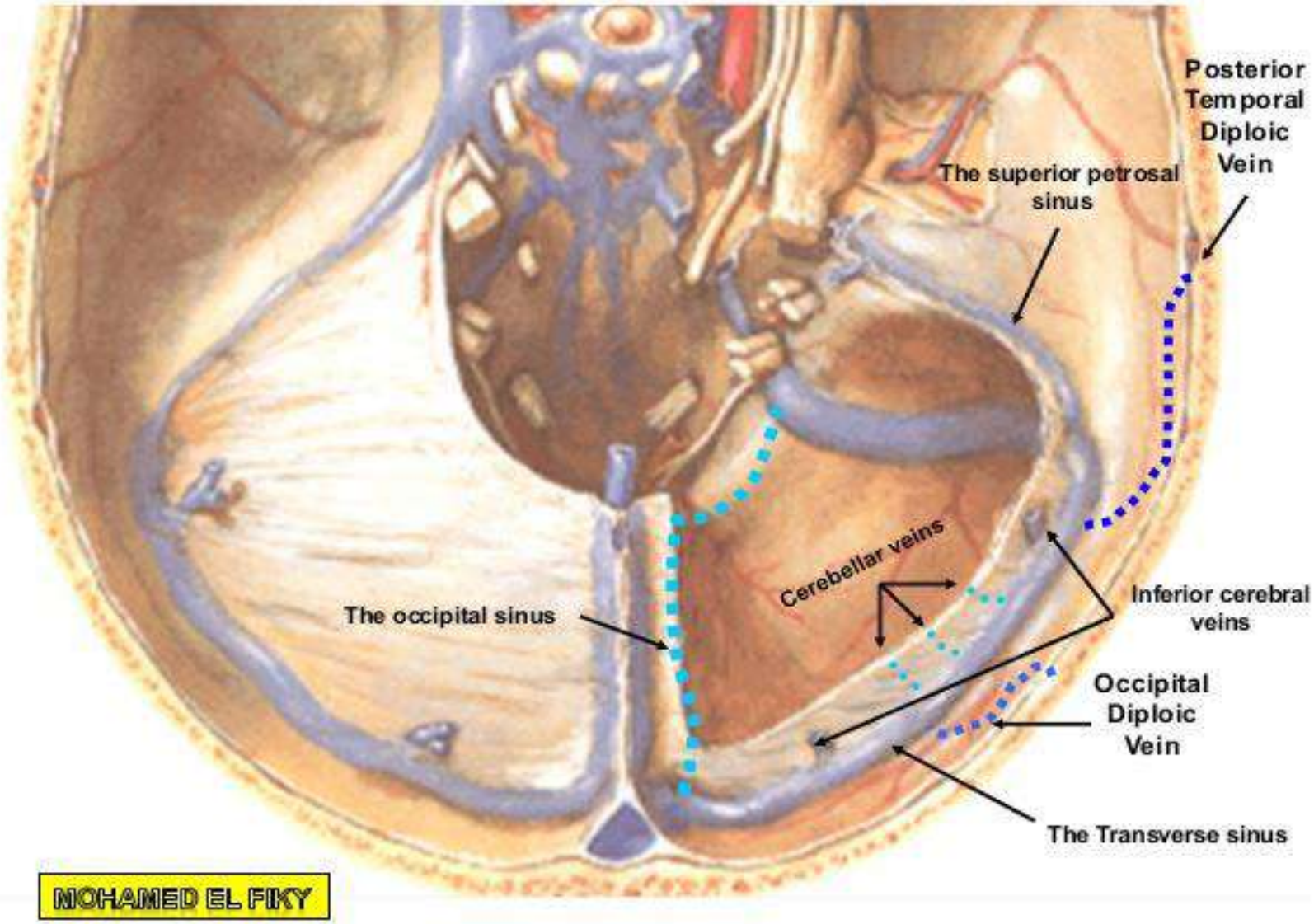
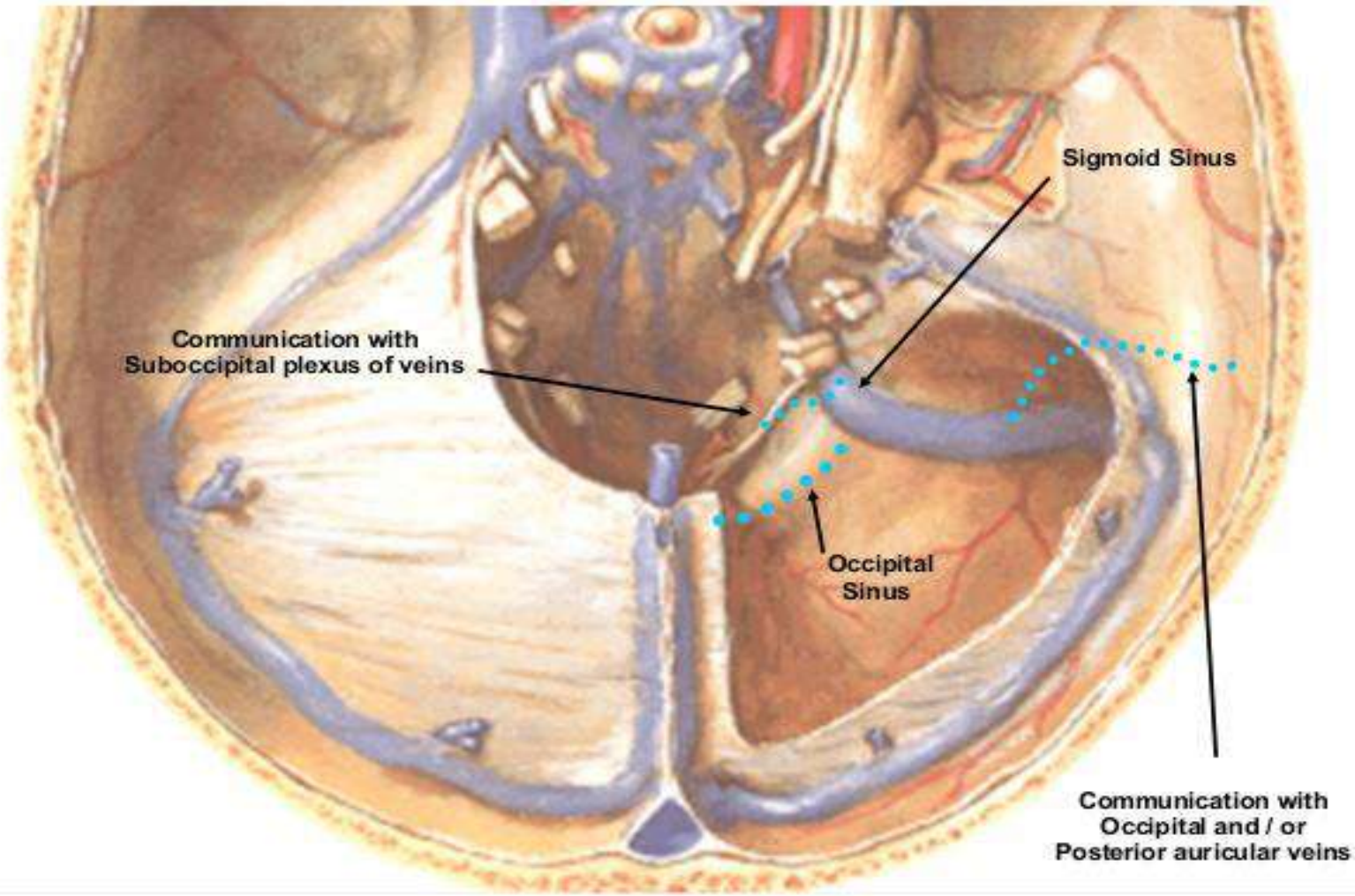

