The University of Jordan
Faculty Of Medicine

Cranial Cavity Part 1

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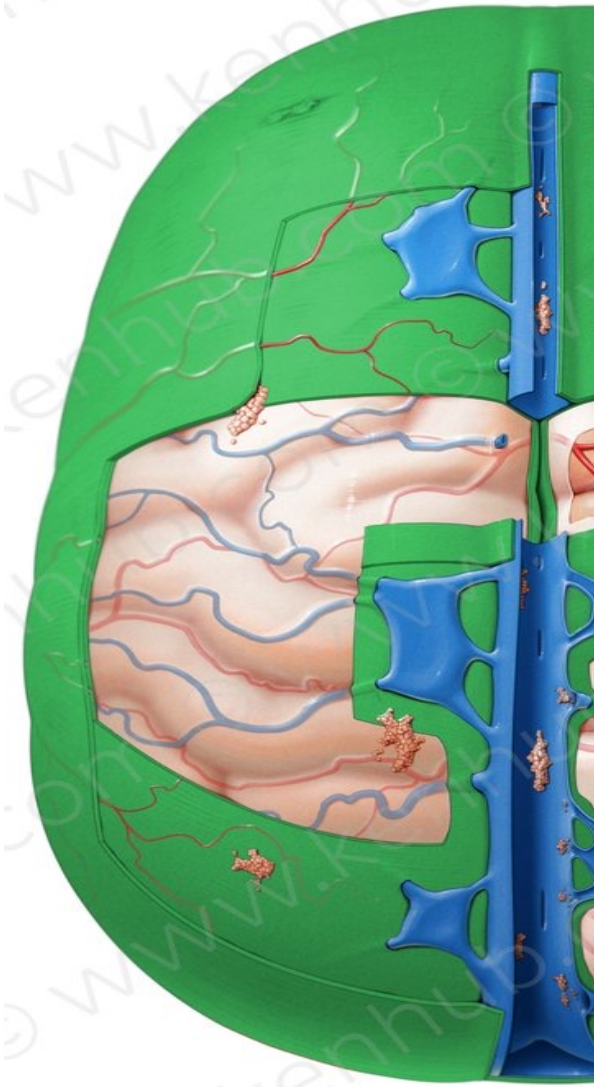
The cranial cavity is the space inside the skull that accommodates the brain and its associated structures.

The whole of the brain and spinal cord are enveloped by three membranes called the meninges which are named from outside to inside :

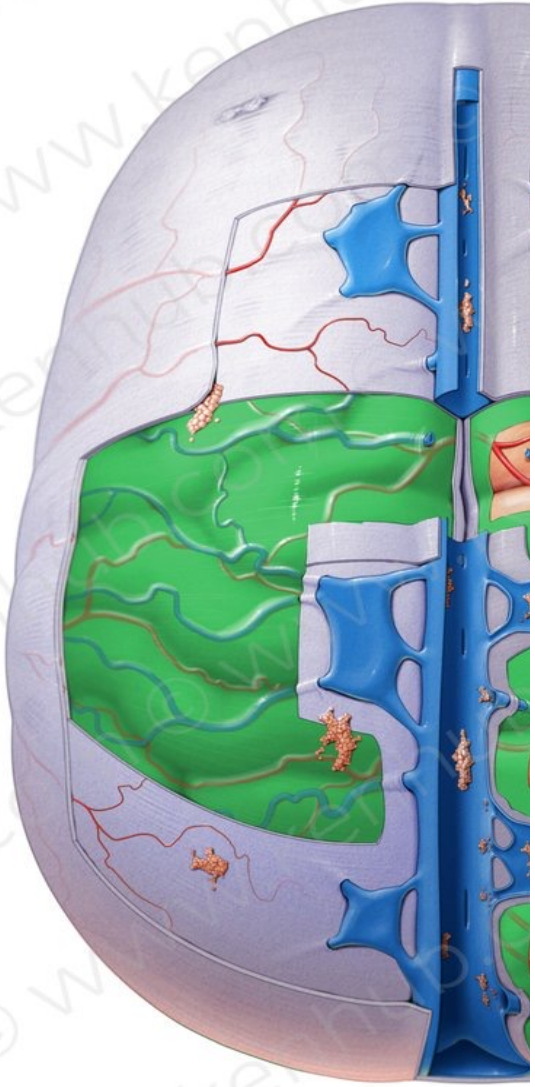
1. Dura mater
2. Arachnoid
3. Pia mater

They are separated by two spaces

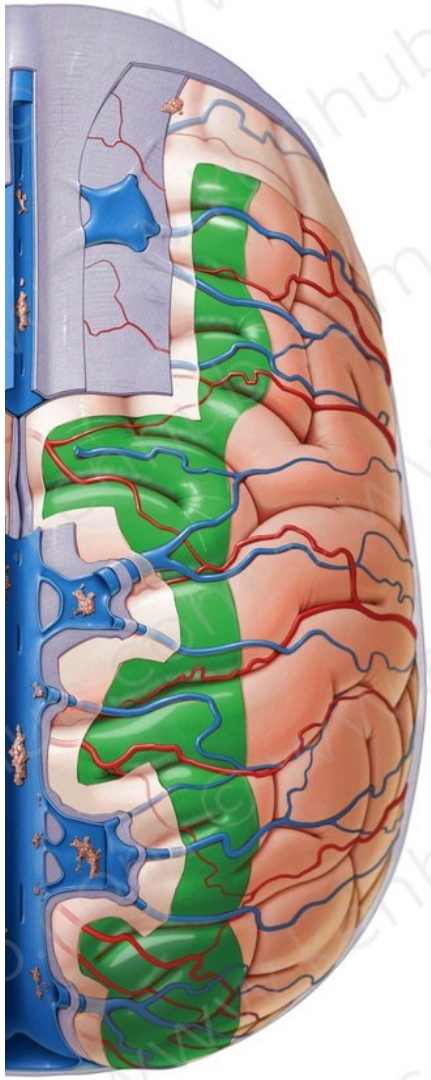
A. The subdural space (between Dura and Arachnoid)
B. The Subarachnoid space (between Arachnoid and Pia)



Dura mater



Arachnoid



Pia mater

Dura Mater :

It is the outermost and the thickest meningeal layer.

It has 2 layers :

1- The outer (periosteal) layer:

It is the periosteum which lines the inside of the skull

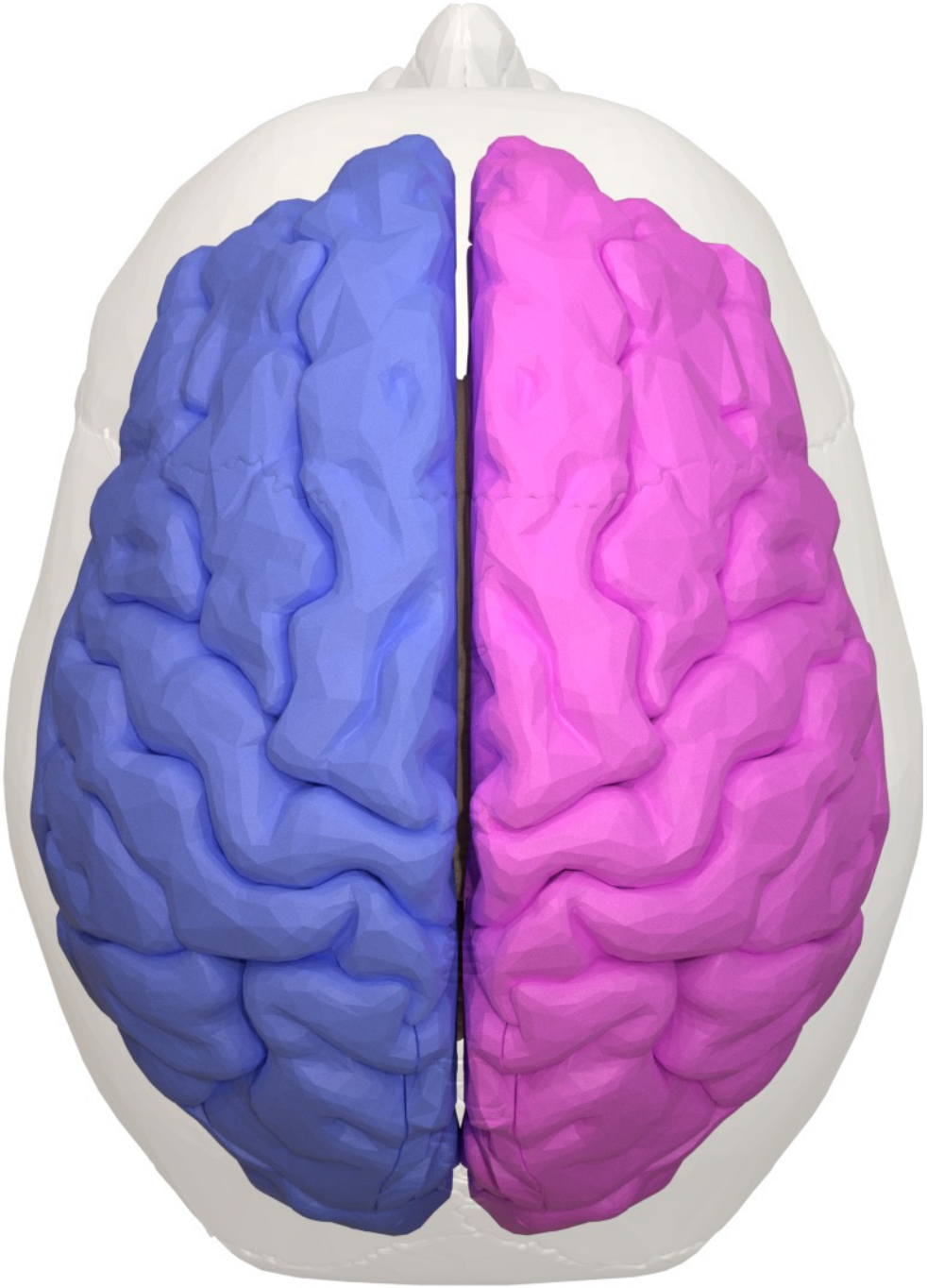
2- The inner meningeal layer:

It is the dura mater proper and forms four dural folds.

The 2 layers of the dura are closely adherent except in 2 cases:

A. Where the meningeal layer tends to form a dural fold

B. Where the meningeal layer leaves the outer layer to enclose a venous sinus in between the 2 layers (the dural venous sinuses).

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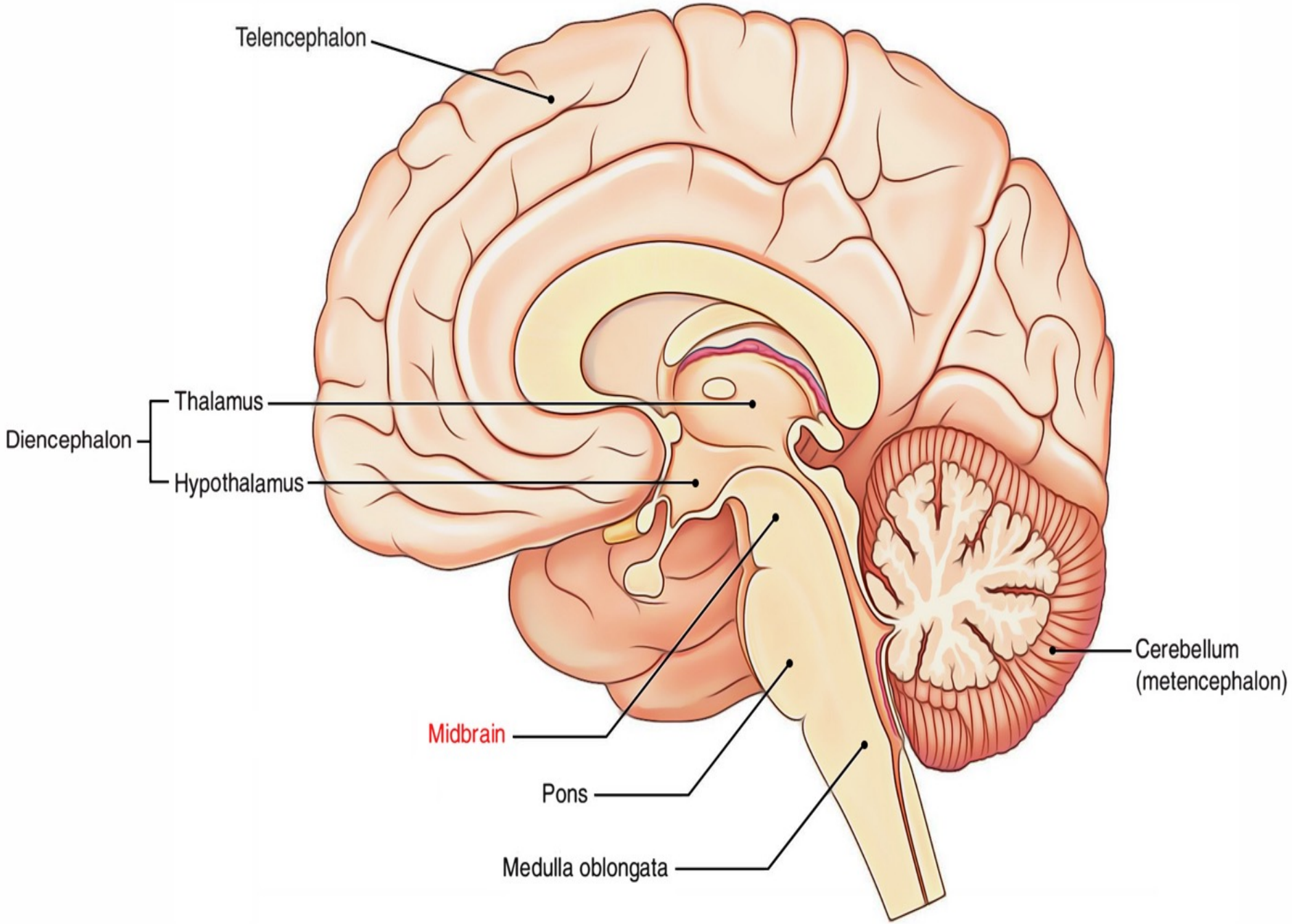
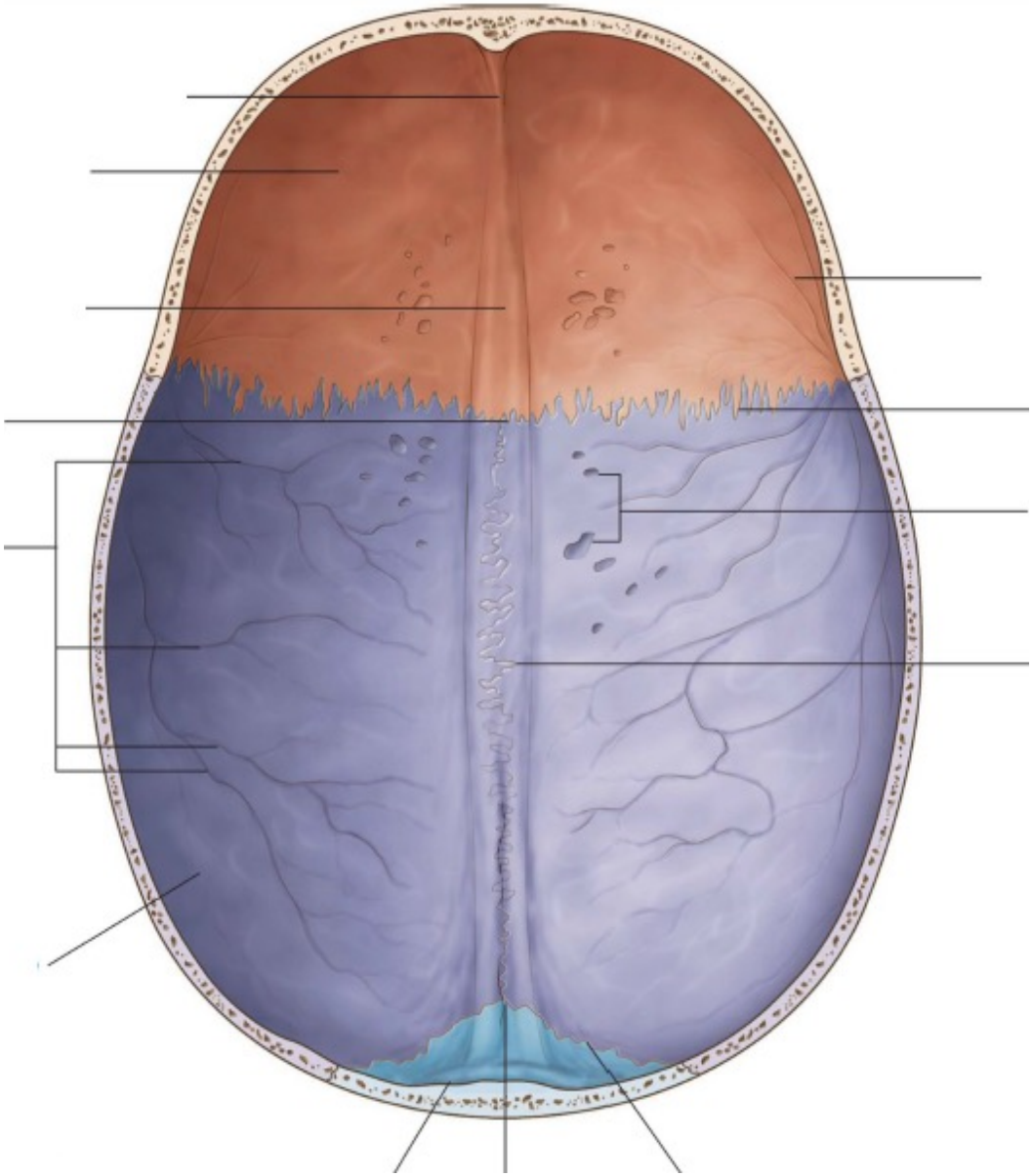
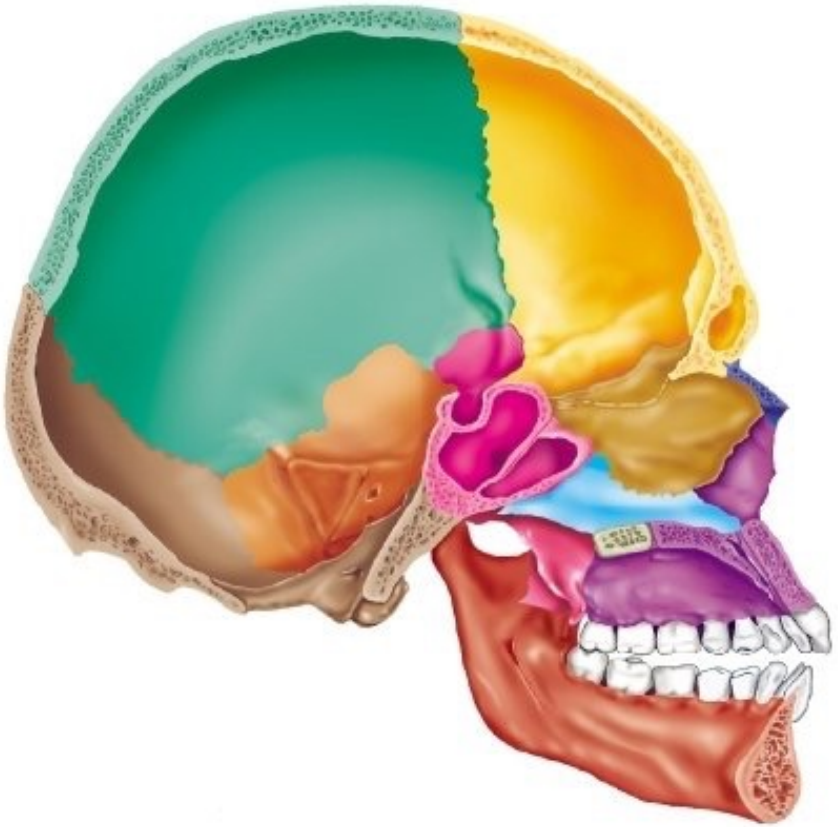

