SISTEM SYARAF

Dibagi menjadi :

a. **Sistem syaraf pusat :** yang terdiri dari : otak dan medulla spinalis

b. **Sistem syaraf perifer :** terdiri dari

- Syaraf cranialis (12 pasang)
- Syaraf spinal
- Syaraf otonom

EMBRIOLOGI

- Berasal dari neuro ektoderm. Mula-mula membentuk neural plate → neural fold → neural tube
- Ada neuro porus anterior → an encephaly
- Ada neuro porus posterior → spina bifida. Setelah neuro porus anterior dan posterior menutup terbentuk tiga gelembung otak : a. procencephalon → telencephalon dan diencephalon, b.mesencephalon → mesencephalon

c. Rhombencephalon →

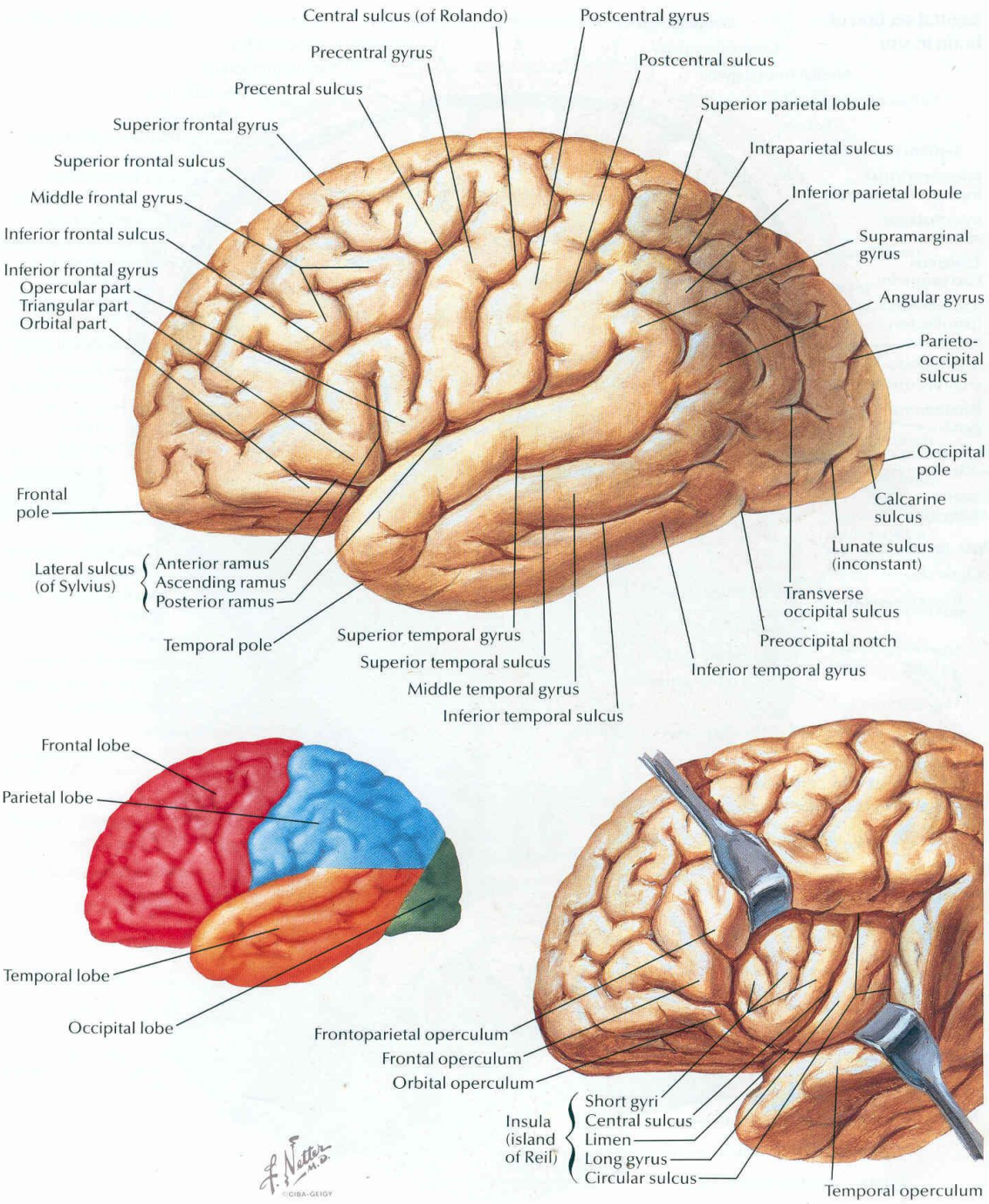
- metencephalon → pons dan cerebellum
- myelencephalon → medulla oblongata dan medulla spinalis

1. TELENCEPHALON

Terdiri dari : cortex cerebri dan centrum semi ovale

Cortex cerebri : mempunyai sulcus dan gyrus, sulcus yang penting adalah fisura cerebri lateralis dan sulcus centralis → membagi hemisphere cerebri menjadi : 1. Lobus frontalis, 2. Lobus parietalis, 3.Lobus occipitalis, 4.Lobus temporalis, 5.Insula Relei.

Medulla atau centrum semi ovale terdiri dari serat-serat → corpus calosum.