Posterior Temporal Diploic Vein
The superior petrosal sinus
Cerebellar veins
Inferior cerebral veins
The occipital sinus
Occipital Diploic Vein
The Transverse sinus
NOHAMED EL FIKY

6- Sigmoid Sinus

Origin: Is the direct continuation of the transverse sinus at the postero inferior angle of the parietal bone.
Shape: S-shaped.
Course: Runs downwards and medially in the sigmoid sulcus.
Termination: ends by passing through the posterior compartment of the jugular foramen to become the internal jugular vein.



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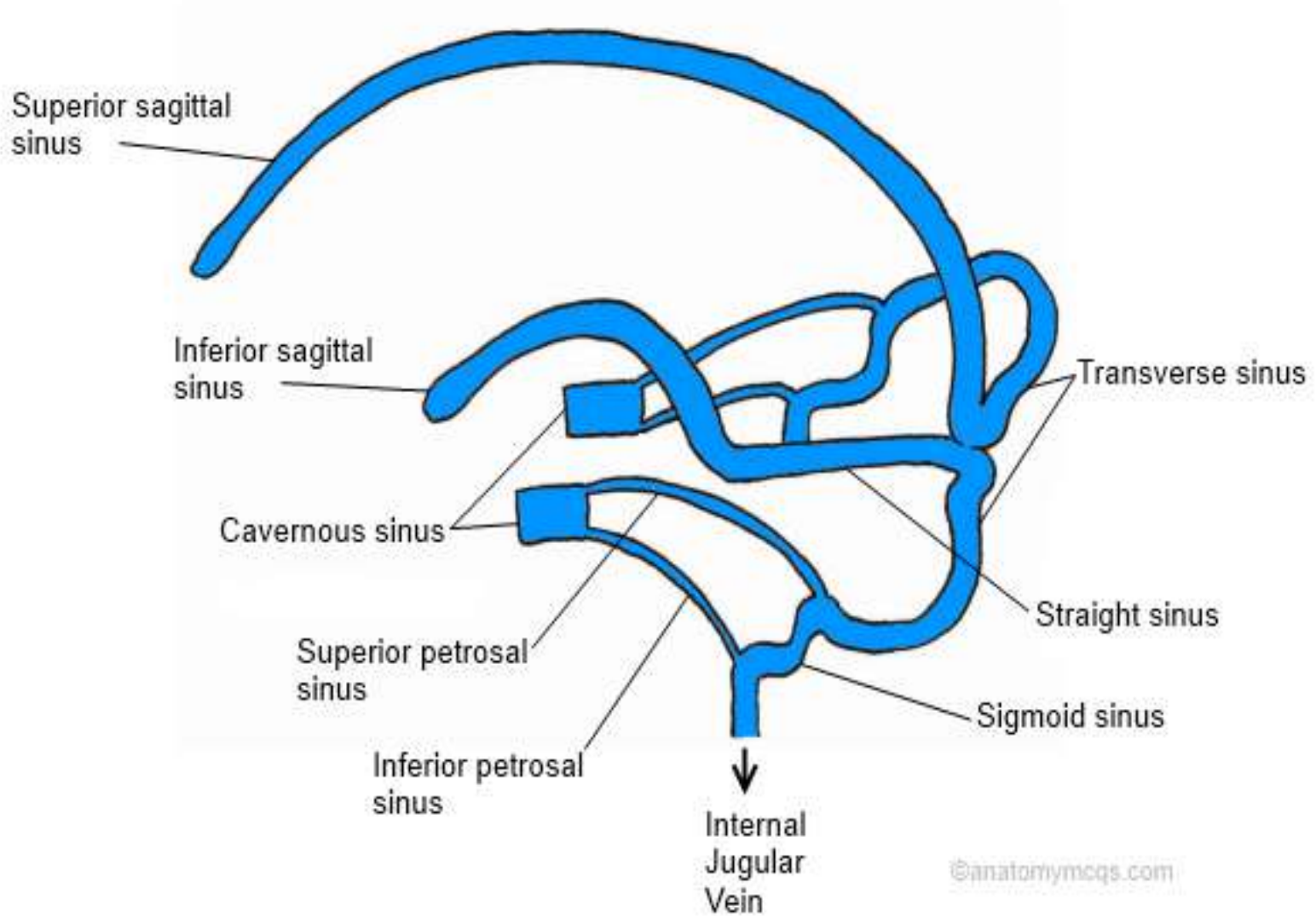
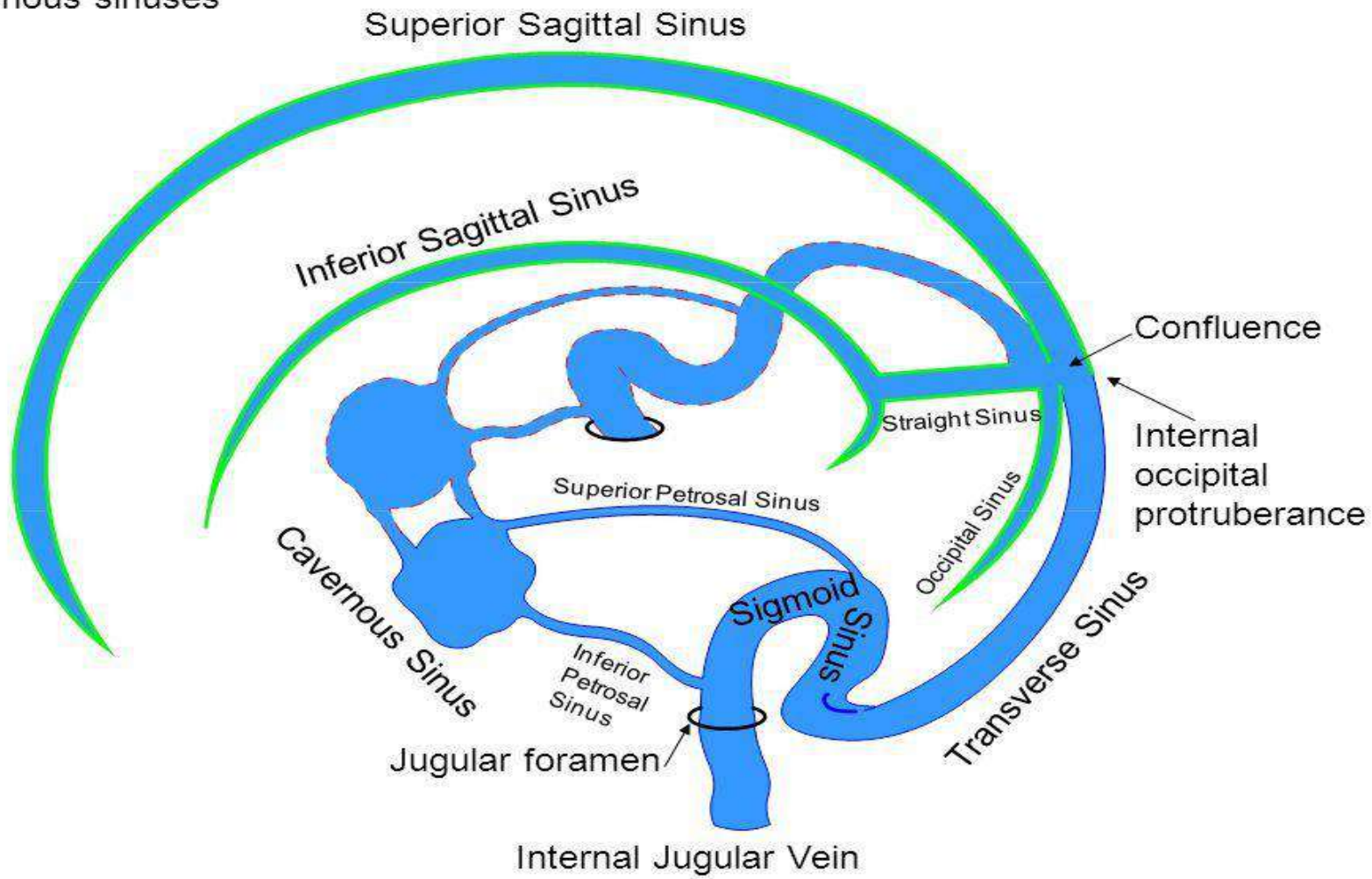
VENOUS SINUSES