Telencephalon
Diencephalon
Thalamus
Hypothalamus
Midbrain
Pons
Medulla oblongata
Cerebellum
(metencephalon)





Dural Folds

The meningeal layer of the dura is folded inwards to form four septa

(1) Falx Cerebri: Falx Cerebri

It is a crescenteric fold of meningeal dura which descends vertically between the two cerebral hemispheres.

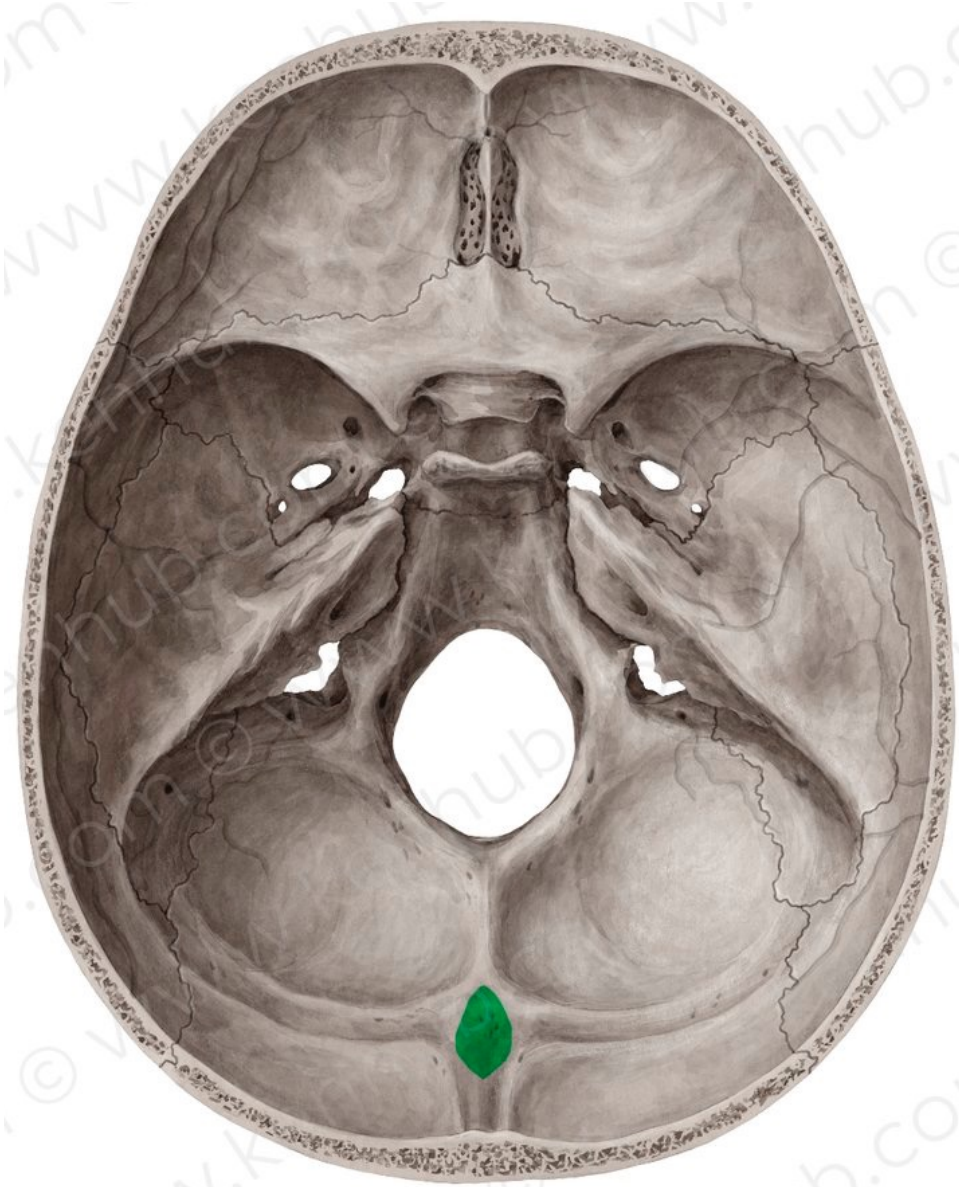
It has 2 ends, 2 borders, 2 surfaces.

Anterior end : is attached to the crista galli.

Posterior end : is blended with the tentorium cerebelli and here there is the **straight sinus.**

Upper border : is convex and is attached to the internal surface of the cranial vault and contains the **superior sagittal sinus.**

Lower border : is concave and free and contains the **inferior sagittal sinus.**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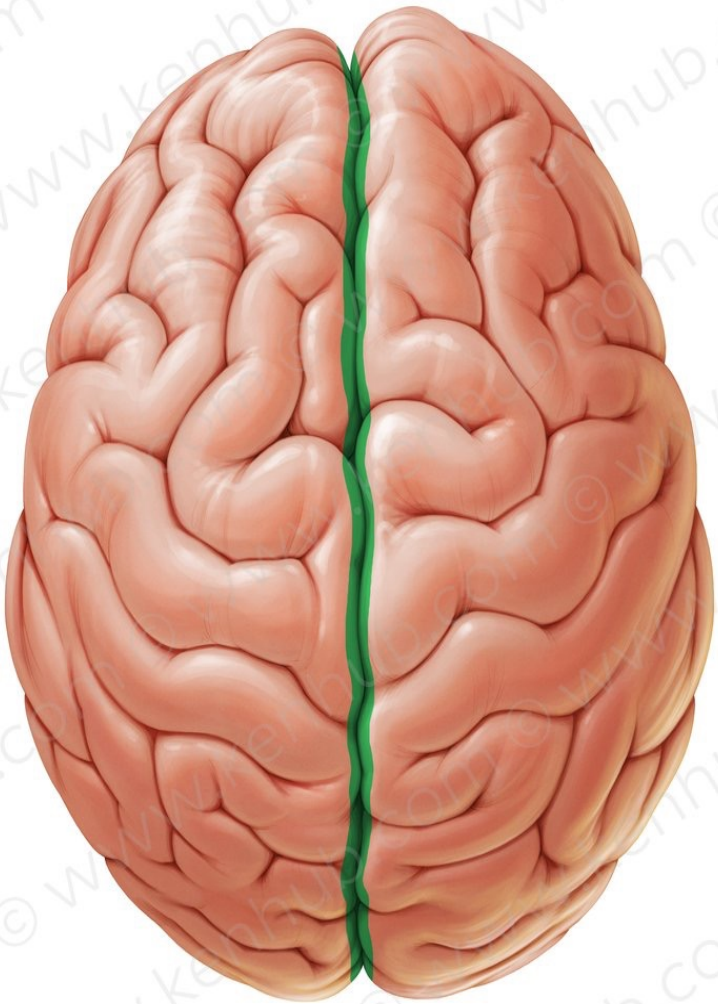
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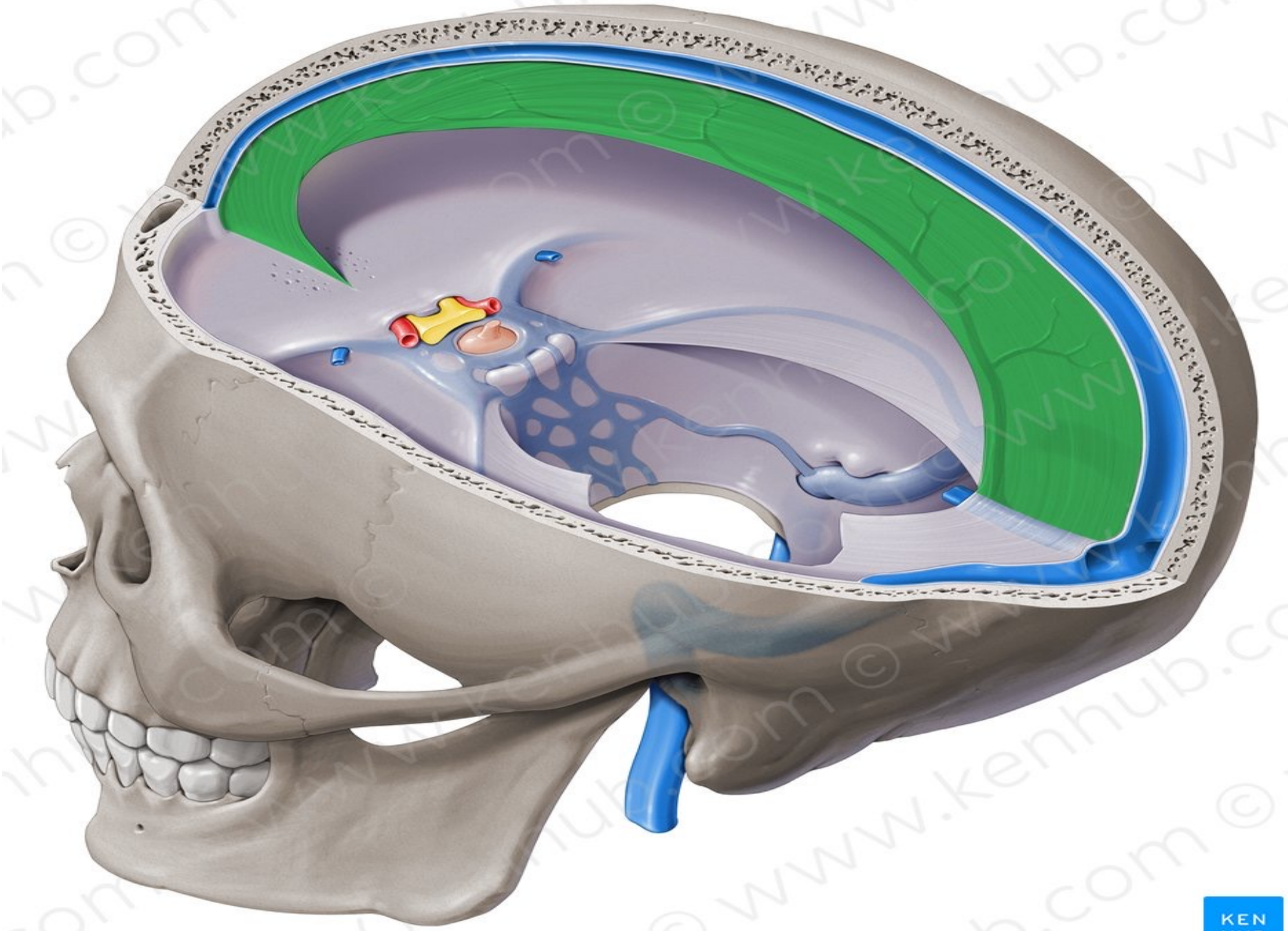
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(2) Tentorium Cerebelli:

It is a tent shaped fold of dura which forms a roof over the posterior cranial fossa, dividing the cranial cavity into supratentorial and infratentorial compartments.

It has 2 margins, 2 surfaces

- **Inner (free) margin**

✓ Is *concave* ,It is attached anteriorly to the anterior clinoid process.

✓ It bounds the tentorial notch occupied by the midbrain.

- **Outer (attached) margin** is convex and is attached on either side to the lips of the transverse sulcus, to the superior border of the petrous temporal bone, to the posterior clinoid process.

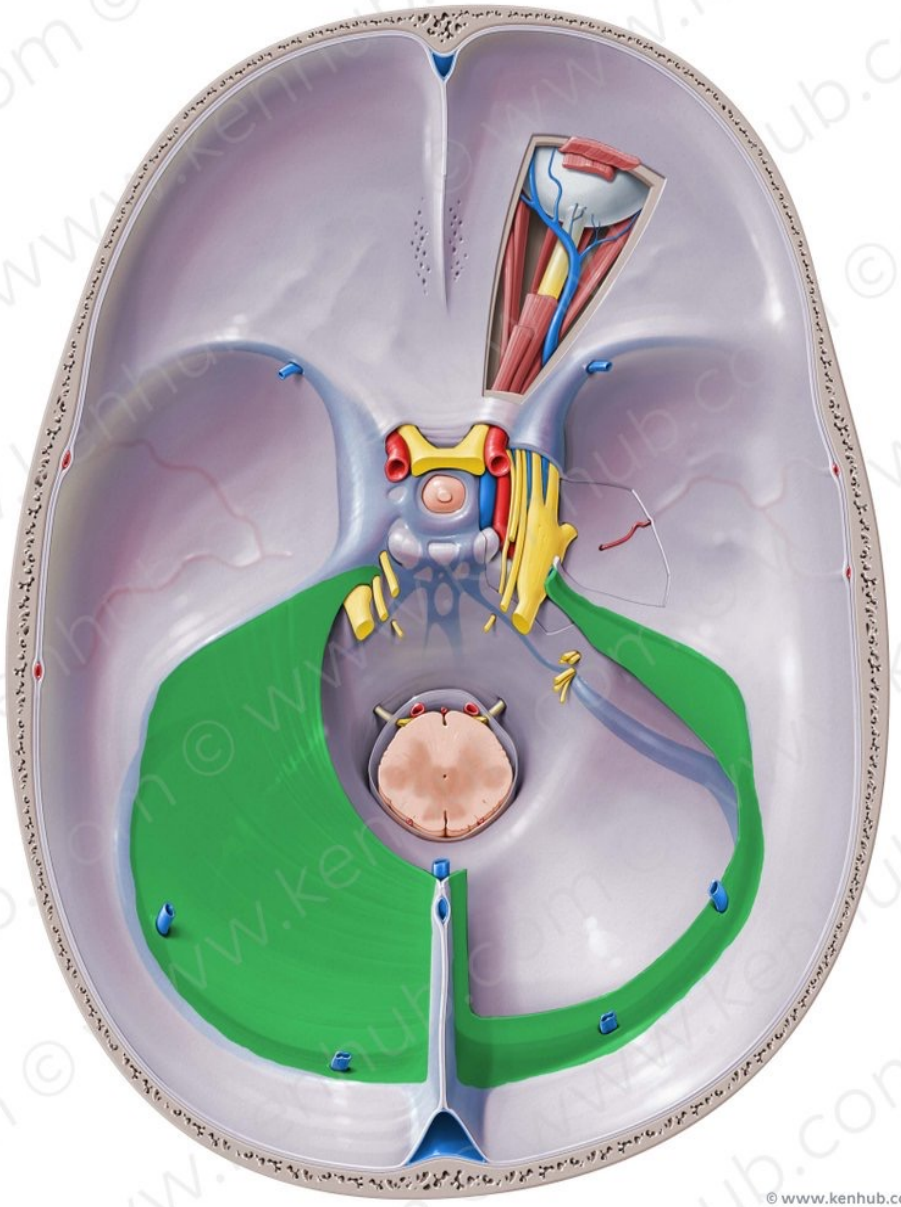
It encloses the **transverse and the superior petrosal venous sinuses.**

- **Superior surface:** it gives attachment for falx cerebri and is related to occipital lobes of the *cerebral* hemispheres.