Central sulcus (of Rolando)
Postcentral gyrus
Precentral gyrus
Postcentral sulcus
Precentral sulcus
Superior parietal lobule
Superior frontal gyrus
Intraparietal sulcus
Superior frontal sulcus
Inferior parietal lobule
Middle frontal gyrus
Supramarginal gyrus
Inferior frontal sulcus
Inferior frontal gyrus
Opercular part
Triangular part
Orbital part
Angular gyrus
Parieto-occipital sulcus
Occipital pole
Frontal pole
Calcarine sulcus
Lunate sulcus (inconstant)
Lateral sulcus (of Sylvius)
Anterior ramus
Ascending ramus
Posterior ramus
Transverse occipital sulcus
Preoccipital notch
Temporal pole
Superior temporal gyrus
Superior temporal sulcus
Inferior temporal gyrus
Middle temporal gyrus
Inferior temporal sulcus
Frontal lobe
Parietal lobe
Temporal lobe
Occipital lobe
Frontoparietal operculum
Frontal operculum
Orbital operculum
Insula (island of Reil)
Short gyri
Central sulcus
Limen
Long gyrus
Circular sulcus
Temporal operculum
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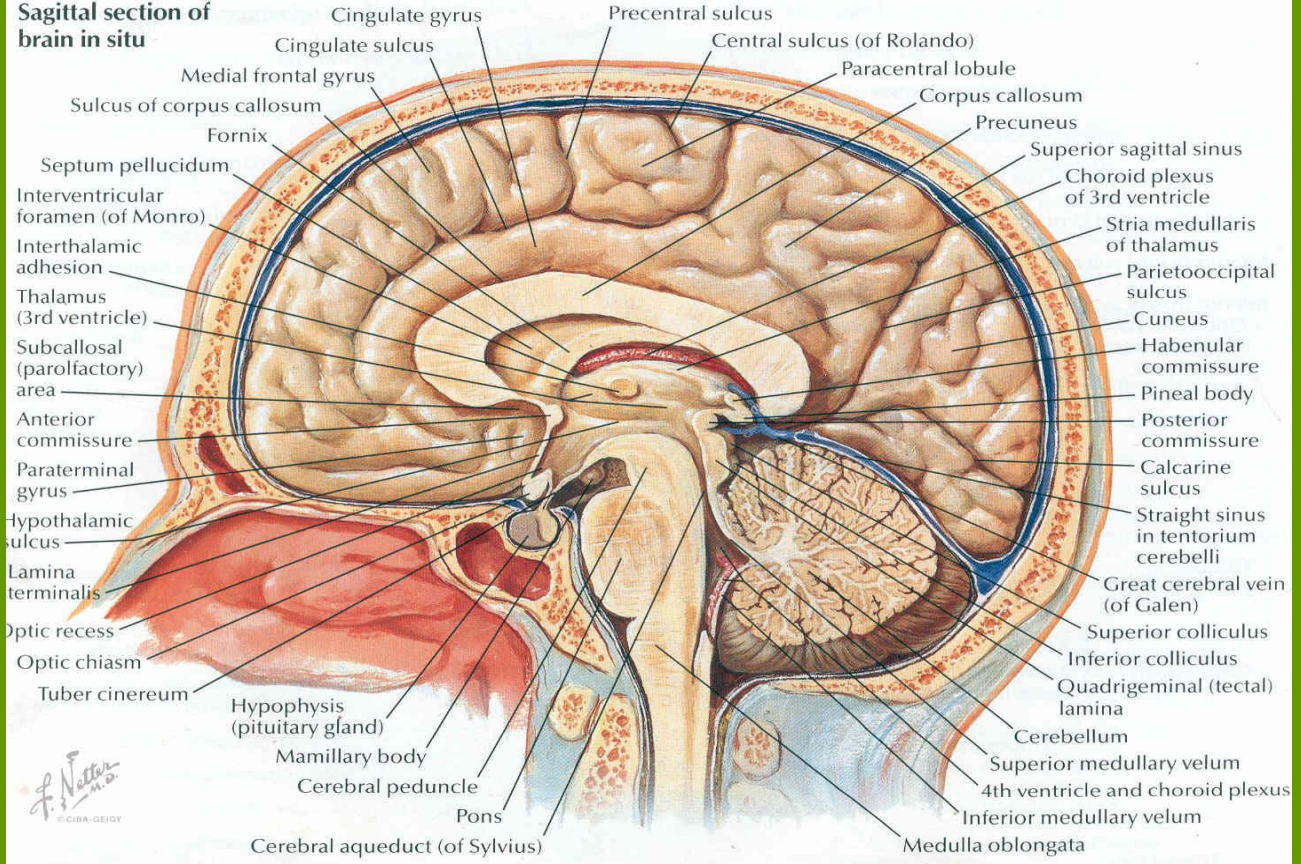
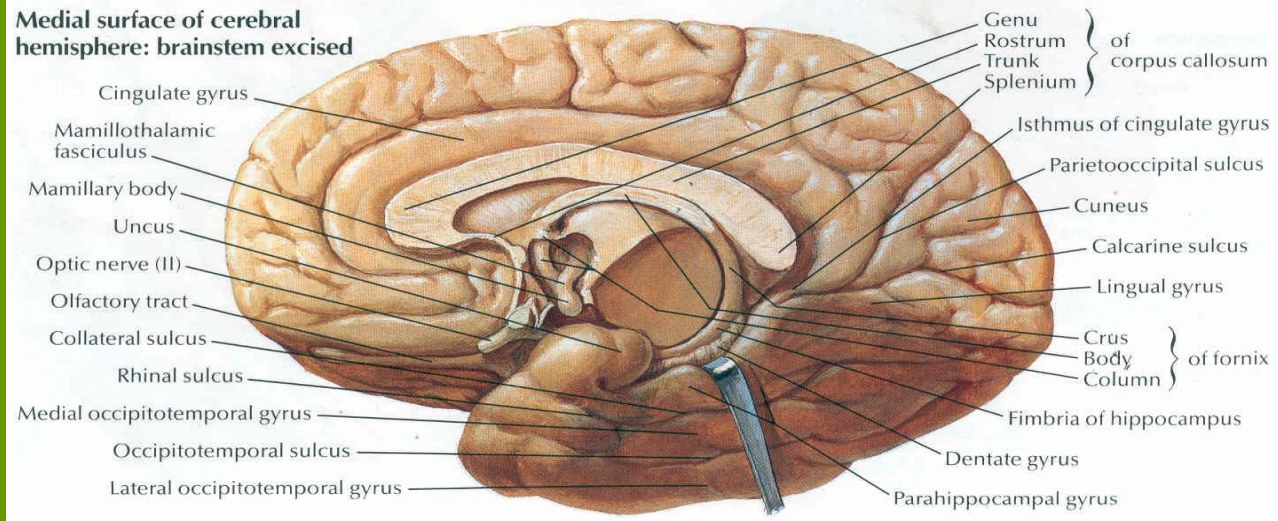
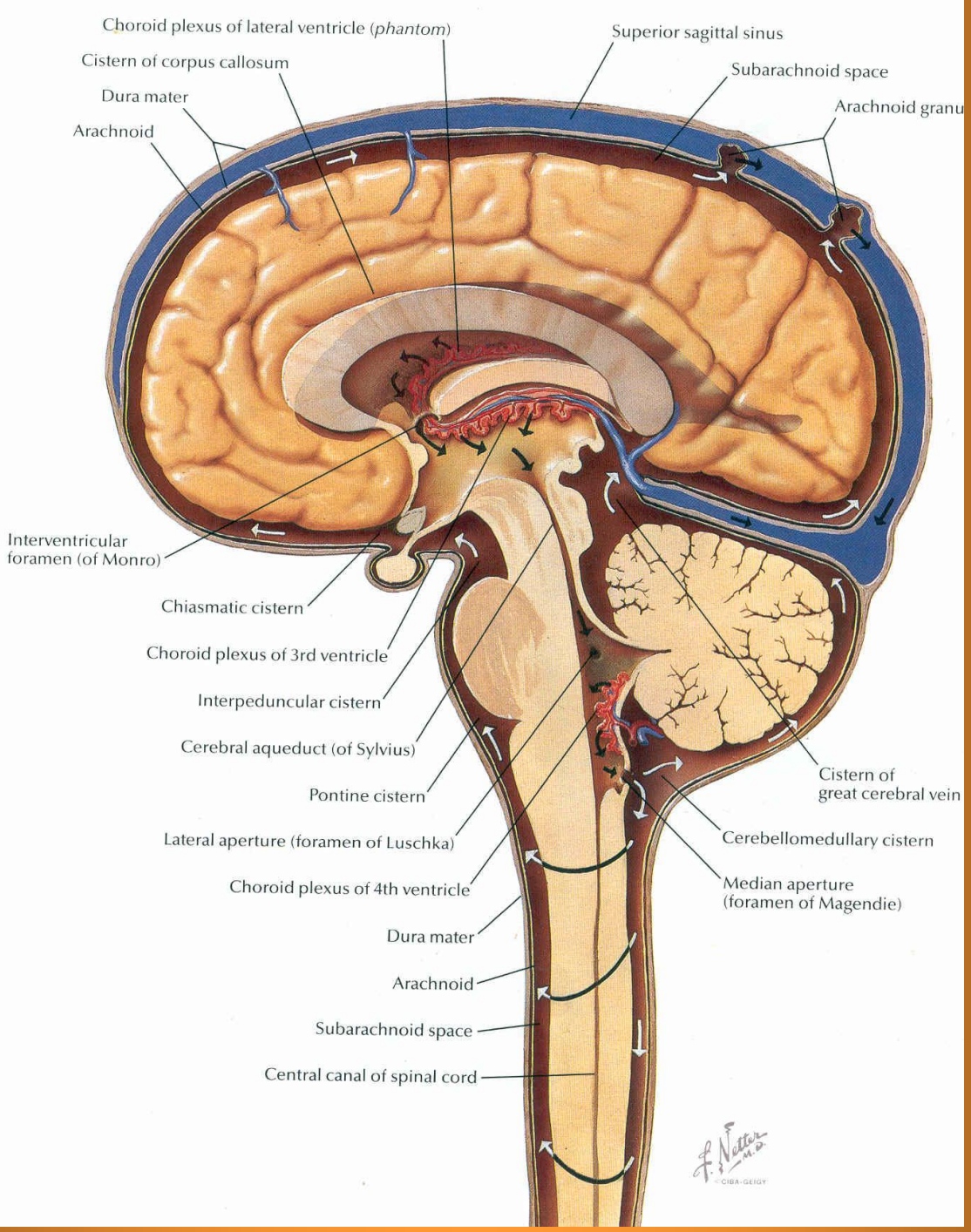
Sagittal section of brain in situ