Venous sinuses

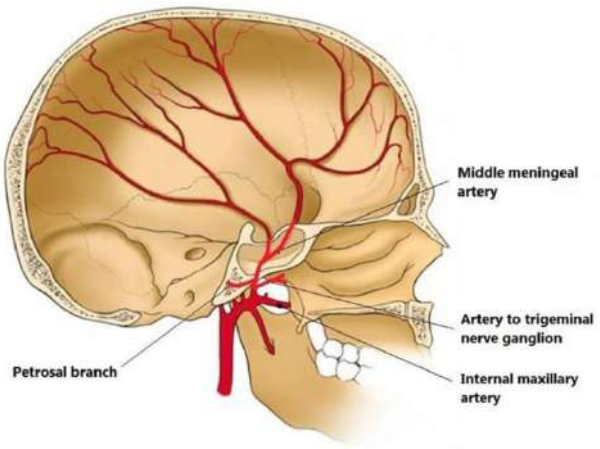


Fold	Shape	Venous sinuses enclosed
Falx cerebri	Sickle-shaped	Superior sagittal, inferior sagittal and straight sinuses
Tentorium cerebelli	Tent-shaped (semilunar)	Transverse and superior petrosal sinuses
Falx cerebelli	Sickle-shaped	Occipital sinus
Diaphragma sellae	Horizontal fold	Anterior and posterior intercavernous sinuses