- **Inferior surface**: it gives attachment for falx cerebelli and is related to *cerebellar* hemispheres.

➢ At the apex of the petrous bone, the attached margin is crossed by the free margin of the tentorium.

➢ This triangular area so formed is pierced by **oculomotor and trochlear nerves** in their way to the cavernous sinus.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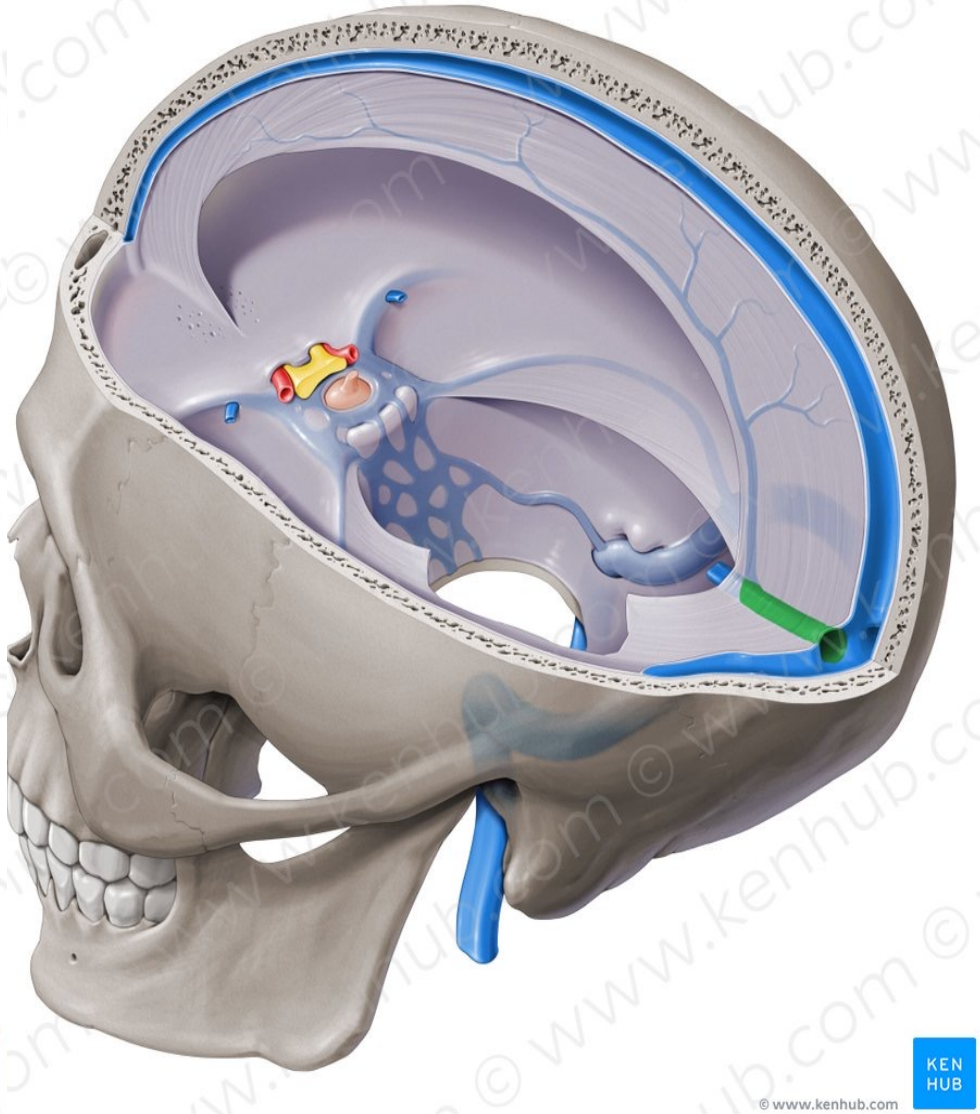
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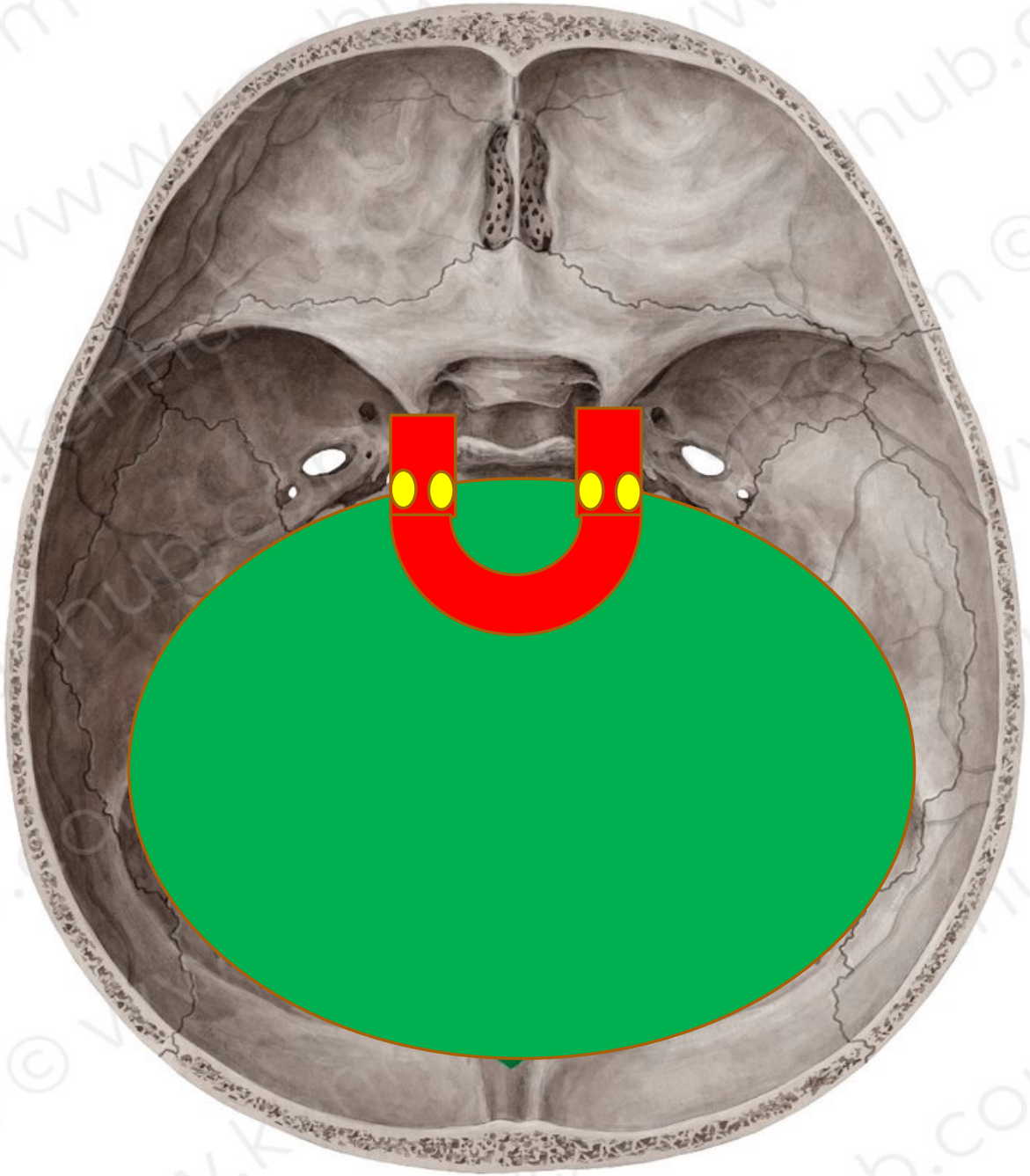
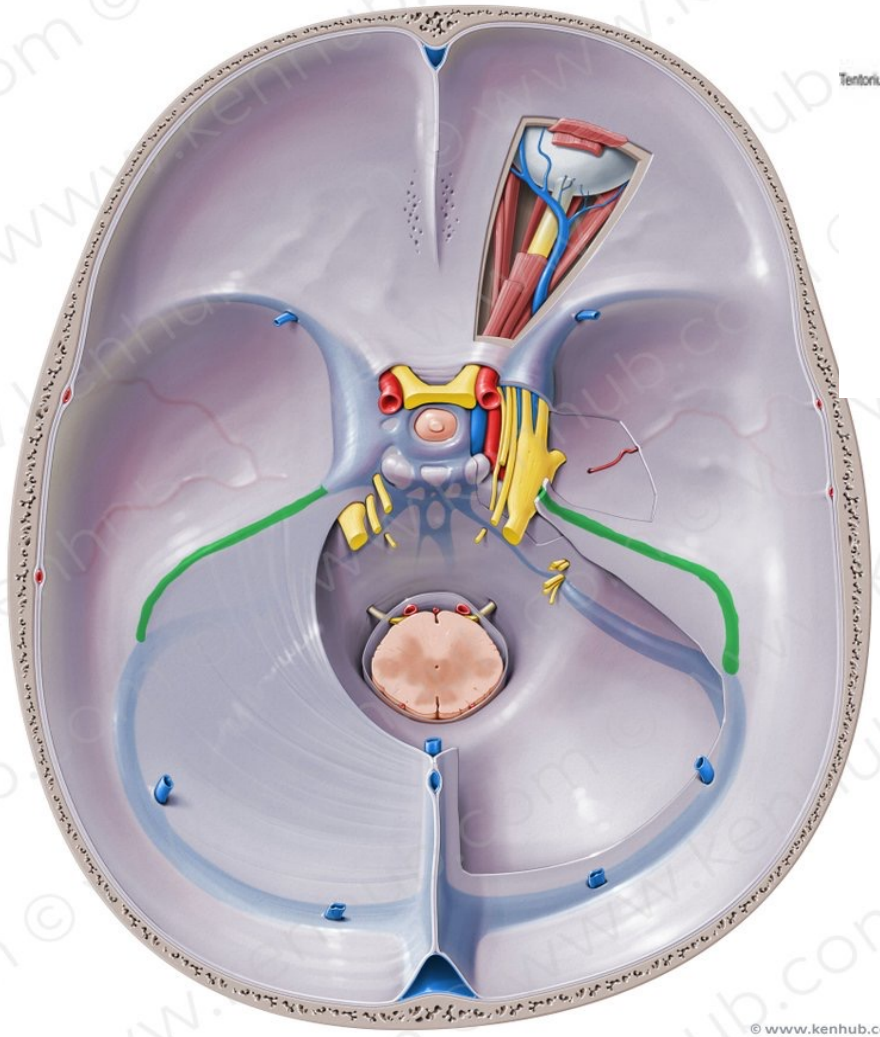
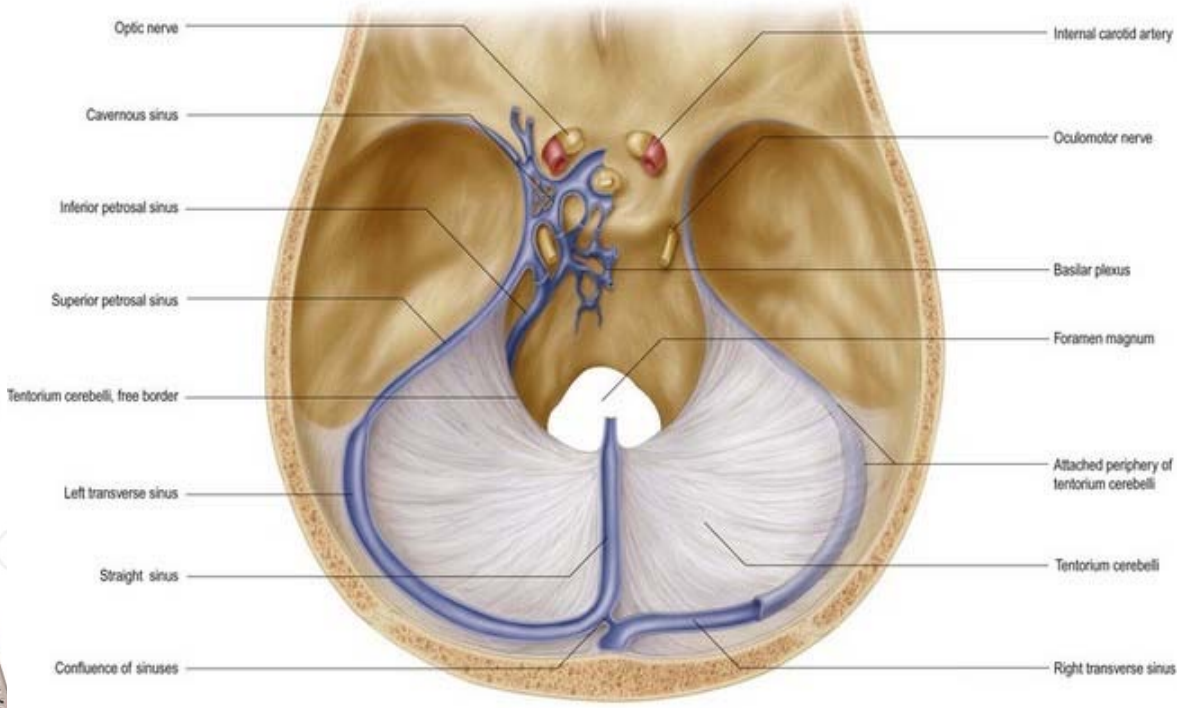






3- Falx Cerebelli :

It is the small crescentic dural fold which projects into the posterior cerebellar notch.

It has base, apex and 2 margins.