Medial surface of cerebral hemisphere: brainstem excised




Choroid plexus of lateral ventricle (phantom)
Superior sagittal sinus
Cistern of corpus callosum
Subarachnoid space
Dura mater
Arachnoid granu
Arachnoid
Interventricular foramen (of Monro)
Chiasmatic cistern
Choroid plexus of 3rd ventricle
Interpeduncular cistern
Cerebral aqueduct (of Sylvius)
Cistern of great cerebral vein
Pontine cistern
Cerebellomedullary cistern
Lateral aperture (foramen of Luschka)
Median aperture (foramen of Magendie)
Choroid plexus of 4th ventricle
Dura mater
Arachnoid
Subarachnoid space
Central canal of spinal cord
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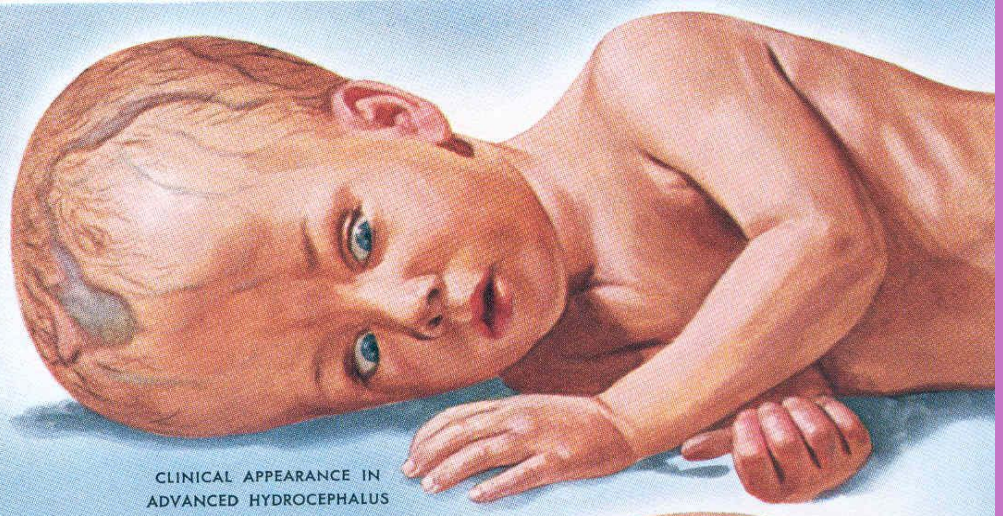
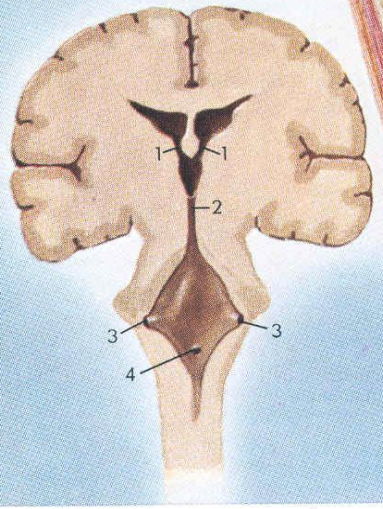
Di dalam hemisphere didapatkan ruangan yang disebut ventricle lateralis.

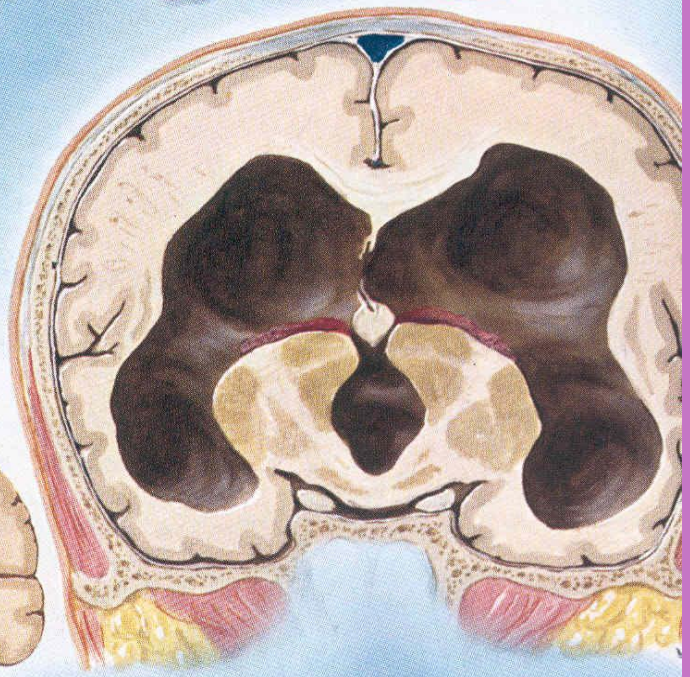


CLINICAL APPEARANCE IN
ADVANCED HYDROCEPHALUS

SITES OF OBSTRUCTION IN
INTERNAL HYDROCEPHALUS

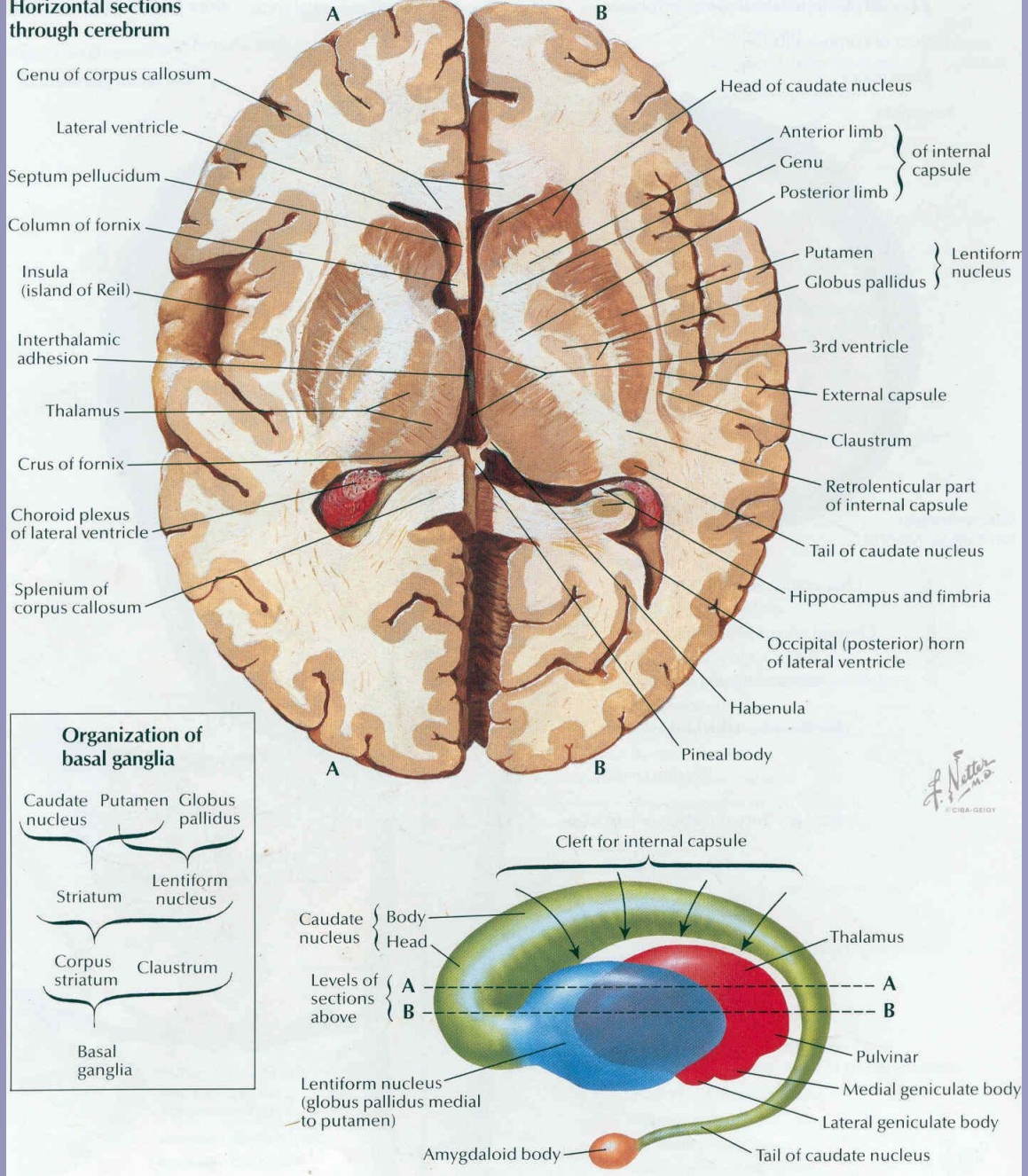
1. Interventricular foramina (Monro)
2. Aqueduct of Sylvius
3. Foramina of Luschka
4. Foramen of Magendie





SECTION THROUGH BRAIN SHOWING MARKED
DILATATION OF LATERAL AND THIRD VENTRICLES

- **Basal ganglia :** nucleus caudatus, nucleus lentiformis, claustrum dan nucleus amigdale