Shapes of dural folds and e


Thank You

Middle meningeal artery



Clinical Correlation
middle meningeal artery

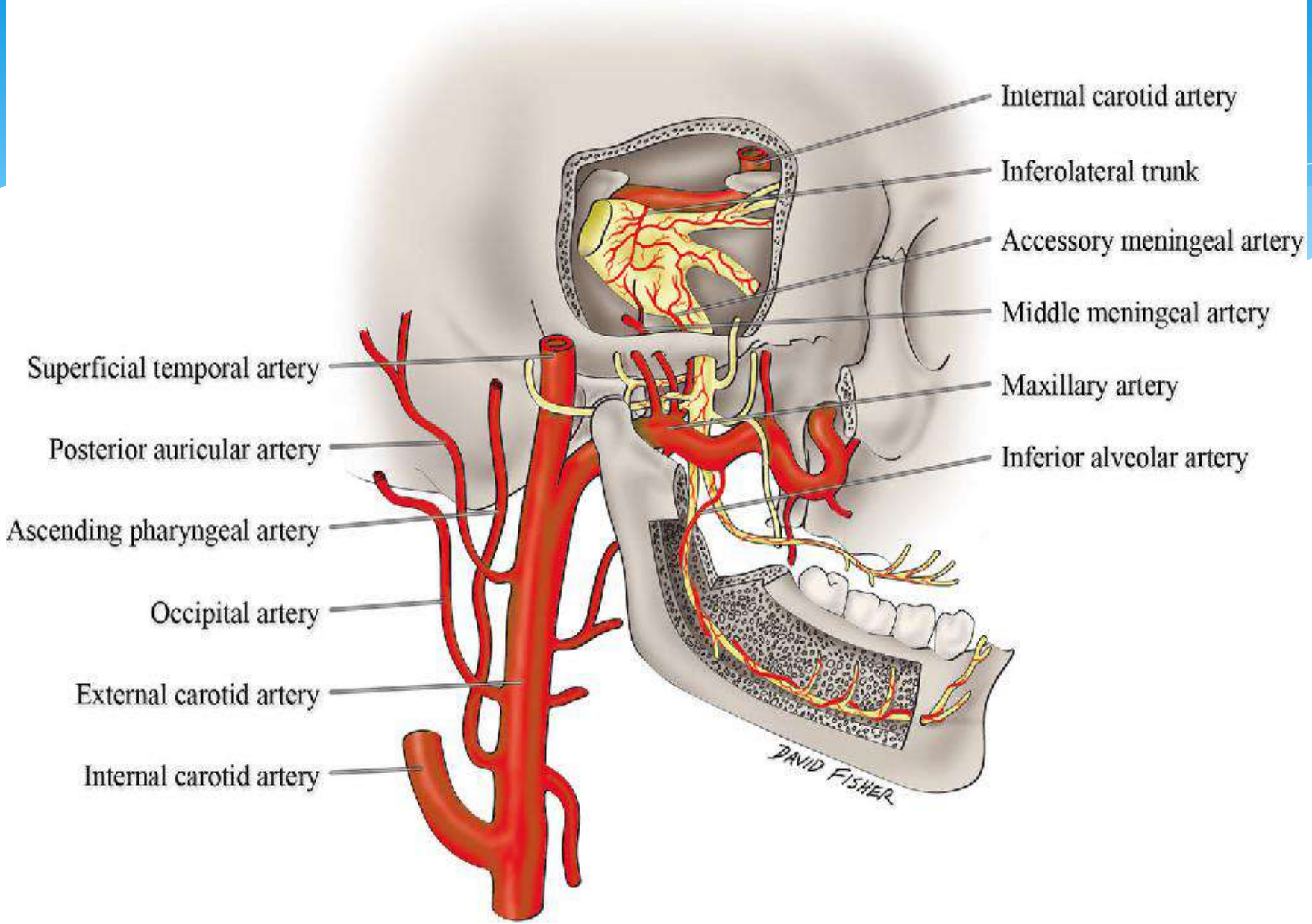
The *middle meningeal artery*, a branch of maxillary artery enters the cranial cavity through the foramen spinosum to lie between the endosteal and meningeal layers of dura mater.

Its anterior and posterior branches, along with accompanying meningeal veins (between the arteries and bone) stand out prominently as if in relief on the external surface of the dura mater to groove and supply bones of the cranial vault.