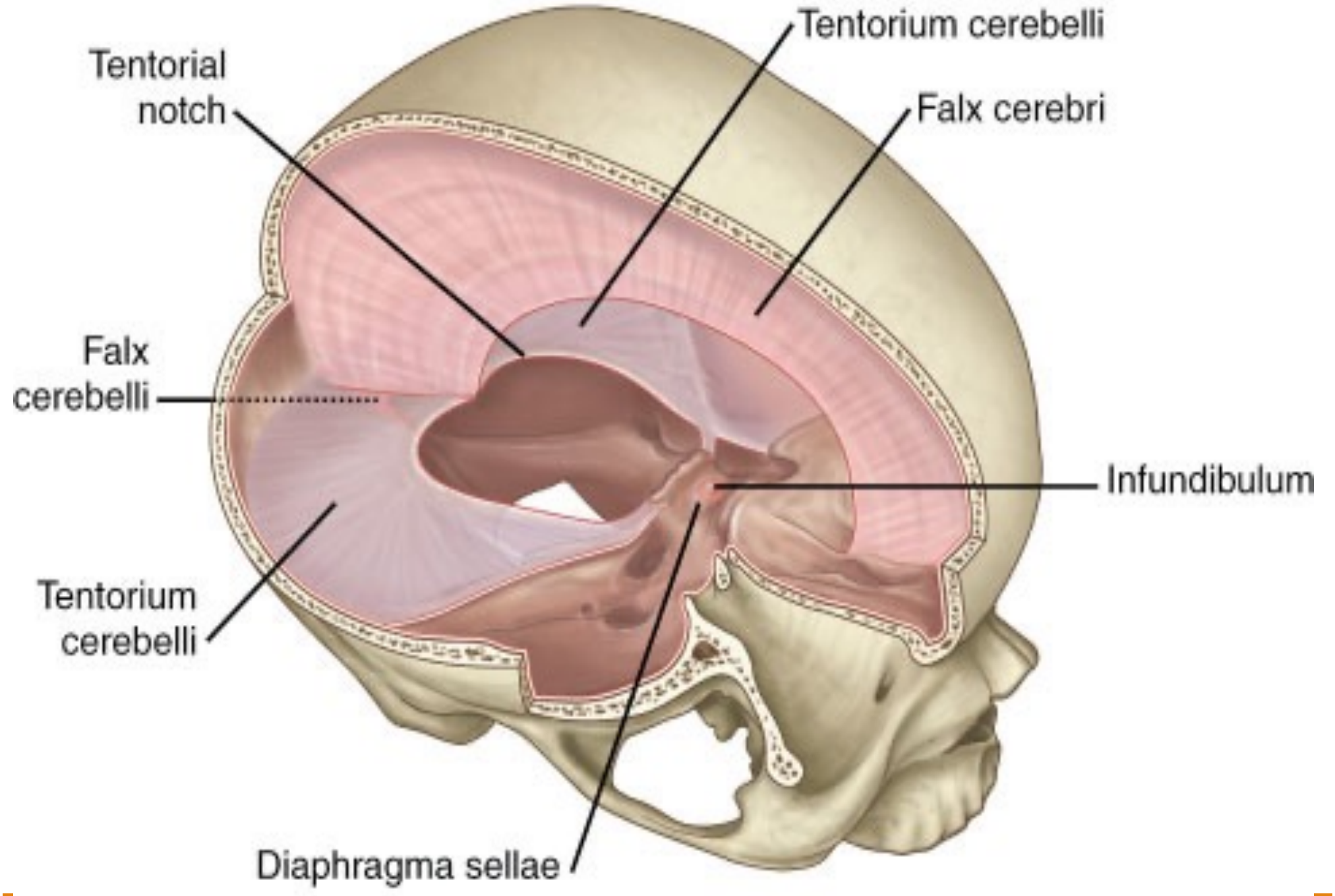
- **Base :** is attached to the inferior surface of the tentorium cerebelli.
- **Apex :** divides into 2 parts which merge inferiorly with the sides of foramen magnum.
- **Posterior margin :** is attached to the internal occipital crest.

It encloses the **occipital venous sinus.**

- **Anterior margin :** is concave and free.

4- Diaphragmatic Sella

- It is a small, circular horizontal dura fold-which forms a roof for the Sella turcica, so it covers the pituitary gland.
- Attached to the tuberculm sellae anteriorly and to the dorsum sellae posteriorly
- It has a central opening which transmits-the infundibulum


Tentorium cerebelli
Tentorial notch
Falx cerebri
Falx cerebelli
Infundibulum
Tentorium cerebelli
Diaphragma sellae

Read Only

Nerve supply of the dura:

- is supplied by trigeminal nerve and C2, C3 spinal nerves

- Stimulation of the sensory endings of the trigeminal nerve above the level of the tentorium cerebelli produces referred pain to an area of skin on the same side of the head.

- Stimulation of the dural endings below (posterior cranial fossa) the level of the tentorium produces referred pain to the back of the neck and back of the scalp along the distribution of the greater occipital nerve


Thank
you

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Cranial Cavity Part 2

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Dural venous sinuses

Dural Venous Sinuses

- They are wide venous channels which lie between the outer periosteal and meningeal layers of dura **EXCEPT** the **inferior sagittal and straight sinuses** which lie within dural folds
- They are lined by endothelium
- No muscle tissue in their wall .
- They have no valves
- They communicate with the veins outside the skull by the *valueless* emissary veins.
- They drain bones of the skull, meninges, C.S.F., end brain into the I.J.V.

Classification

Unpaired group	Paired group
1. Superior sagittal sinus	1. Sphenoparietal
2. Inferior sagittal sinus	2. Cavernous
3. Straight sinus	3. Superior petrosal
4. Occipital	4. Inferior petrosal
5. Basilar plexus	5. Transverse
6. Intercavernous	6. Sigmoid.

Superior Sagittal Sinus :

It runs in the superior border of the falx cerebri and near the internal occipital protuberance, it deviates (usually) to the ***right*** to become the **right transverse** sinus.

It receives :

1- Superior cerebral veins which are thin-walled

Rupture of these veins cause subdural hemorrhage with compression of the brain.

2- Arachnoid granulations which filter C.S.F. into the venous circulation

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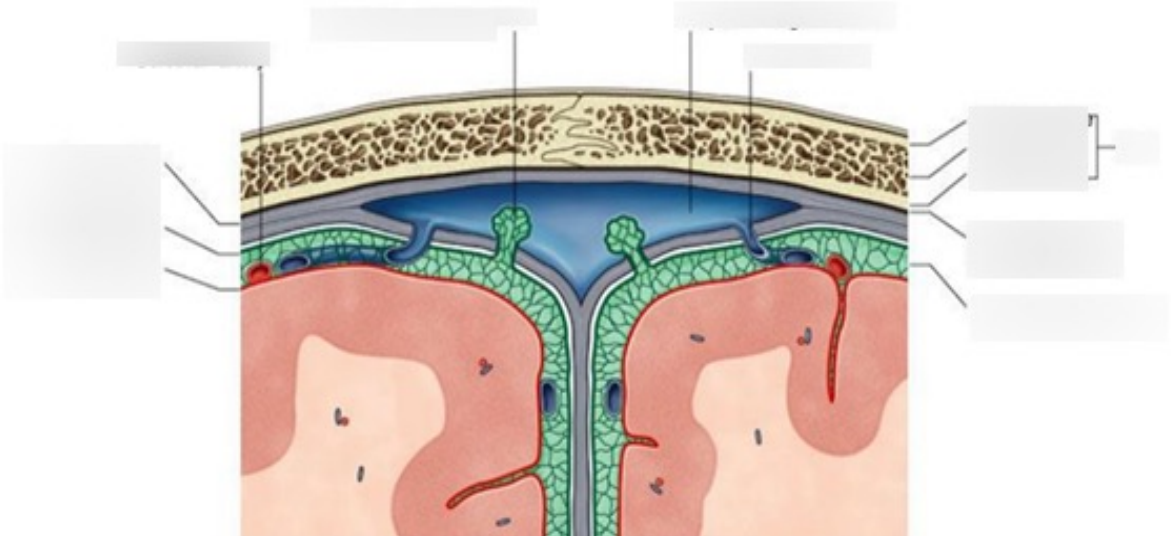
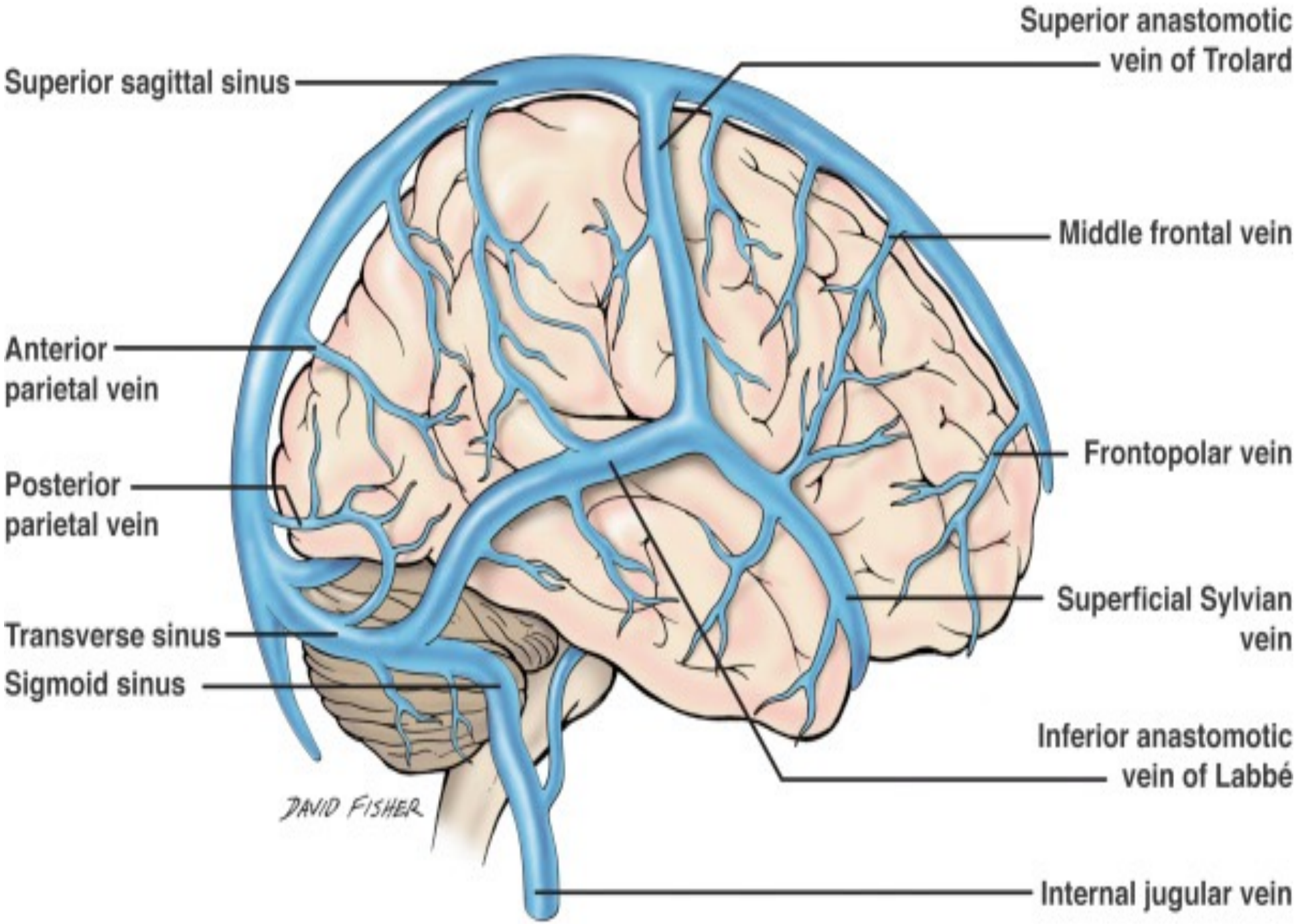


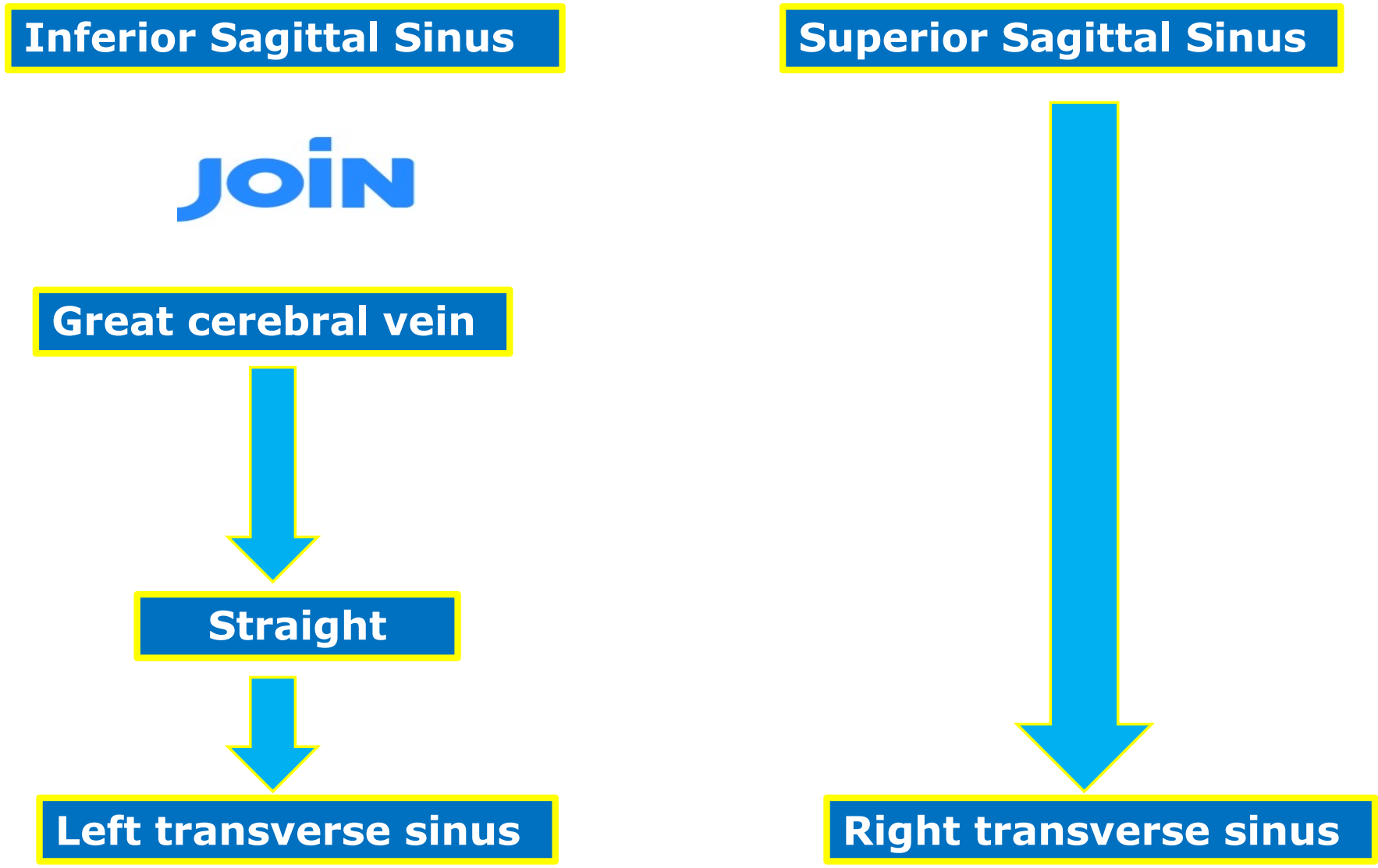

Superior anastomotic vein of Trolard
Superior sagittal sinus
Middle frontal vein
Anterior parietal vein
Posterior parietal vein
Frontopolar vein
Superficial Sylvian vein
Transverse sinus
Sigmoid sinus
Inferior anastomotic vein of Labbé
DAVID FISHER
Internal jugular vein

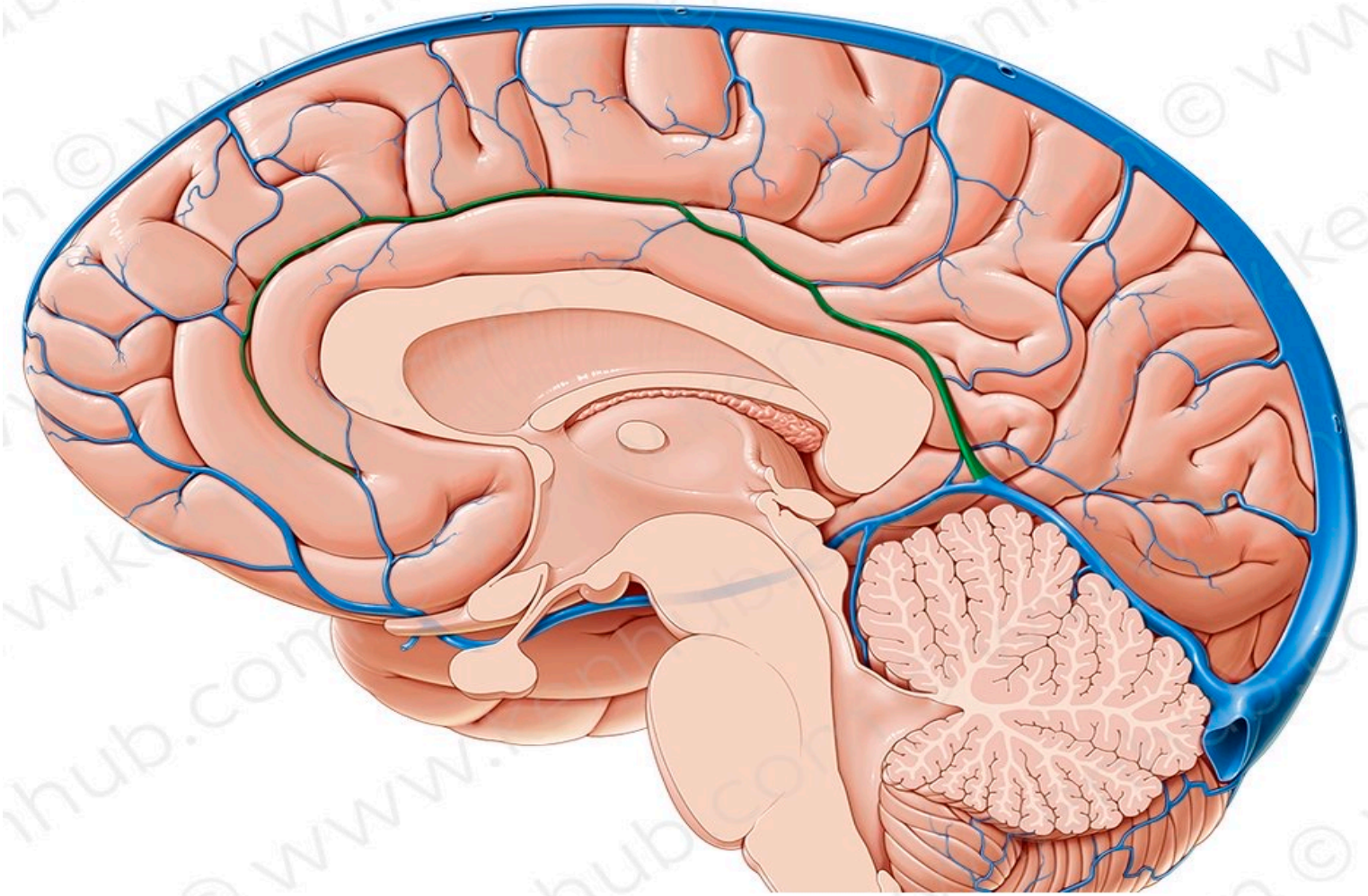
Inferior Sagittal Sinus :

- It lies in the posterior 2/3 of the lower (free) border of falx cerebri.
- It joins the great cerebral vein to form the straight sinus.