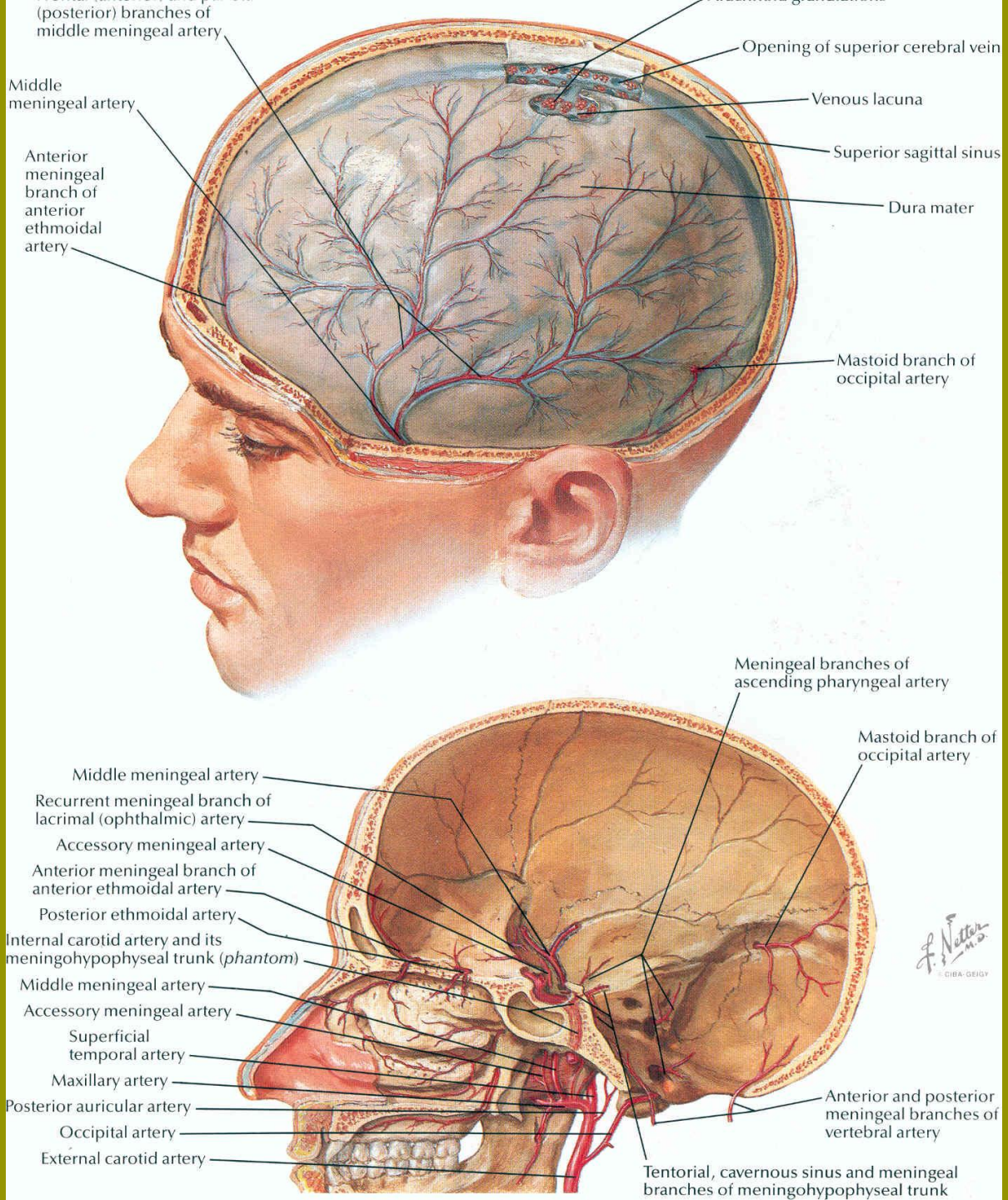


Organization of basal ganglia

Caudate nucleus + Putamen = Striatum
Globus pallidus + Lentiform nucleus = Lentiform nucleus
Striatum + Lentiform nucleus = Corpus striatum
Corpus striatum + Claustrum = Basal ganglia

Interrelationship of thalamus, lentiform nucleus, caudate nucleus and amygdaloid body (schema): left lateral view

- otak dan medulla spinalis dibungkus oleh meningens yang terdiri dari : duramater → encephali dan spinalis
- duplikatur duramater terdiri dari falx cerebri, falx cerebelli, tentorium cerebelli dan diafragma sellae.


(posterior) branches of middle meningeal artery
Middle meningeal artery
Anterior meningeal branch of anterior ethmoidal artery
Opening of superior cerebral vein
Venous lacuna
Superior sagittal sinus
Dura mater
Mastoid branch of occipital artery
Meningeal branches of ascending pharyngeal artery
Mastoid branch of occipital artery
Middle meningeal artery
Recurrent meningeal branch of lacrimal (ophthalmic) artery
Accessory meningeal artery
Anterior meningeal branch of anterior ethmoidal artery
Posterior ethmoidal artery
Internal carotid artery and its meningohypophyseal trunk (phantom)
Middle meningeal artery
Accessory meningeal artery
Superficial temporal artery
Maxillary artery
Posterior auricular artery
Occipital artery
External carotid artery
Anterior and posterior meningeal branches of vertebral artery
Tentorial, cavernous sinus and meningeal branches of meningohypophyseal trunk
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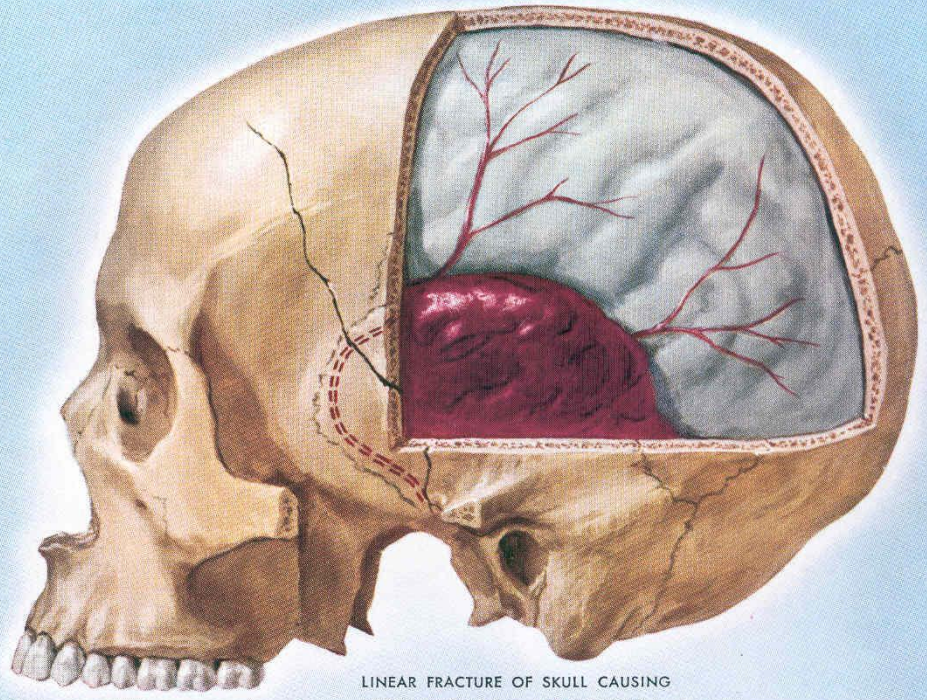
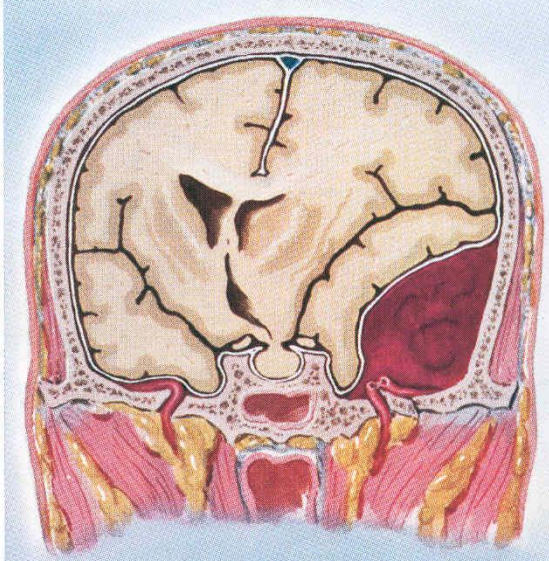
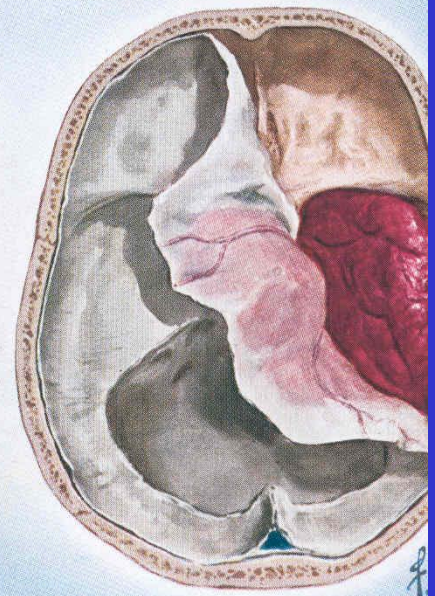