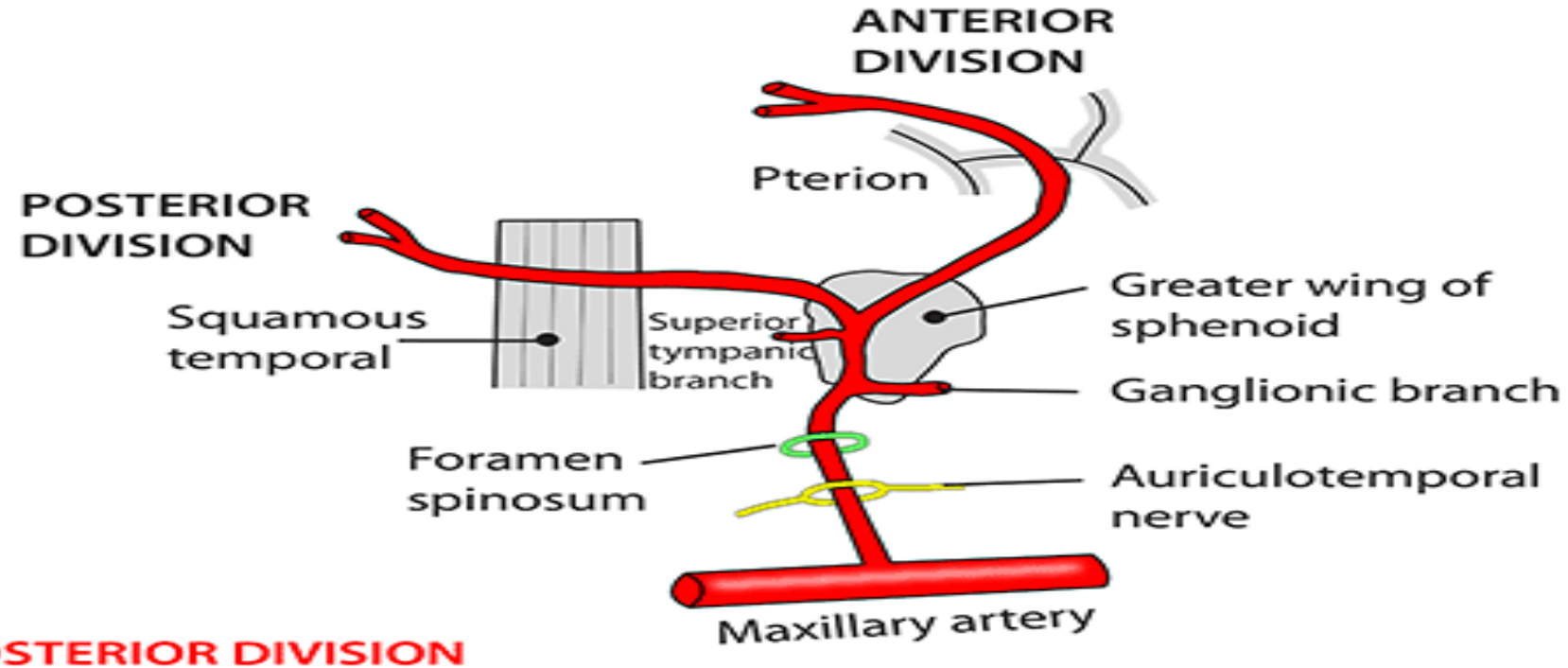
The anterior (frontal) branch crosses the pterion, on its inner aspect

and the posterior (parietal) branch ascends backwards towards the lambda.

A fracture of thin squamous temporal bone may cause a middle meningeal haemorrhage from the artery or vein, producing an extradural haematoma.


Internal carotid artery
Inferolateral trunk
Accessory meningeal artery
Middle meningeal artery
Maxillary artery
Inferior alveolar artery
Superficial temporal artery
Posterior auricular artery
Ascending pharyngeal artery
Occipital artery
External carotid artery
Internal carotid artery
DAVID FISHER

RIGHT MIDDLE MENINGEAL ARTERY



POSTERIOR DIVISION

Where a vertical line from the mastoid process meets a horizontal line from the upper margin of the orbit. Fractured skull leads to extradural haemorrhage