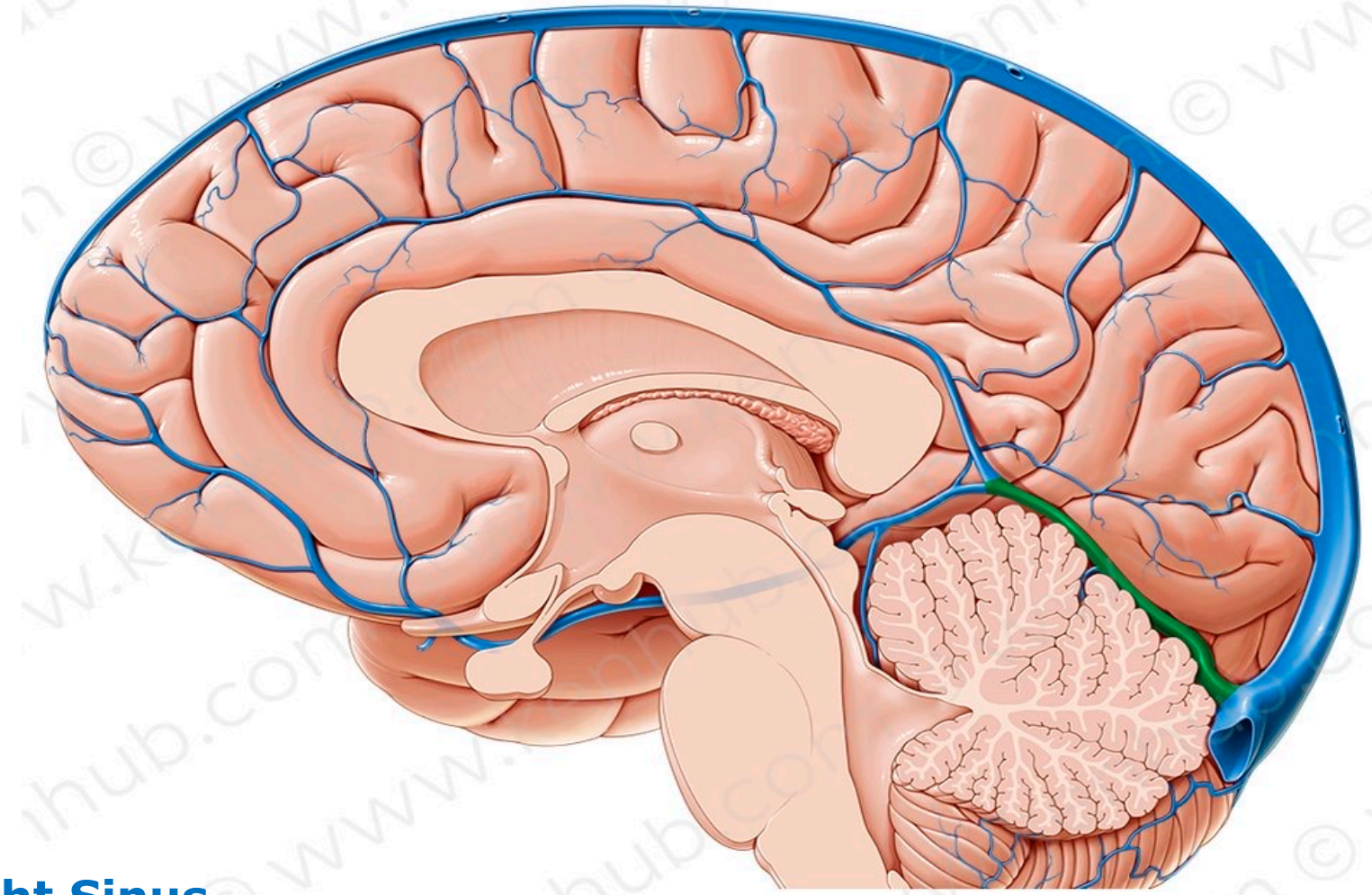
Straight Sinus :

- It lies at the junction between falx cerebri and the tentorium cerebelli.
- It deviates usually to the ***left*** to become the ***left*** transverse sinus.


Inferior Sagittal Sinus
JOIN
Great cerebral vein
Straight
Left transverse sinus
Superior Sagittal Sinus
Right transverse sinus



Inferior Sagittal Sinus

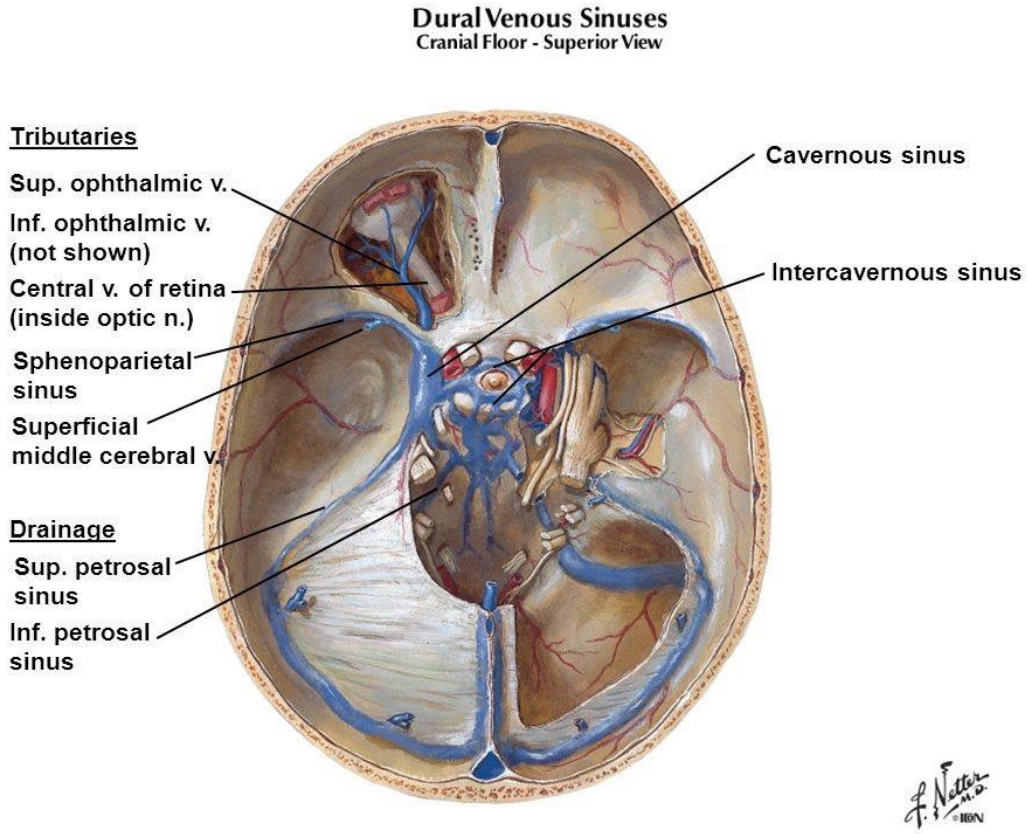


Straight Sinus

The Cavernous Sinuses :

It lies between the 2 layers of the dura on the side of the body of the sphenoid bone

It extends from superior orbital fissure anteriorly to apex of petrous bone posteriorly



The sinus receives :

1-The superior ophthalmic vein

2-The inferior ophthalmic vein

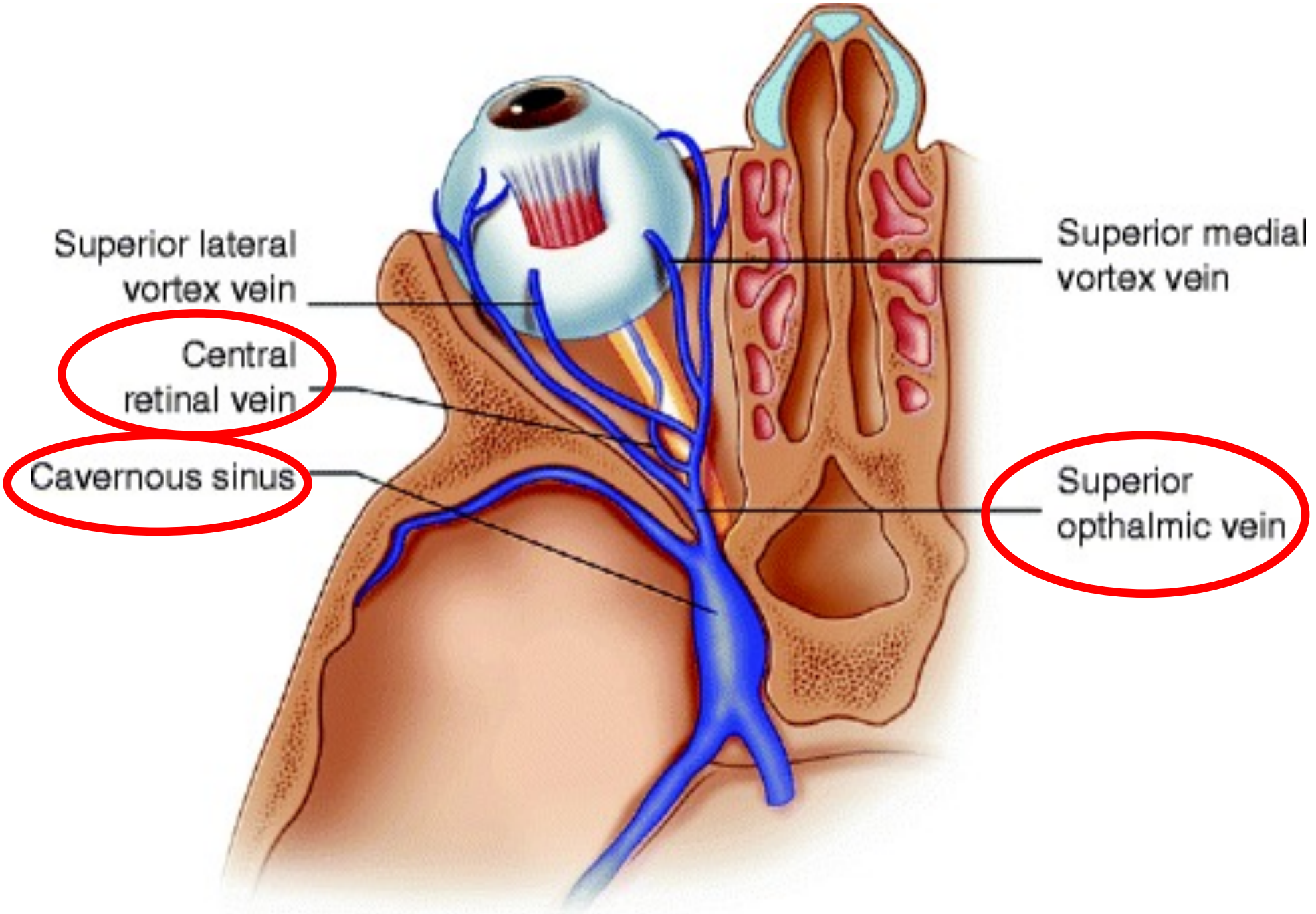
3-The central vein of the retina

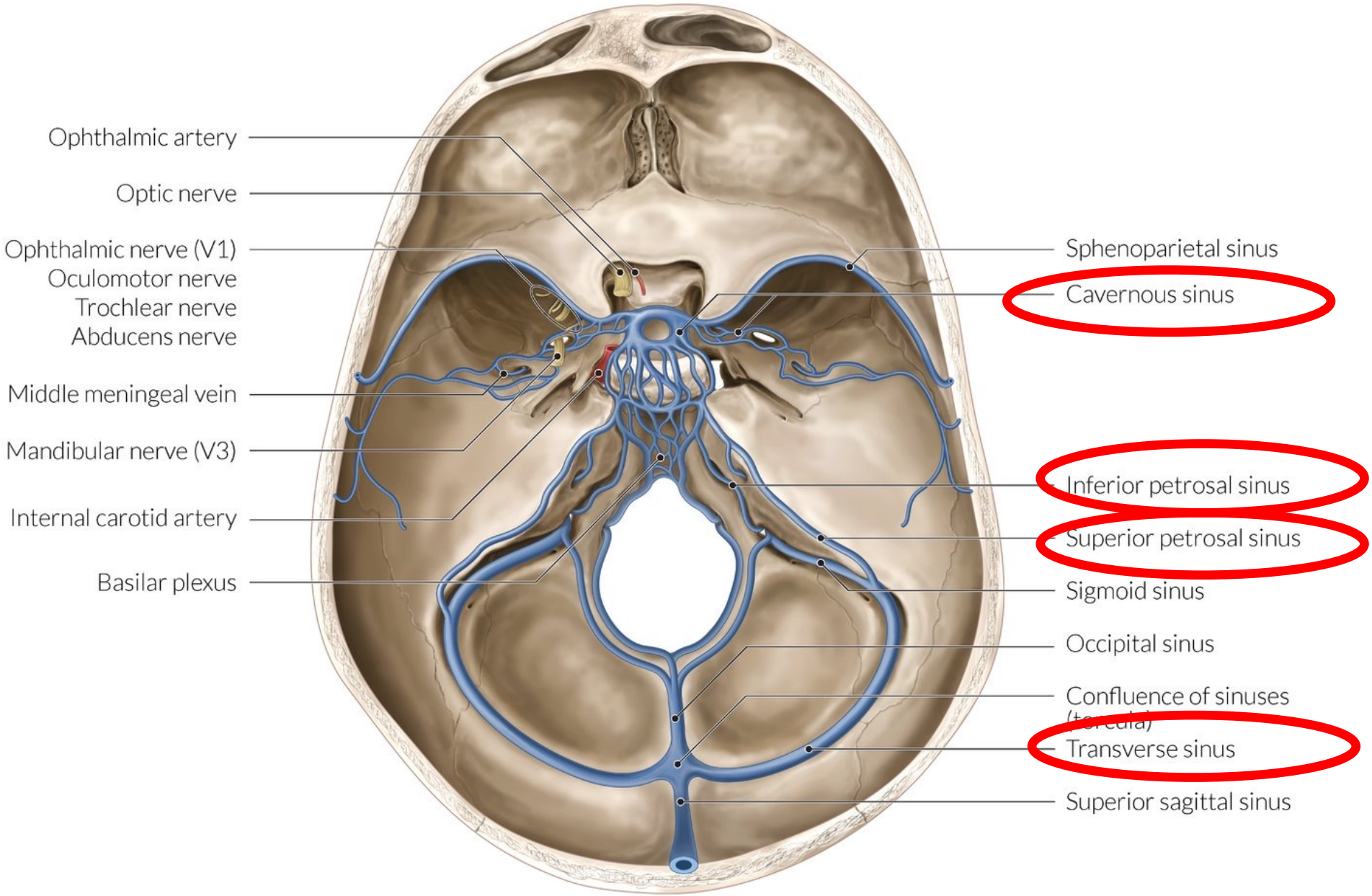
4-Superficial middle cerebral vein

5- Sphenoparietal sinus

The sinus drains posteriorly into:

1. The transverse sinus through the superior petrosal sinus
2. Internal jugular vein through Inferior petrosal sinus


Superior lateral
vortex vein
Central
retinal vein
Cavernous sinus
Superior medial
vortex vein
Superior
opthalmic vein

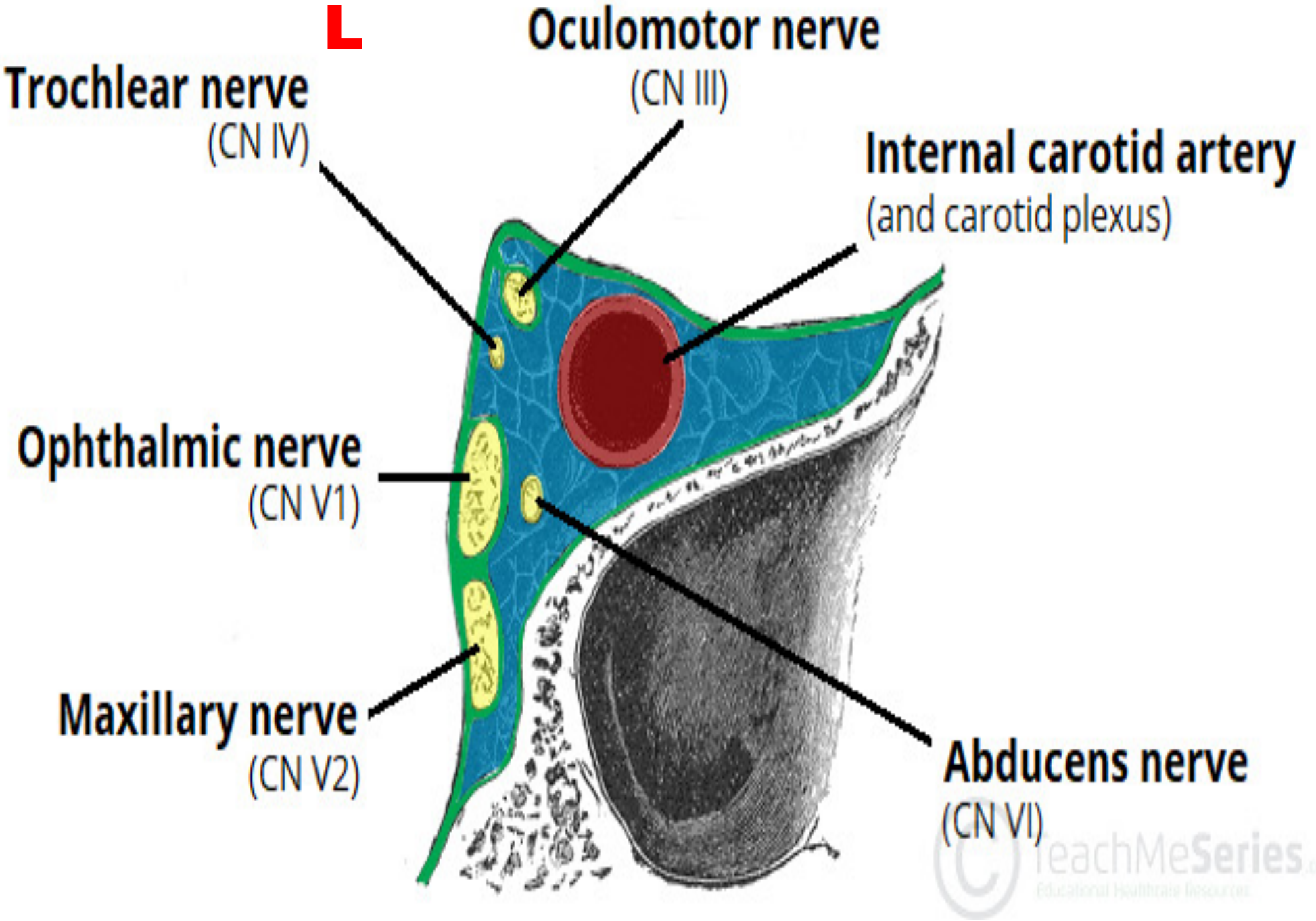

Ophthalmic artery
Optic nerve
Ophthalmic nerve (V1)
Oculomotor nerve
Trochlear nerve
Abducens nerve
Middle meningeal vein
Mandibular nerve (V3)
Internal carotid artery
Basilar plexus
Sphenoparietal sinus
Cavernous sinus
Inferior petrosal sinus
Superior petrosal sinus
Sigmoid sinus
Occipital sinus
Confluence of sinuses
Transverse sinus
Superior sagittal sinus

Structures traverse the cavernous sinus :

- The inferomedial wall of the sinus is traversed by the 3rd part of the internal carotid artery and the Abducent N. (6^{th} cranial neve) , inferolateral to the artery .

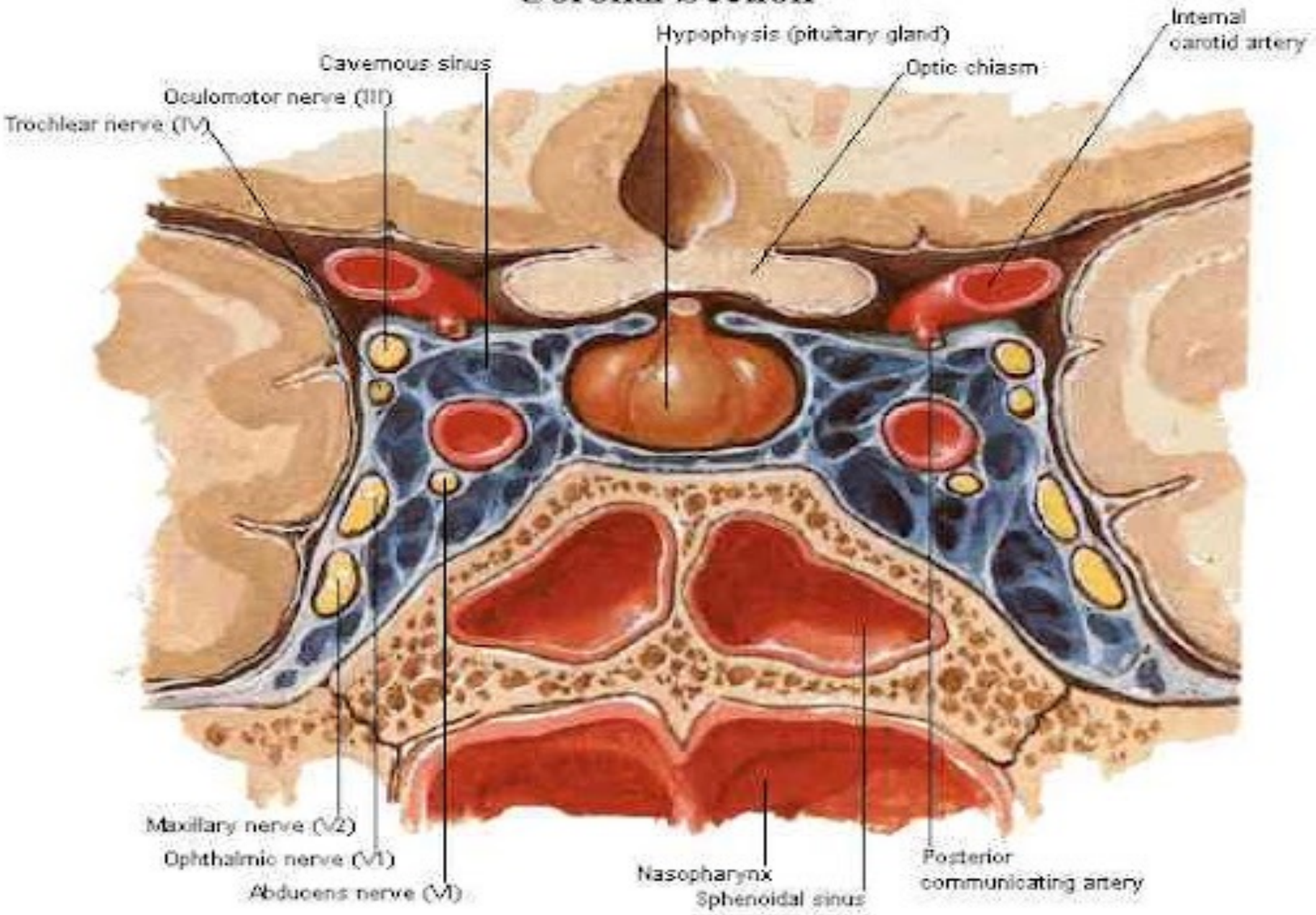
- The lateral wall is traversed (from above downwards) by the oculomotor, trochlear nerves , ophthalmic and maxillary nerves.

All the above structures are *separated* from the blood within the sinus by the sinus endothelium.


L
Trochlear nerve
(CN IV)
Oculomotor nerve
(CN III)
Internal carotid artery
(and carotid plexus)
Ophthalmic nerve
(CN V1)
Maxillary nerve
(CN V2)
Abducens nerve
(CN VI)
TeachMeSeries.com

Cavernous Sinus

Coronal Section



The Transverse Sinuses :

- Each runs in the transverse sulcus between the 2 layers of the attached margin of tentorium cerebelli

-The right sinus is continuous with the superior sagittal sinus; the left with the straight sinus.

- Each terminates by becoming the sigmoid sinus.

The Sigmoid Sinuses :

- This S-shaped sinus is the direct continuation of the transverse sinus.

- It begins behind the base of the petrous temporal bone and passes through the posterior compartment of the jugular foramen where it continues as the Internal jugular vein.

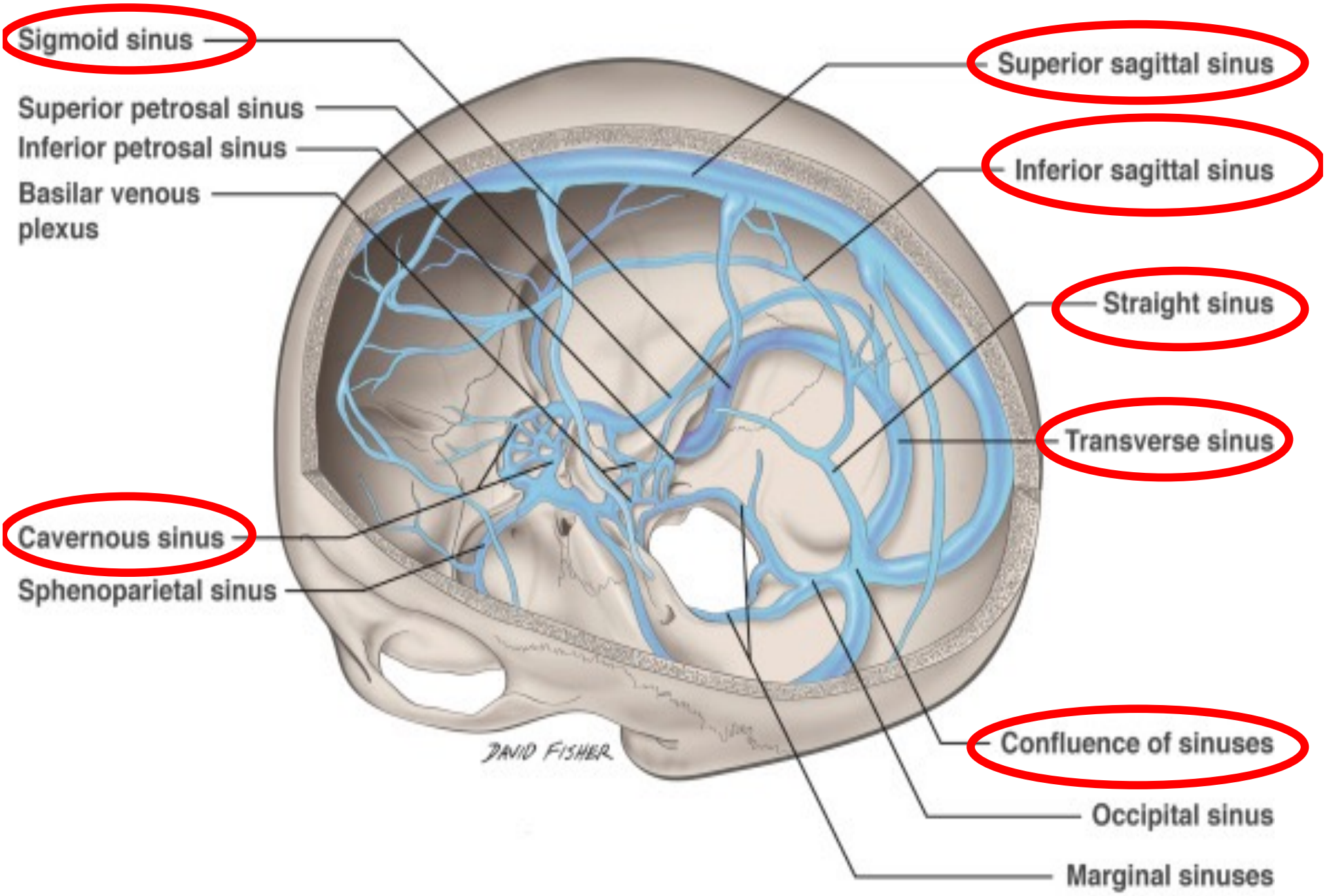
The confluence of sinuses Or torcula :

Site : internal occipital protuberance

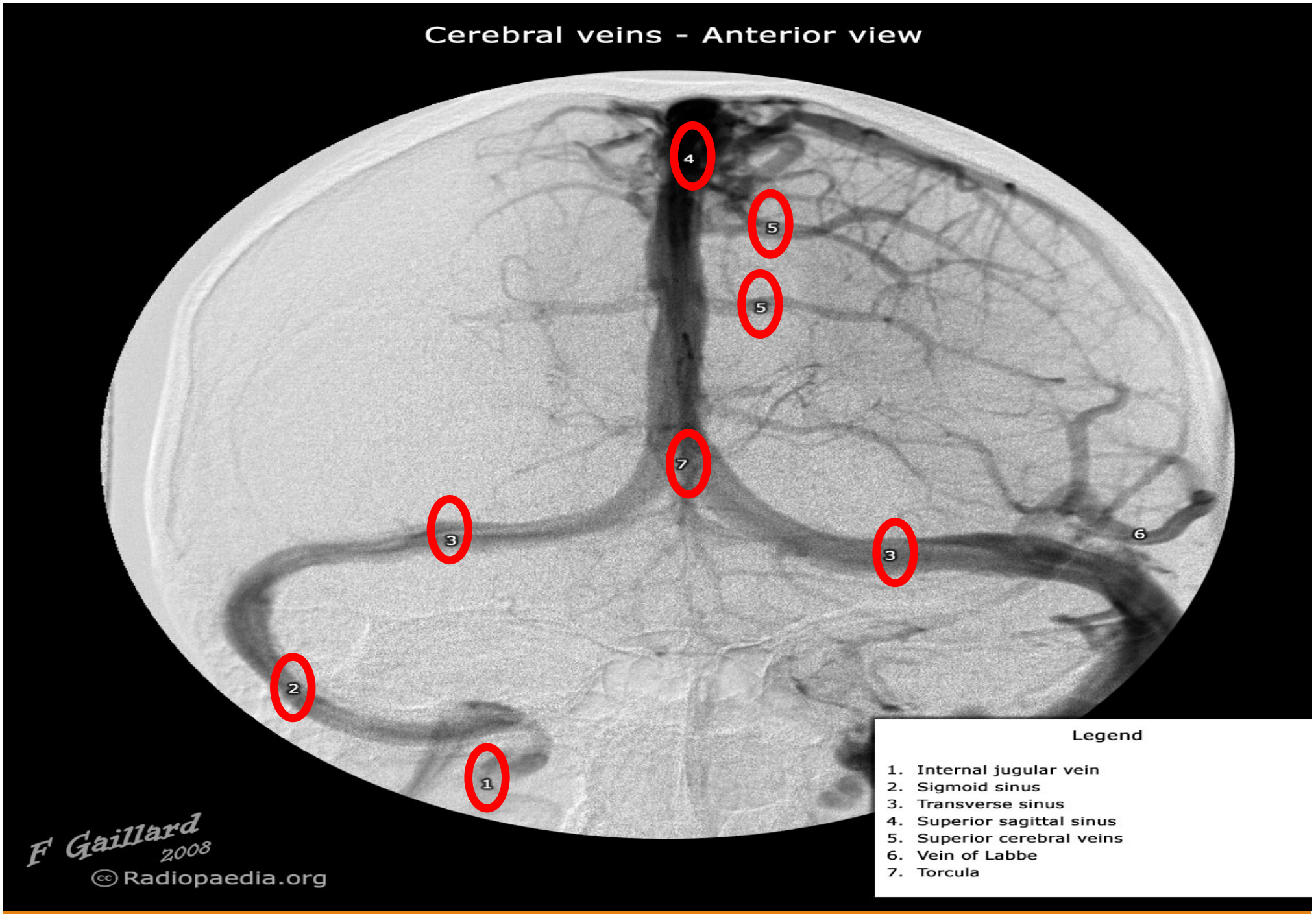
It is the site of communications between 5 venous sinuses

1. Superior sagittal
2. Straight
3. Occipital
4. Right and left transverse sinuses.

Thrombosis in one sinus will spread to the other sinuses in the confluence.