LINEAR FRACTURE OF SKULL CAUSING
MIDDLE MENINGEAL HEMORRHAGE

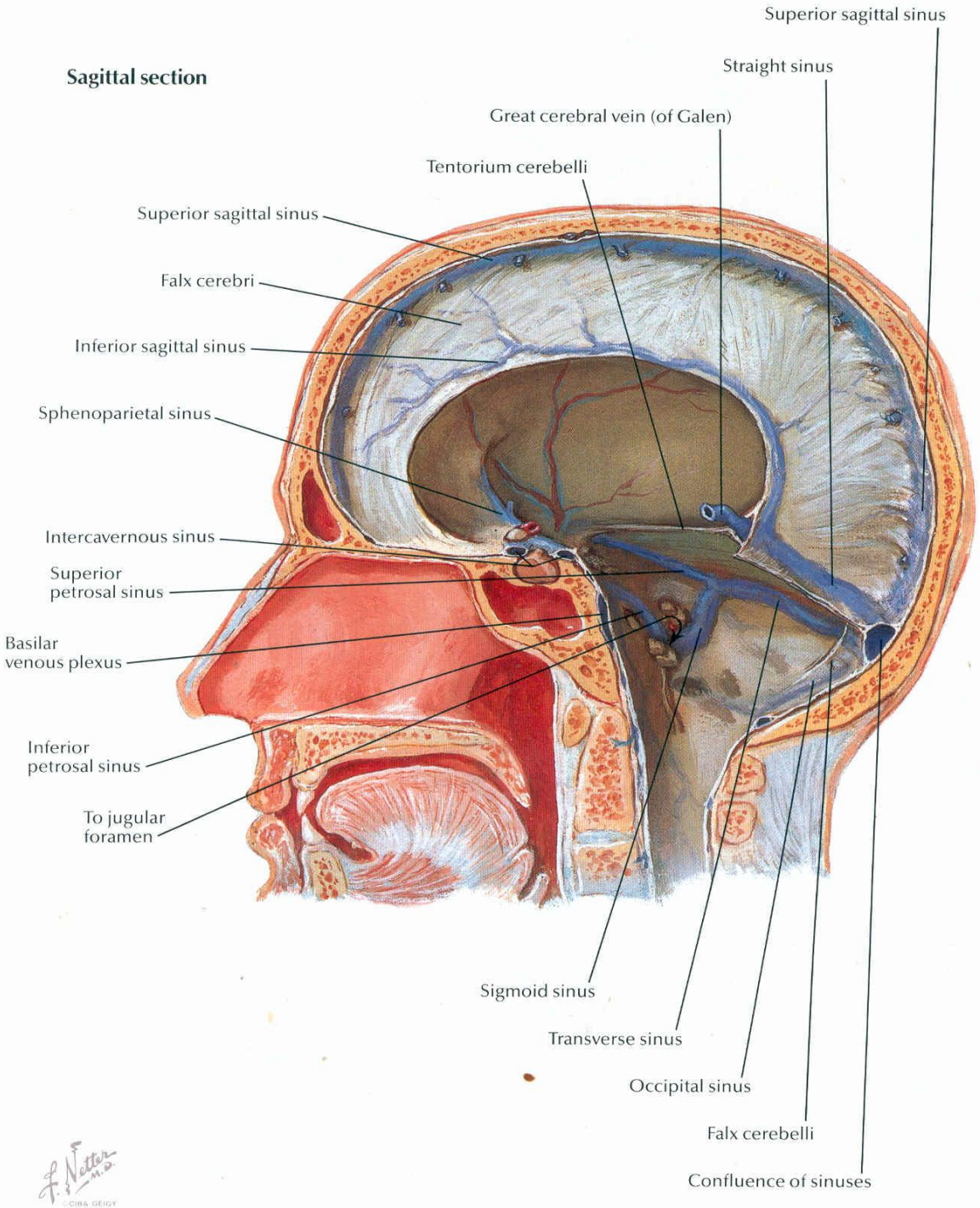


EXTRADURAL HEMATOMA DUE TO TEAR OF MIDDLE
MENINGEAL ARTERY AT THE FORAMEN SPINOSUM
BY FRACTURE OF THE BASE OF THE SKULL

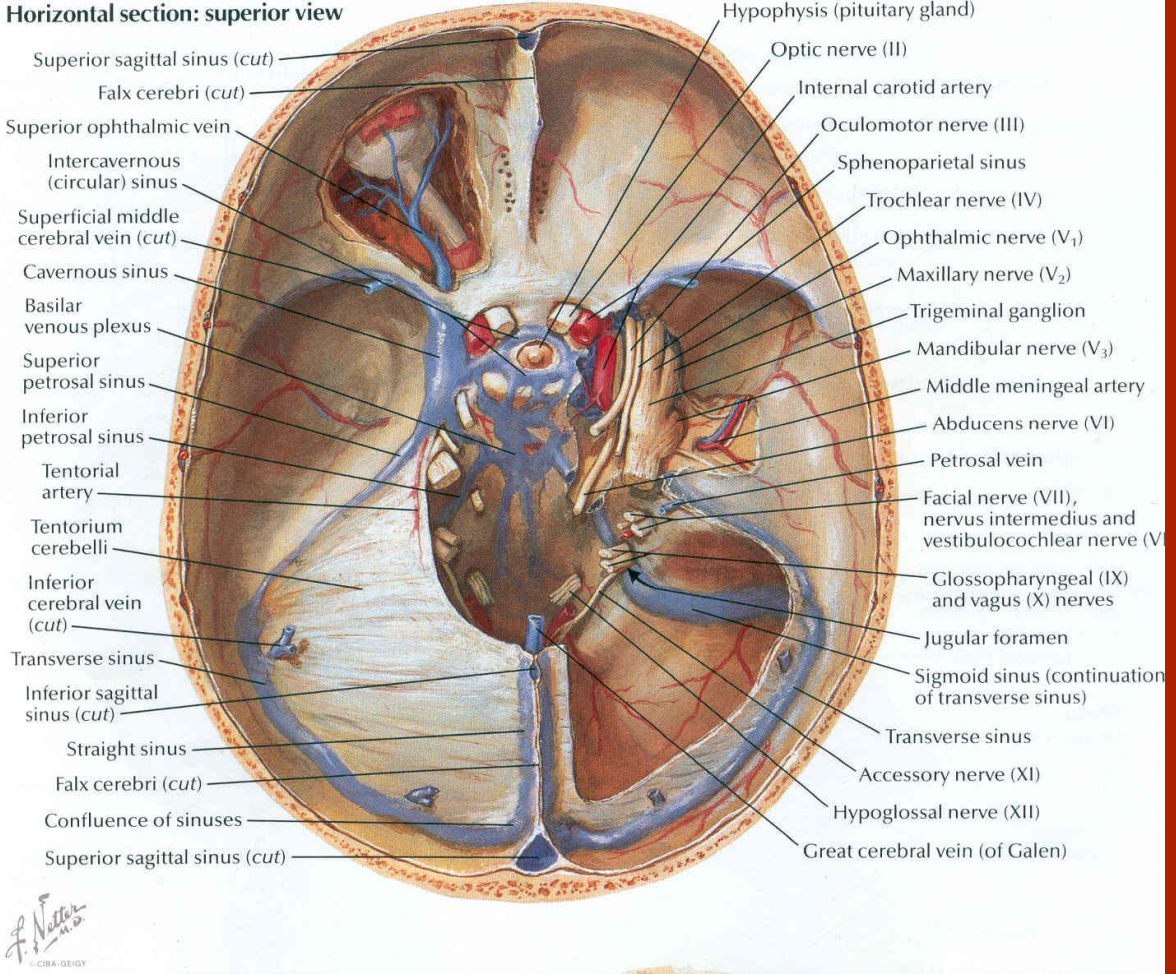


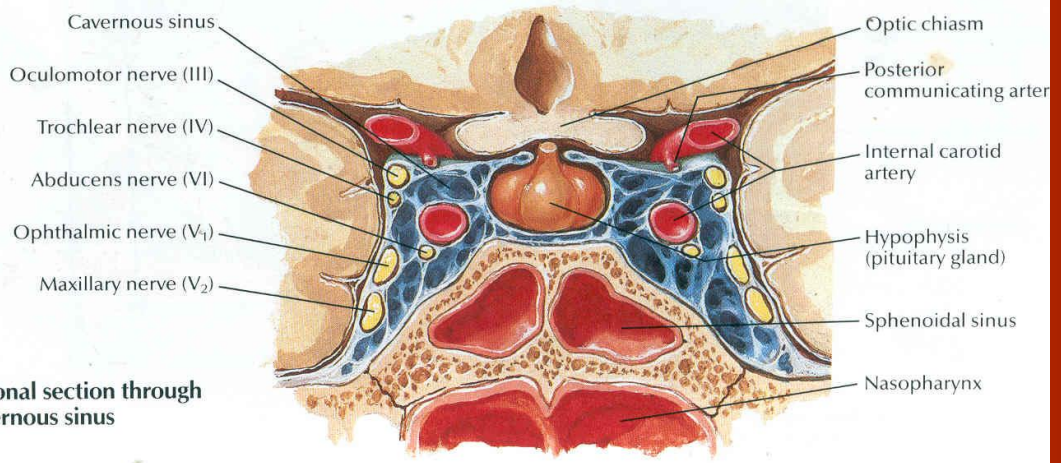
CLOT EXPOSED ON SKULL BASE
BY REFLECTION OF DURA