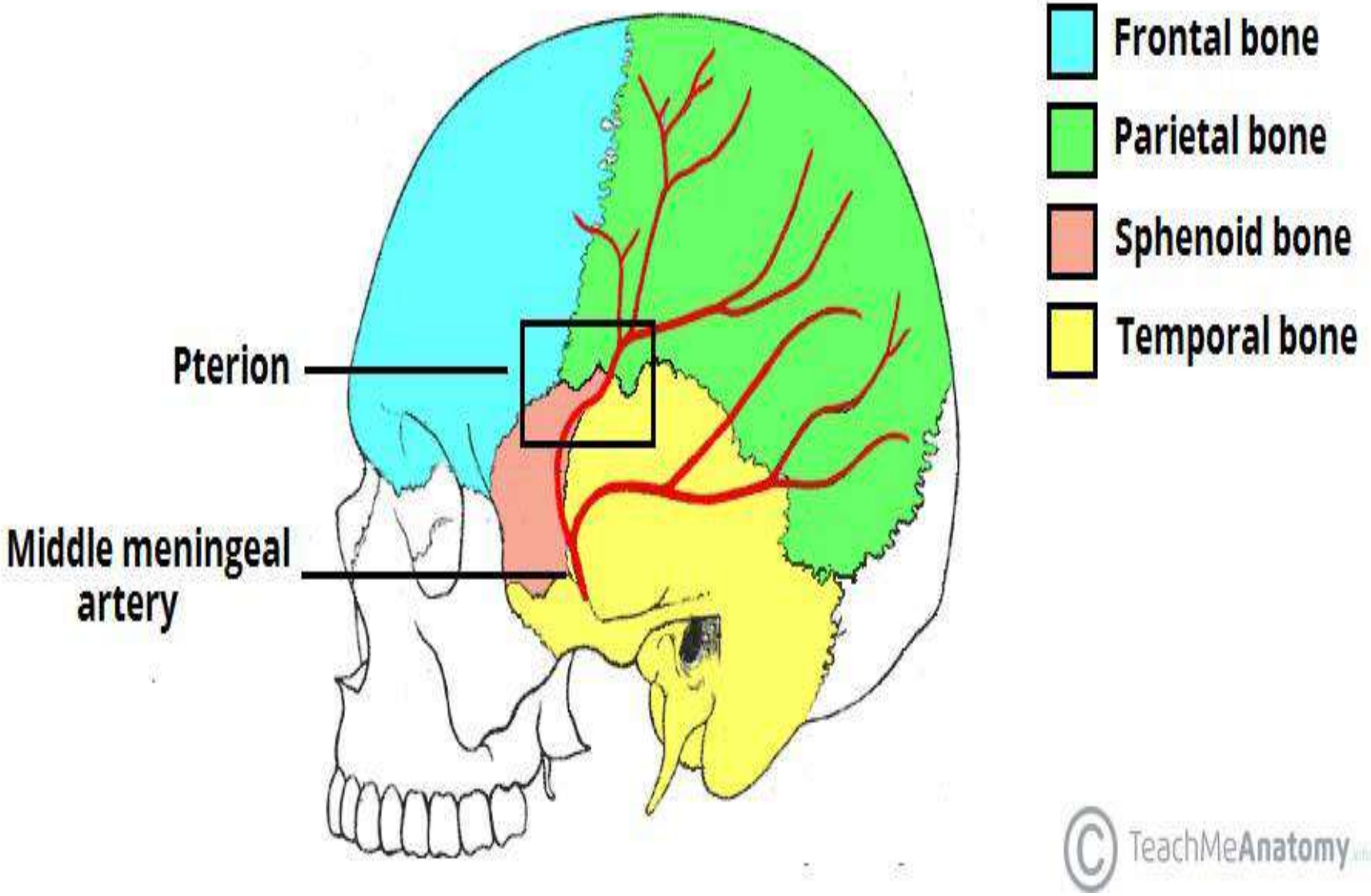
ANTERIOR DIVISION

3cm above the midpoint of the zygomatic arch. Fractured skull leads to extradural haemorrhage with pressure on the motor area

Venous drainage of skull

Diploic veins to sinuses within skull or to veins outside skull.
Meningeal veins to sphenoparietal sinus within skull or pterygoid plexus in infratemporal fossa

Note: the grooves on the insde of the skull are said to be due to veins and not the arteries. **Middle meningeal artery does NOT supply the brain**


Pterion
Middle meningeal artery
Frontal bone
Parietal bone
Sphenoid bone
Temporal bone
© TeachMeAnatomy

Pterion

Pterion is a point of clinical significance – the skull is very thin at this point. In addition to being structurally weak due to being the point of union between several bones, it also lies over the **anterior division of the middle meningeal artery**.