Sigmoid sinus
Superior petrosal sinus
Inferior petrosal sinus
Basilar venous plexus
Cavernous sinus
Sphenoparietal sinus
Superior sagittal sinus
Inferior sagittal sinus
Straight sinus
Transverse sinus
Confluence of sinuses
Occipital sinus
Marginal sinuses
DAVID FISHER

Cerebral veins - Anterior view



Legend

1. Internal jugular vein
2. Sigmoid sinus
3. Transverse sinus
4. Superior sagittal sinus
5. Superior cerebral veins
6. Vein of Labbe
7. Torcula

F Gaillard 2008

Middle meningeal Artery

- It is a branch from the first part of the maxillary A. in the infratemporal fossa.
- It enters the skull through the foramen spinosum.
- It runs intracranial anterolateral between the 2 layers of the dura
- 2 cm above the midpoint of the zygomatic arch, the artery divides into frontal and parietal branches.

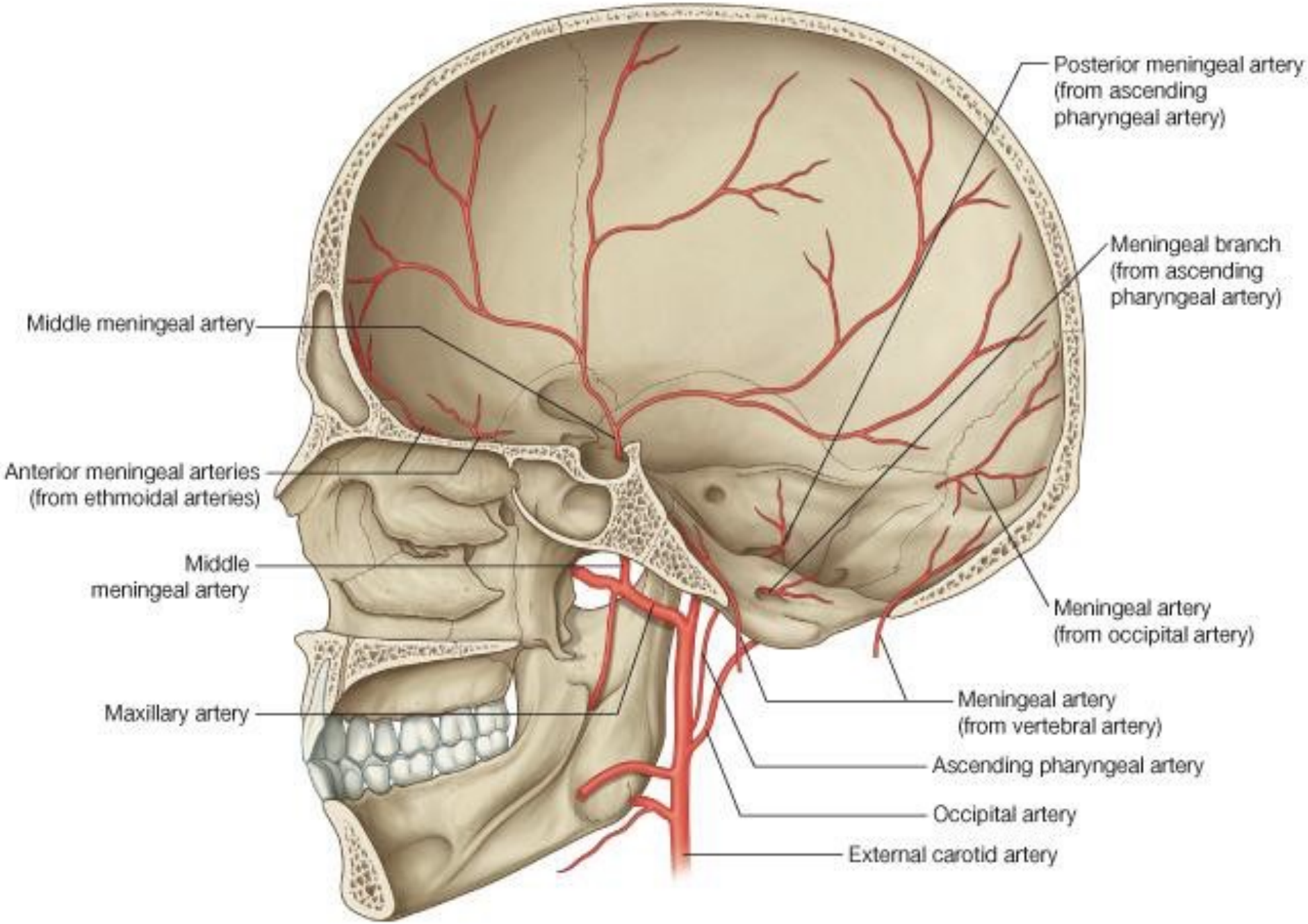
1-The frontal branch : (is the larger) crosses the greater wing of the sphenoid and ascends towards the pterion.

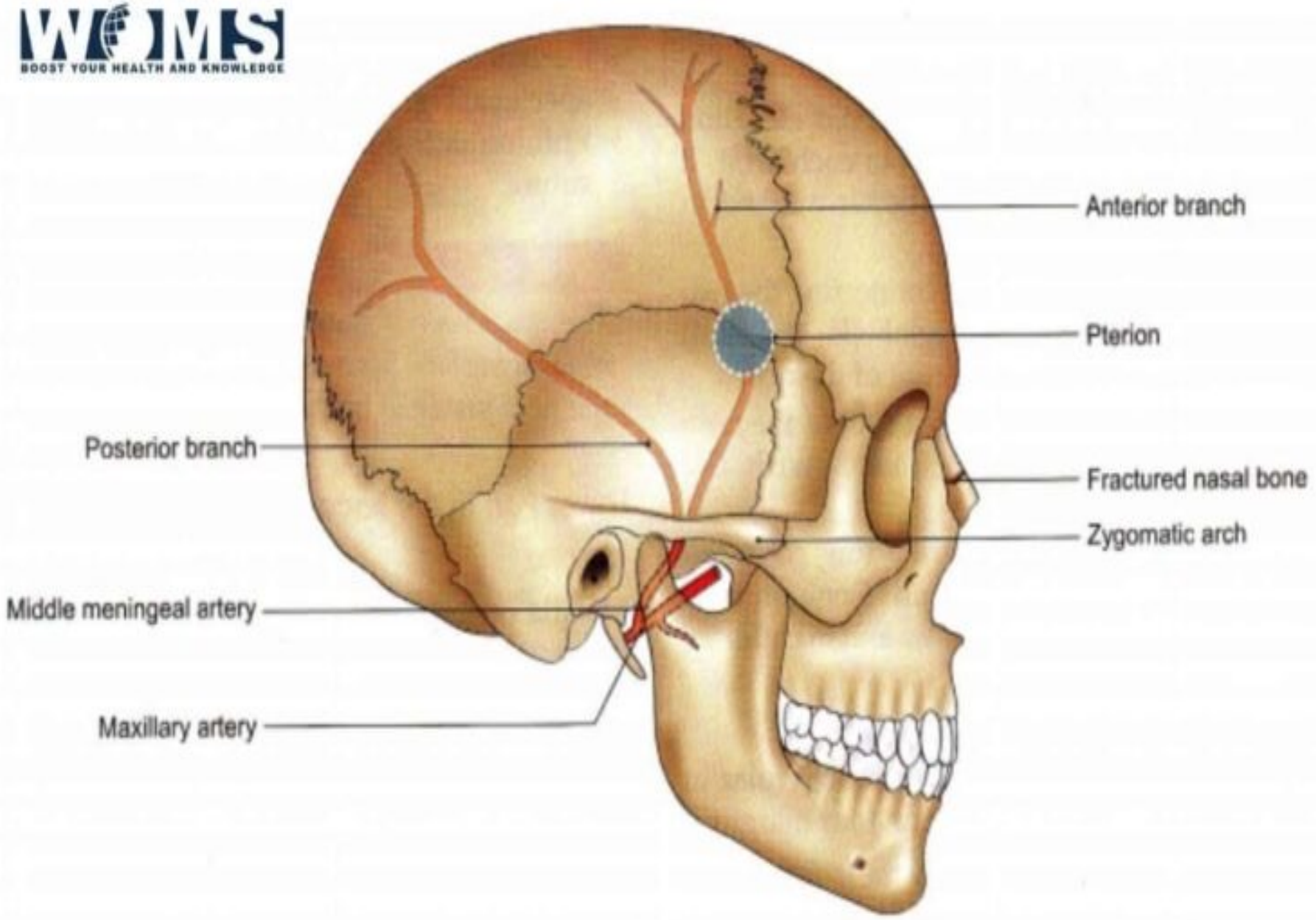
Here, it is related medially to the motor area of the cerebral cortex

2-The parietal branch : runs backwards on the squamous temporal bone, and is related medially to the superior temporal gyrus of the cerebral hemisphere.

Branches of middle meningeal

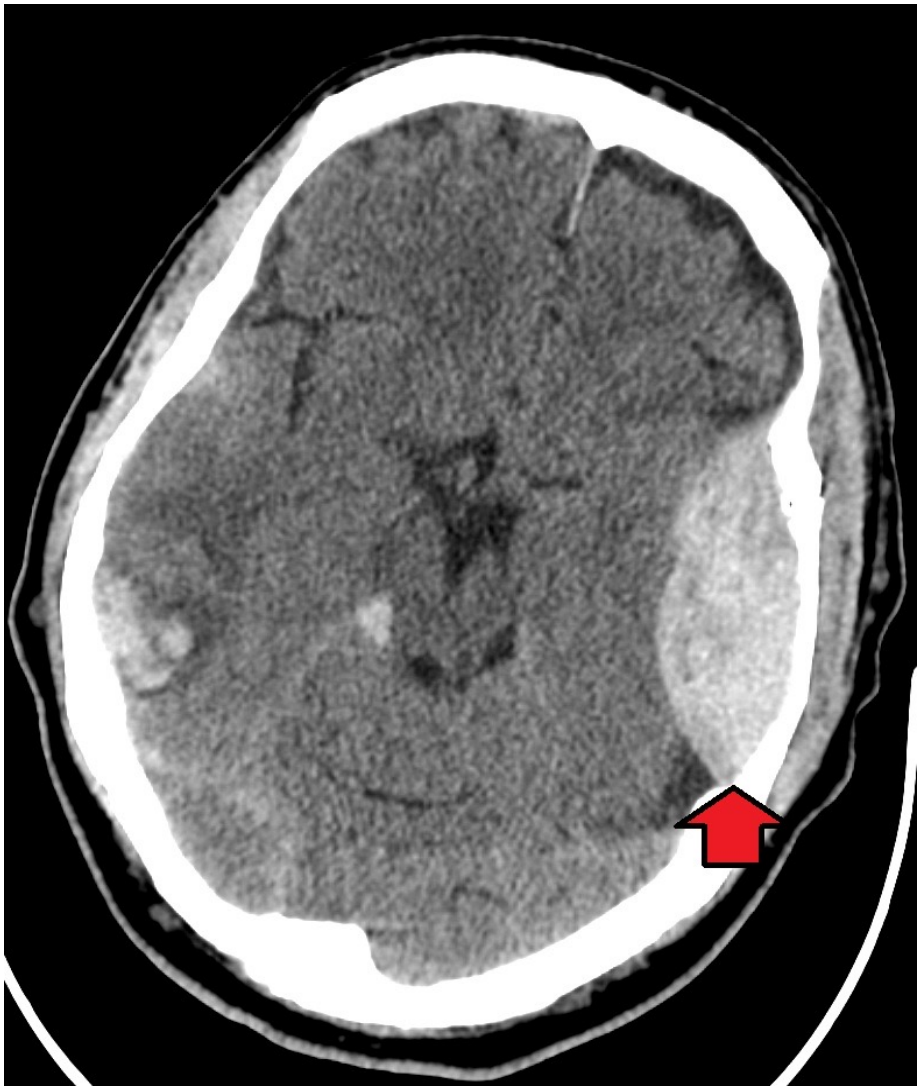
- To the inner table and diploe of the skull bones and dura mater.
- It gives the superior tympanic A. and petrosal branches to the tympanic cavity.


Posterior meningeal artery
(from ascending
pharyngeal artery)
Meningeal branch
(from ascending
pharyngeal artery)
Middle meningeal artery
Anterior meningeal arteries
(from ethmoidal arteries)
Middle
meningeal artery
Maxillary artery
Meningeal artery
(from occipital artery)
Meningeal artery
(from vertebral artery)
Ascending pharyngeal artery
Occipital artery
External carotid artery

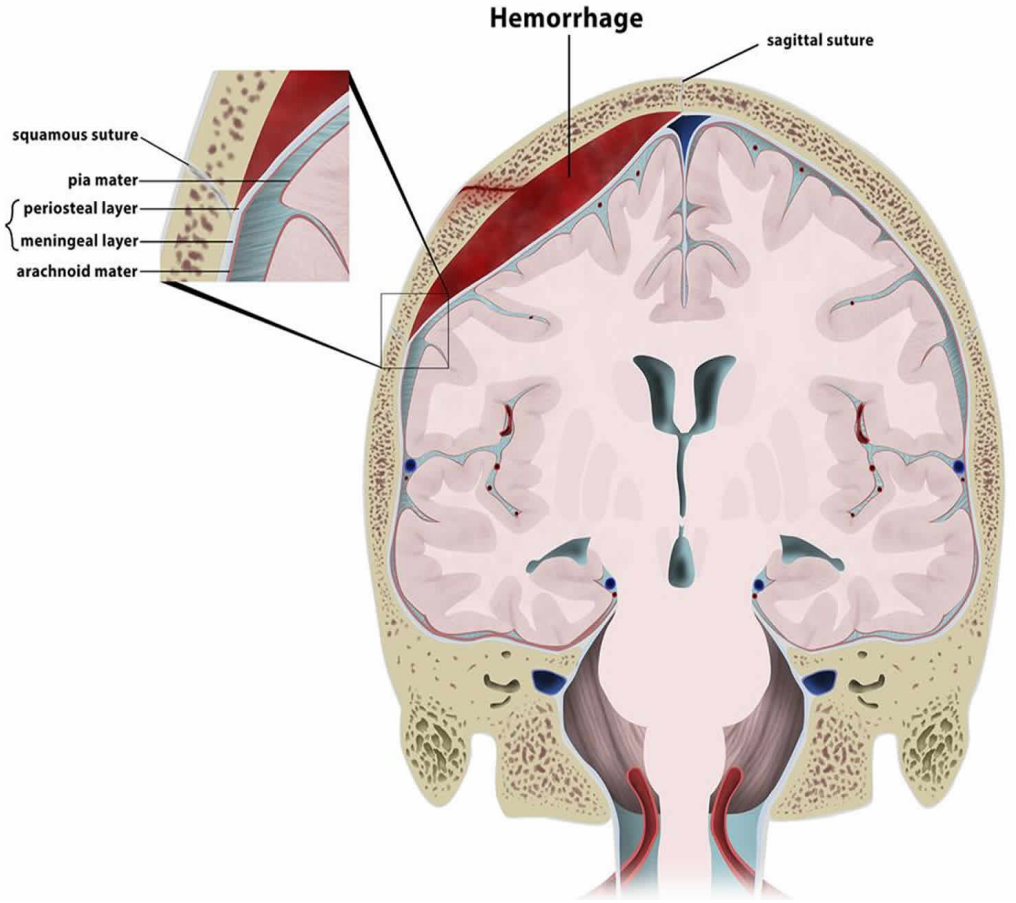

Anterior branch
Pterion
Posterior branch
Fractured nasal bone
Zygomatic arch
Middle meningeal artery
Maxillary artery