Sagittal section



Horizontal section: superior view

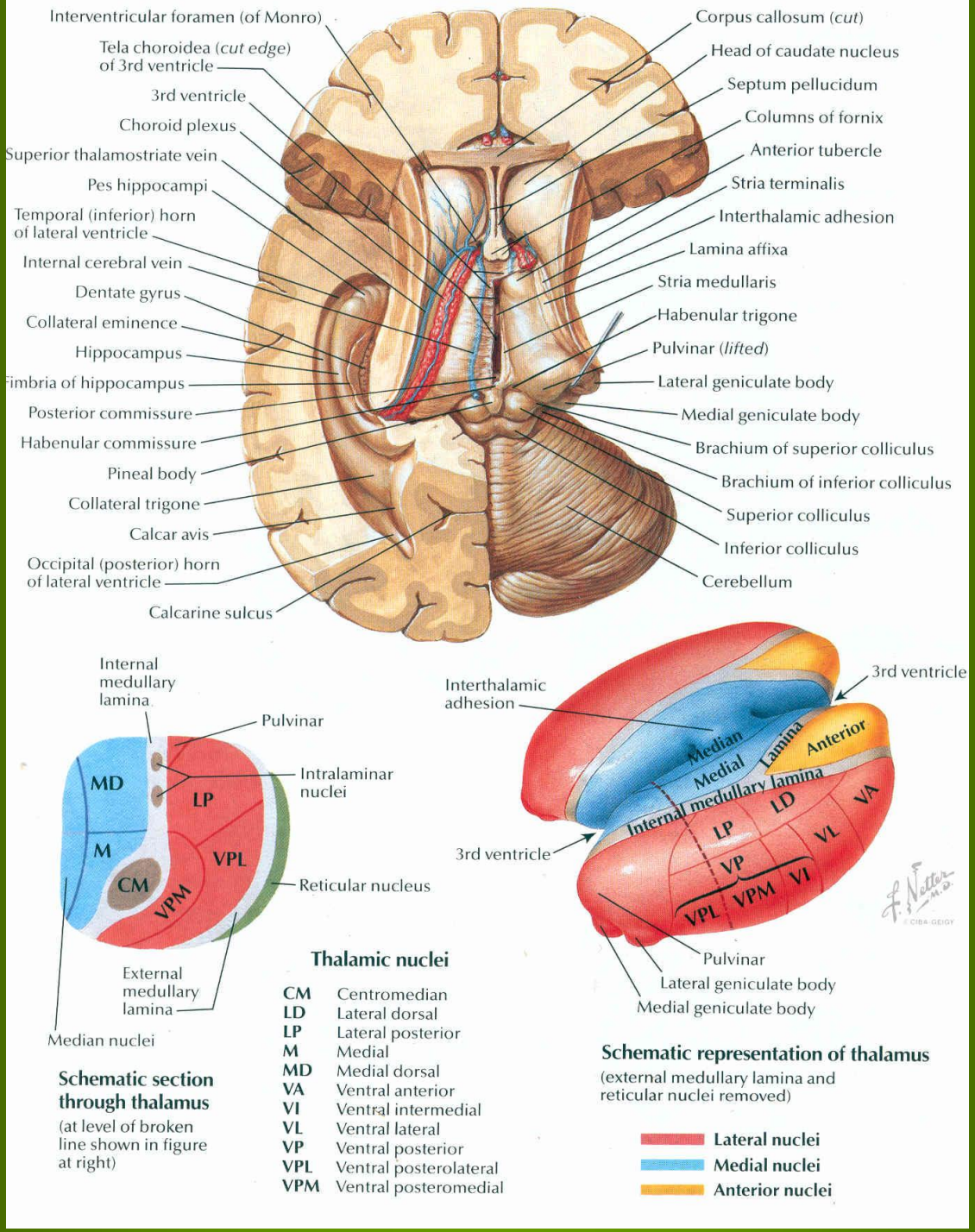




Coronal section through cavernous sinus

2. Diencephalon

Terdiri dari : thalamus, metathalamus, epithalamus, subthalamus dan hypothalamus.



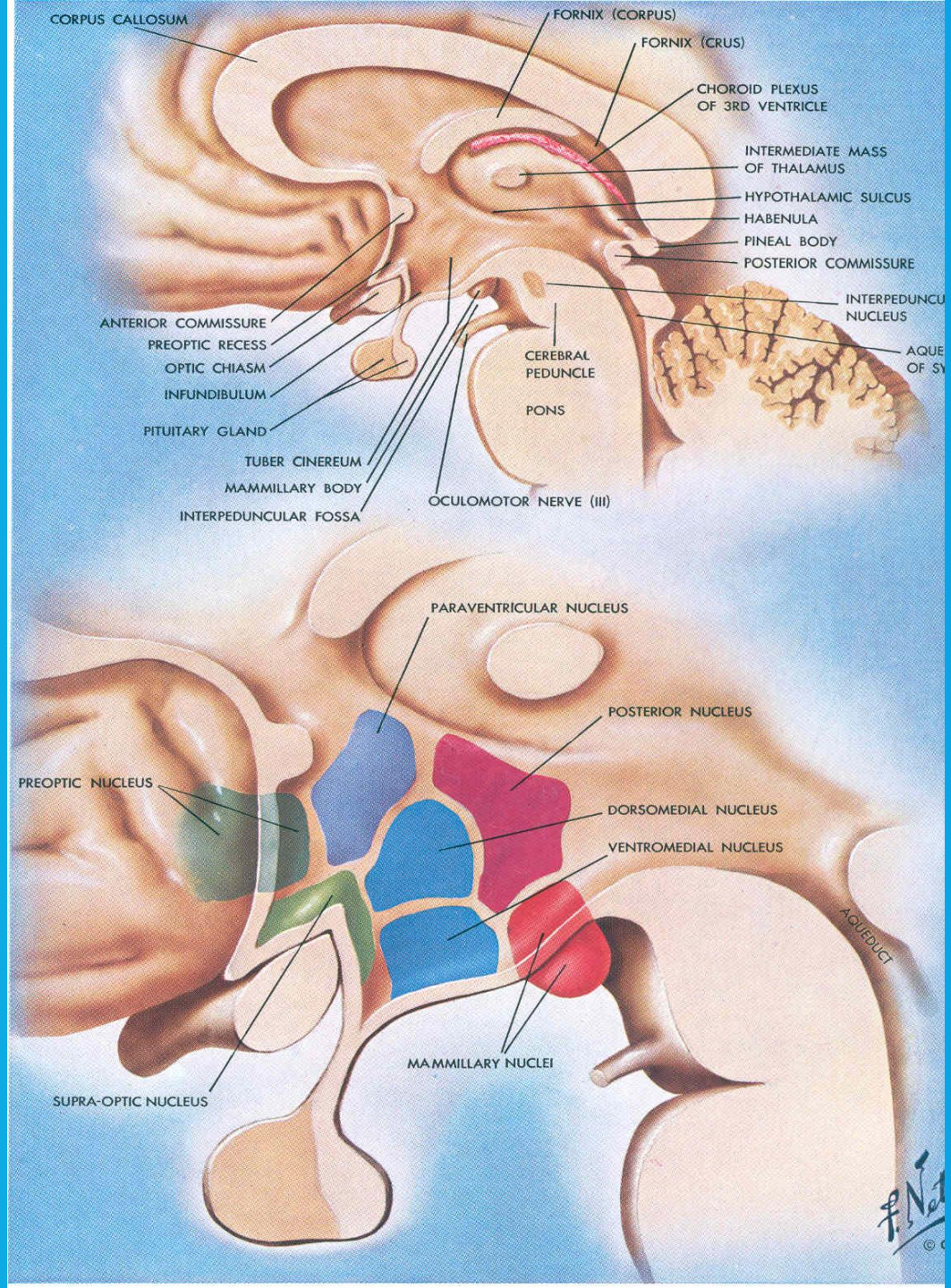
Schematic section through thalamus
(at level of broken line shown in figure at right)