Fracture of the skull at this point can therefore disrupt the middle meningeal artery, leading to an **extradural (epidural) haematoma**

The structure indicated is known as **pterion.**

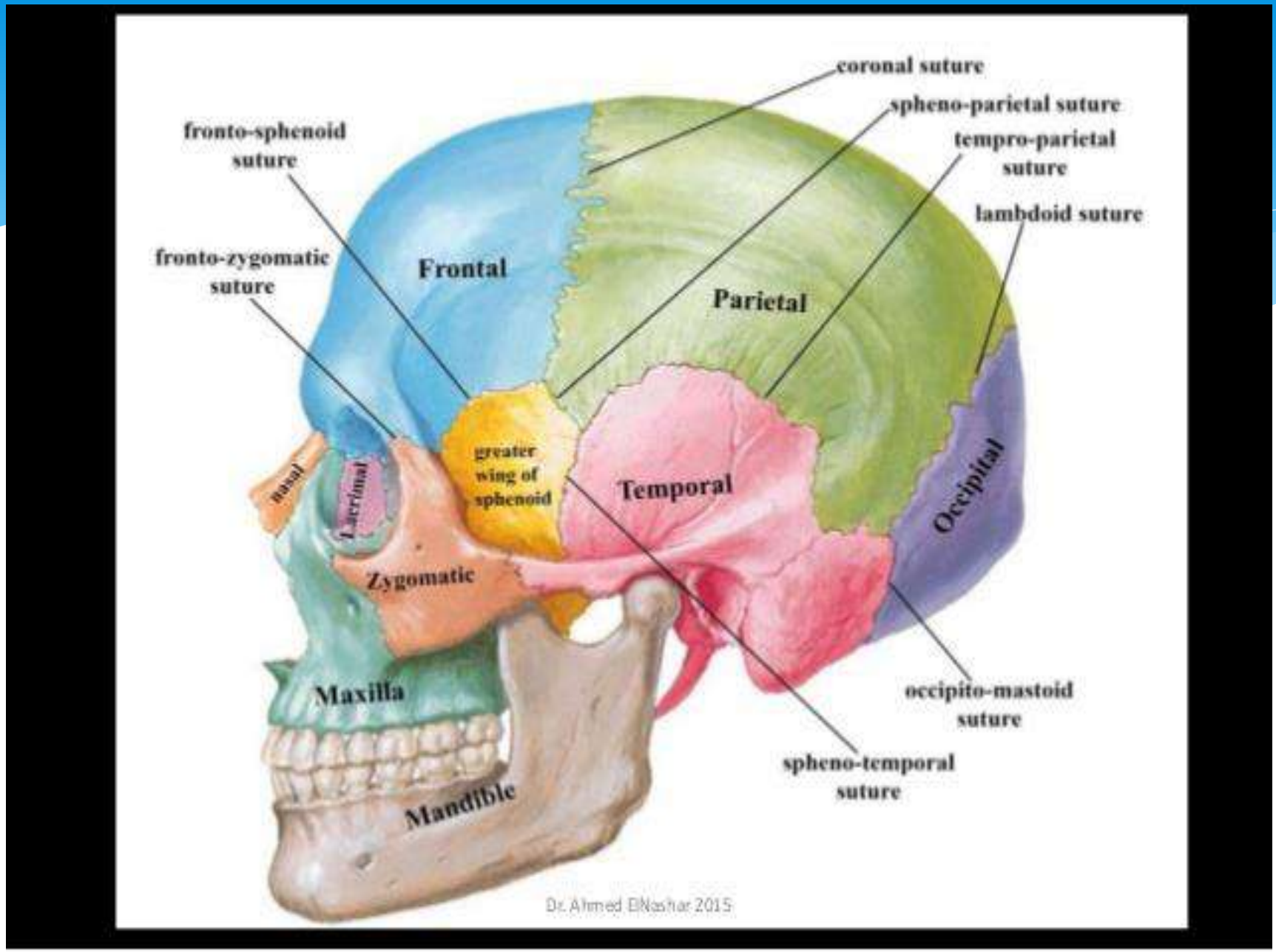
Pterion is the name given to the region on the lateral aspect of the skull where **four bones** are joined:

- Parietal bone
- Squamous part of temporal bone
- Front bone
- Greater wing of sphenoid bone

.

Pterion involves **three cranial sutures**:

- Sphenoparietal suture
- Coronal suture
- Squamous suture


coronal suture
spheno-parietal suture
fronto-sphenoid suture
tempro-parietal suture
lambdoid suture
fronto-zygomatic suture
Frontal
Parietal
greater wing of sphenoid
Temporal
Occipital
nasal
Lacrimal
Zygomatic
Maxilla
occipito-mastoid suture
spheno-temporal suture
Mandible
Dr. Ahmed ElNashar 2015

Internal carotid artery