Epidural Hemorrhage

- Results from injuries to the meningeal arteries or veins.
- The most common artery to be damaged is the **anterior division of the middle meningeal artery**
- Arterial blood is located between the skull and dura
- The intracranial pressure rises, and the enlarging blood clot exerts local pressure on the underlying motor area
- Lucid interval (no symptoms) for a few hours followed by death ("talk and die syndrome")



Epidural Hemorrhage



Look for this website :

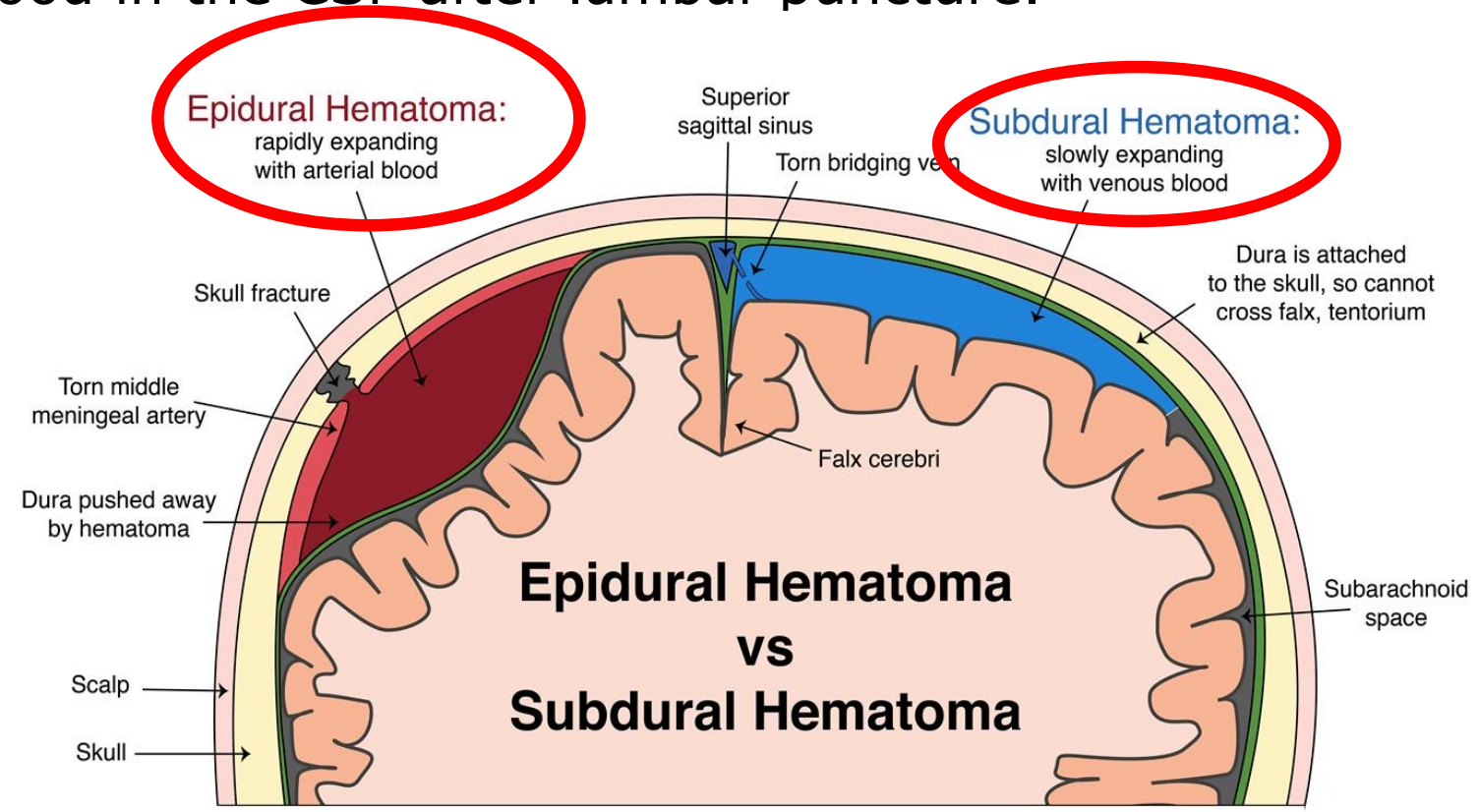
https://www.radiologymasterclass.co.uk/gallery/ct_brain/ct_brain_images/extradural_contracoup_ct_brain

Treatment

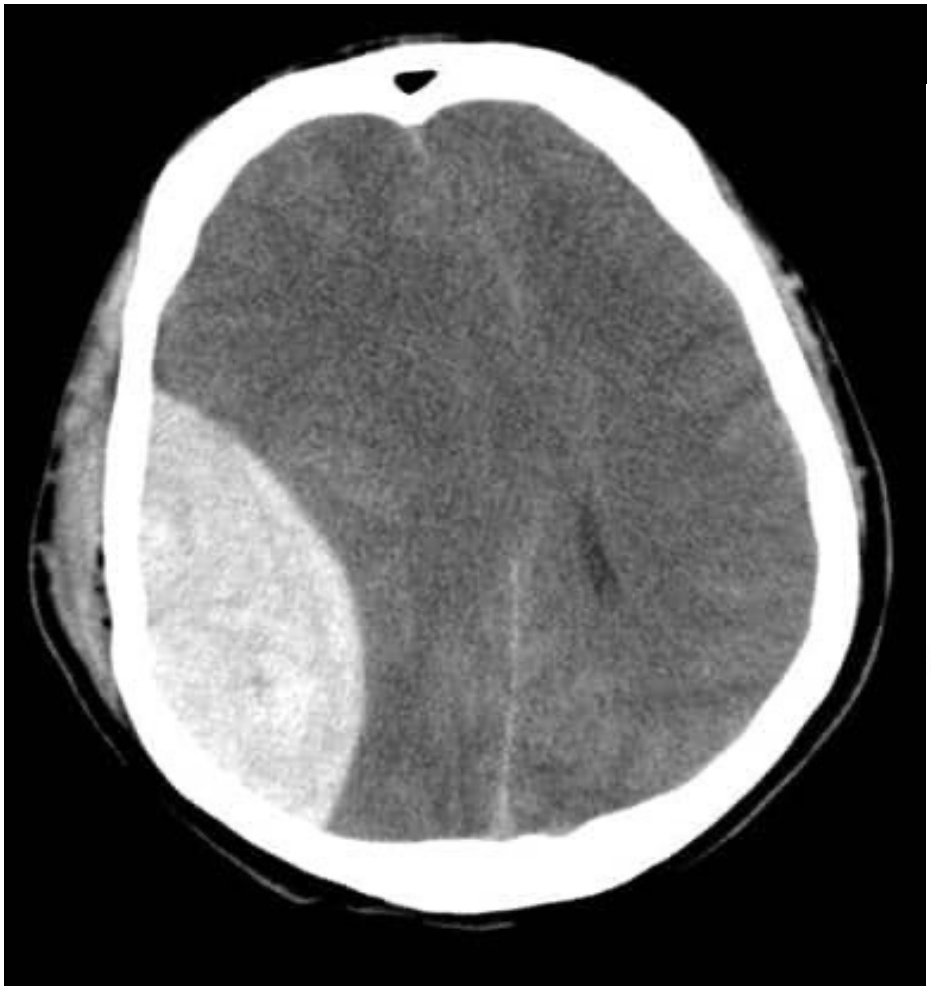
- The burr hole through the skull wall should be placed 2.5 to 4 cm above the midpoint of the zygomatic arch to ligate or plug the torn artery or vein.

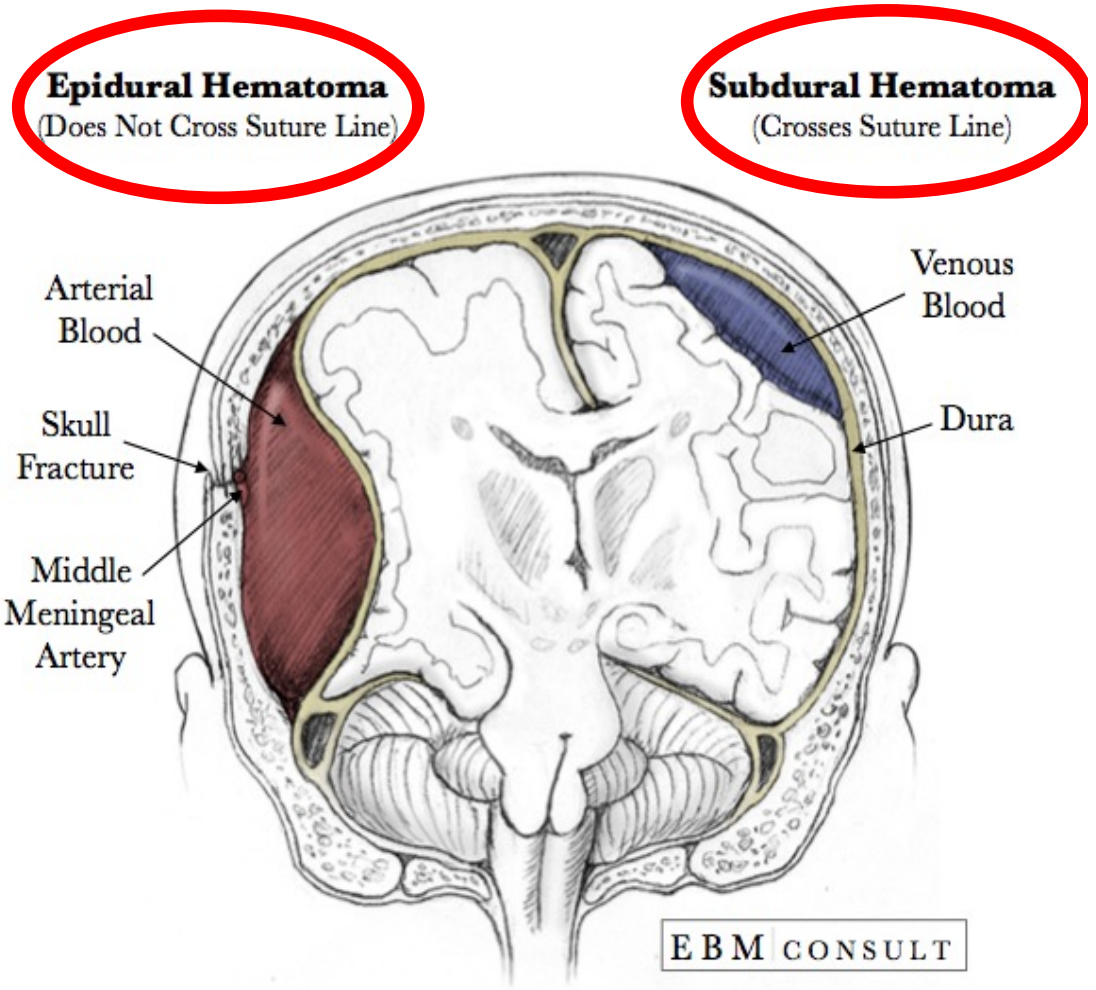
Subdural hemorrhage

- Is caused by a violent shaking of the head (e.g. car accident)
- The blood is located between the dura and arachnoid
- Blood accumulates slowly (days to weeks after trauma);
- No blood in the CSF after lumbar puncture.



Lucy Liu





Look for this website :

https://www.radiologymasterclass.co.uk/gallery/ct_brain/ct_brain_images/subdural_small_ct_brain

Subarachnoid hemorrhage :

- Extravasation of blood in Subarachnoid space usually arterial.
- Th cause traumatic as head truma or non traumatic like rapture arterial aneurysm
- This hemorrhage resulted in meningeal irritation ,severe headache ,neck stiffness and loss of consciousness

Look for this website :
https://www.radiologymasterclass.co.uk/gallery/ct_brain/ct_brain_images/subarachnoid_haemorrhage_sah_ct_brain

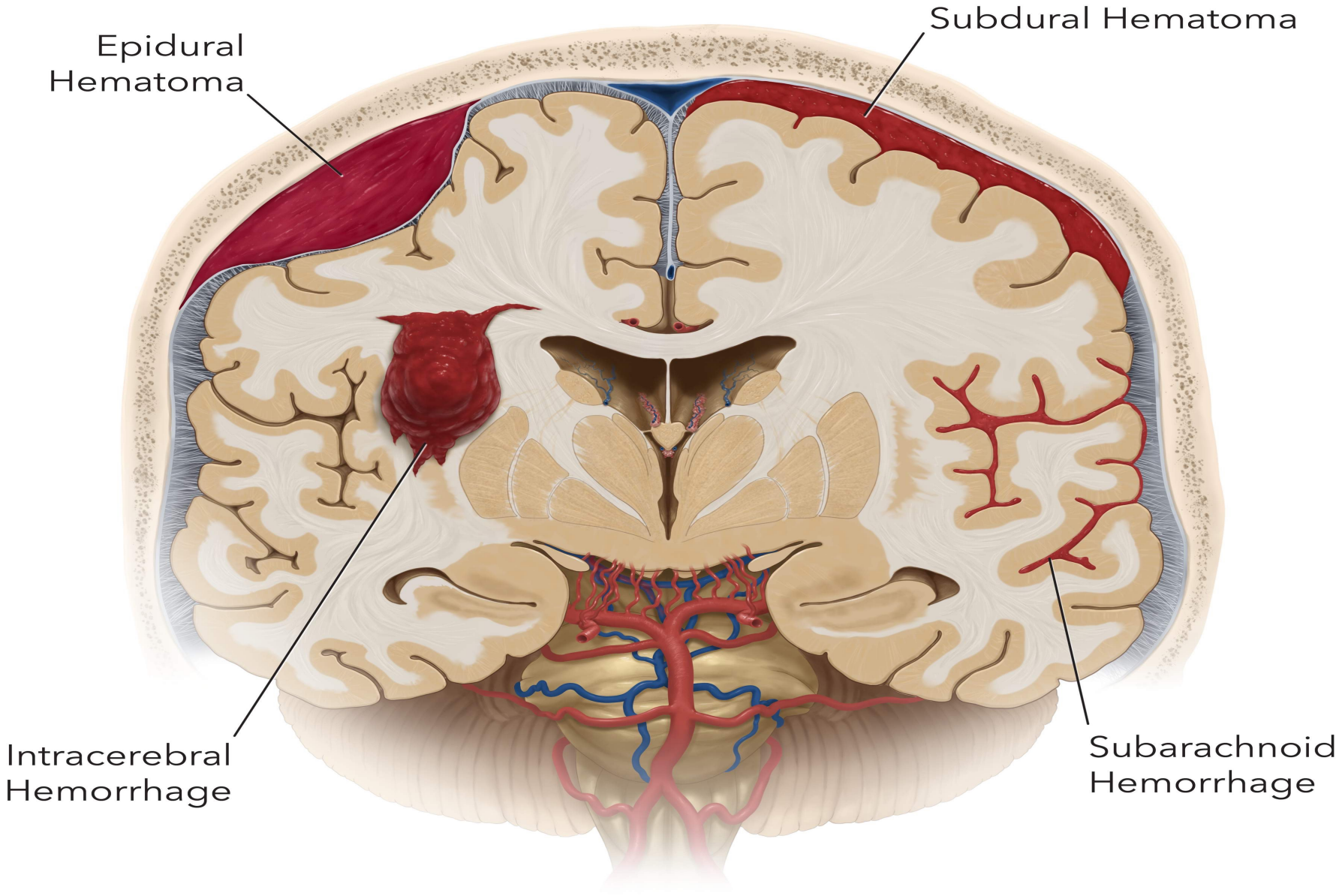
Cerebral hemorrhage

Is caused by rupture of the thin-walled a branch of **the middle cerebral artery.**

The hemorrhage involves the important centers

It produces hemiplegia on the opposite side of the body and may be affect speech

Look for this website :
https://www.radiologymasterclass.co.uk/gallery/ct_brain/ct_brain_images/intracerebral_haemorrhage_ich_ct_brain


Epidural
Hematoma
Subdural Hematoma
Intracerebral
Hemorrhage
Subarachnoid
Hemorrhage


Thank
you