Thalamic nuclei

CM	Centromedian
LD	Lateral dorsal
LP	Lateral posterior
M	Medial
MD	Medial dorsal
VA	Ventral anterior
VI	Ventral intermedial
VL	Ventral lateral
VP	Ventral posterior
VPL	Ventral posterolateral
VPM	Ventral posteromedial

Schematic representation of thalamus
(external medullary lamina and reticular nuclei removed)

Lateral nuclei
Medial nuclei
Anterior nuclei

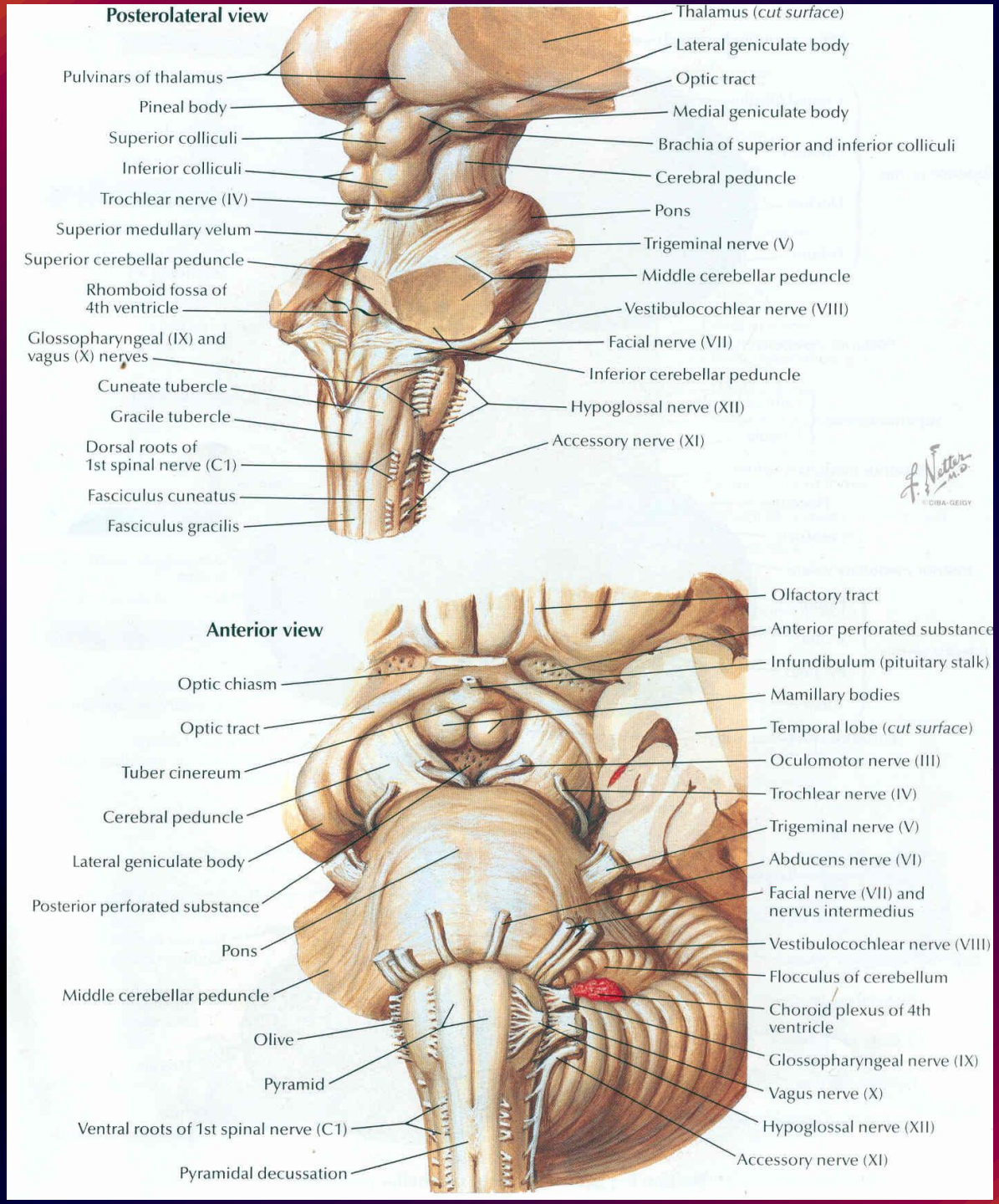

CORPUS CALLOSUM
FORNIX (CORPUS)
FORNIX (CRUS)
CHOROID PLEXUS OF 3RD VENTRICLE
INTERMEDIATE MASS OF THALAMUS
HYPOTHALAMIC SULCUS
HABENULA
PINEAL BODY
POSTERIOR COMMISSURE
INTERPEDUNCU NUCLEUS
AQUE OF SY
ANTERIOR COMMISSURE
PREOPTIC RECESS
OPTIC CHIASM
INFUNDIBULUM
PITUITARY GLAND
TUBER CINEREUM
MAMMILLARY BODY
INTERPEDUNCULAR FOSSA
CEREBRAL PEDUNCLE
PONS
OCULOMOTOR NERVE (III)
PARAVENTRICULAR NUCLEUS
POSTERIOR NUCLEUS
PREOPTIC NUCLEUS
DORSOMEDIAL NUCLEUS
VENTROMEDIAL NUCLEUS
AQUEDUCT
MAMMILLARY NUCLEI
SUPRA-OPTIC NUCLEUS

3. Mesencephalon

Terdiri dari :

Pedunculus cerebri (ventral)

Corpora quadri gemina (posterior)


Posterolateral view
Thalamus (cut surface)
Lateral geniculate body
Optic tract
Medial geniculate body
Brachia of superior and inferior colliculi
Cerebral peduncle
Pons
Trigeminal nerve (V)
Middle cerebellar peduncle
Vestibulocochlear nerve (VIII)
Facial nerve (VII)
Inferior cerebellar peduncle
Hypoglossal nerve (XII)
Accessory nerve (XI)
Pulvinars of thalamus
Pineal body
Superior colliculi
Inferior colliculi
Trochlear nerve (IV)
Superior medullary velum
Superior cerebellar peduncle
Rhomboid fossa of 4th ventricle
Glossopharyngeal (IX) and vagus (X) nerves
Cuneate tubercle
Gracile tubercle
Dorsal roots of 1st spinal nerve (C1)
Fasciculus cuneatus
Fasciculus gracilis
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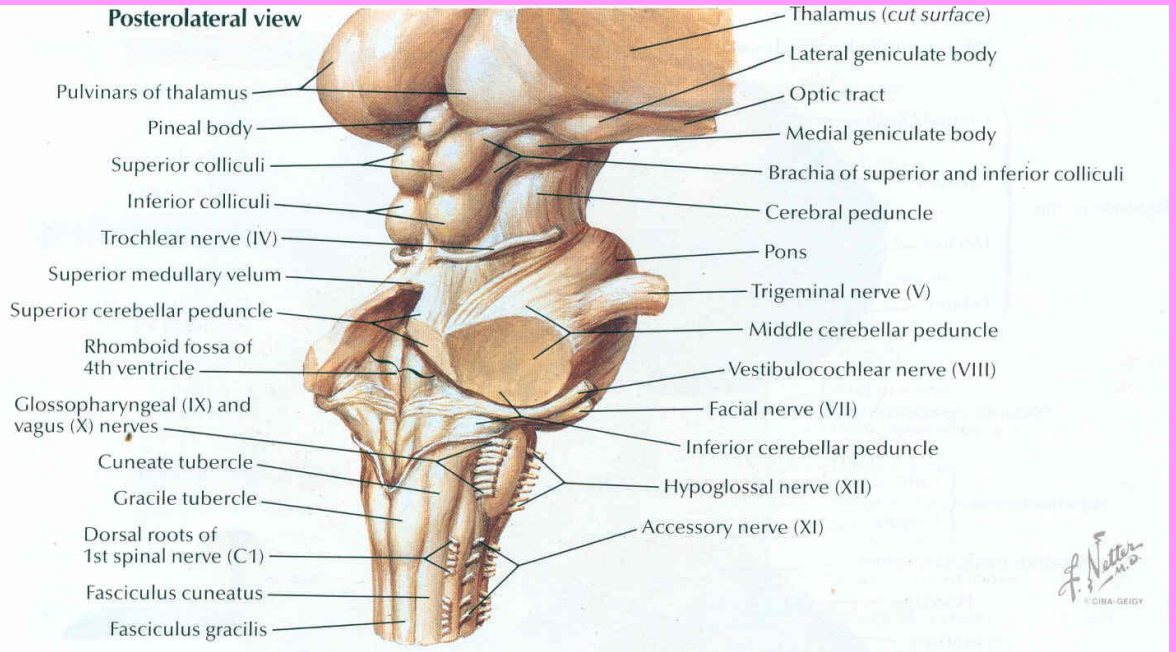
Anterior view
Olfactory tract
Anterior perforated substance
Infundibulum (pituitary stalk)
Mamillary bodies
Temporal lobe (cut surface)
Oculomotor nerve (III)
Trochlear nerve (IV)
Trigeminal nerve (V)
Abducens nerve (VI)
Facial nerve (VII) and nervus intermedius
Vestibulocochlear nerve (VIII)
Flocculus of cerebellum
Choroid plexus of 4th ventricle
Glossopharyngeal nerve (IX)
Vagus nerve (X)
Hypoglossal nerve (XII)
Accessory nerve (XI)
Optic chiasm
Optic tract
Tuber cinereum
Cerebral peduncle
Lateral geniculate body
Posterior perforated substance
Pons
Middle cerebellar peduncle
Olive
Pyramid
Ventral roots of 1st spinal nerve (C1)
Pyramidal decussation

4. Pons

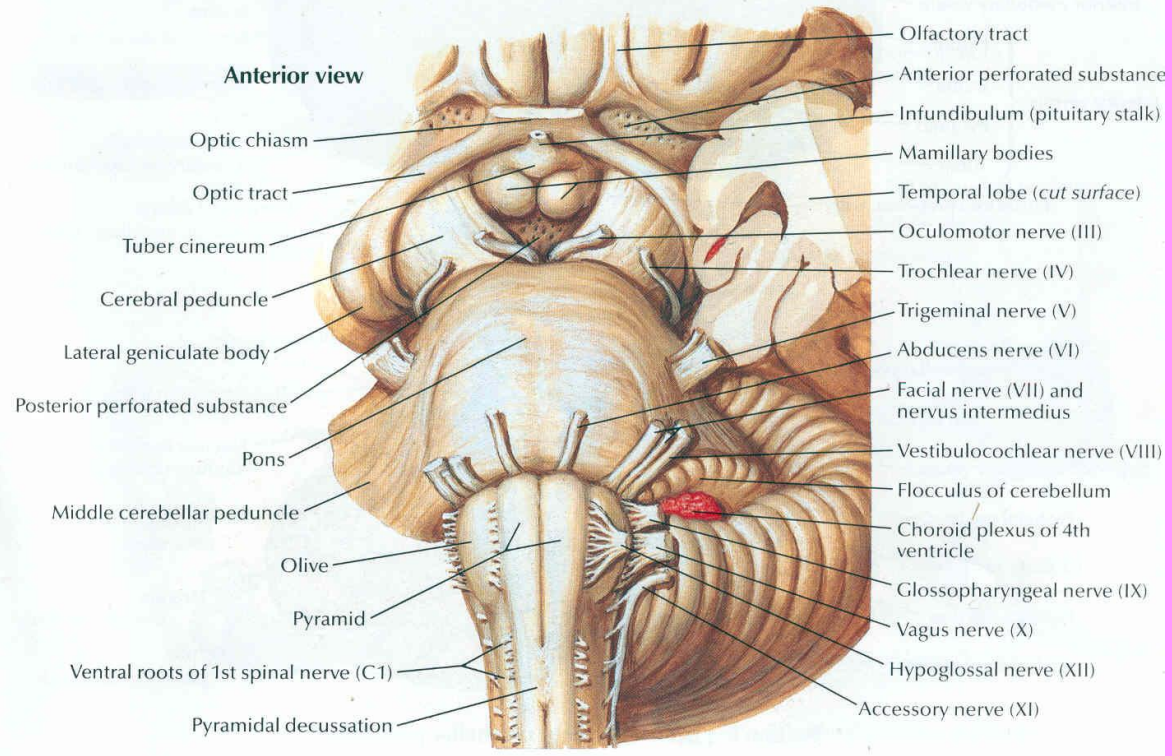
Terdapat fibrae transversalis → pedunculus cerebelli medius. Pada pons keluar N.V. (trigeminus), N.VI (abducens), N.VII (facialis) dan N.VIII (stato acusticus).

- Sulcus basilaris

Posterolateral view

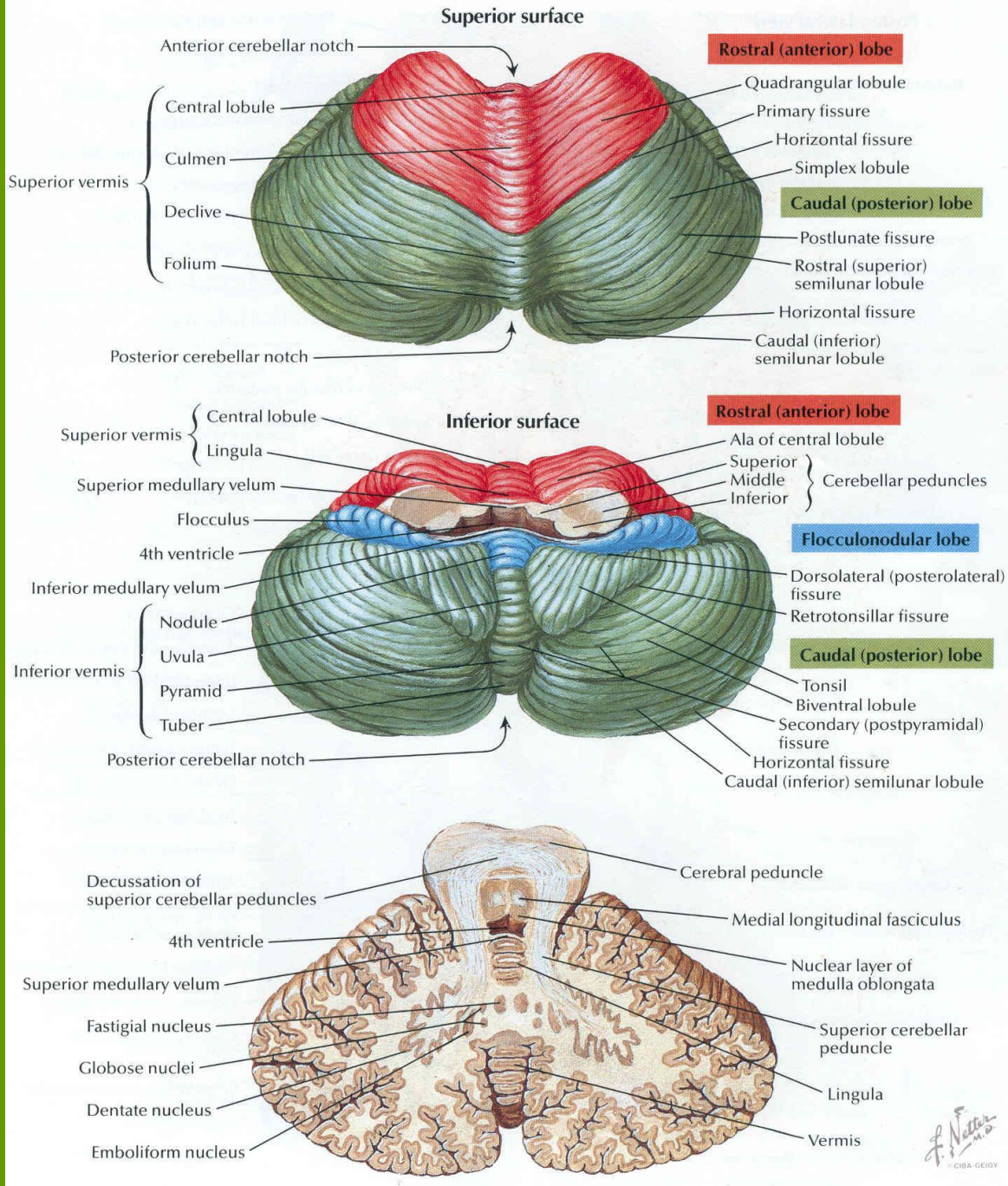


Anterior view



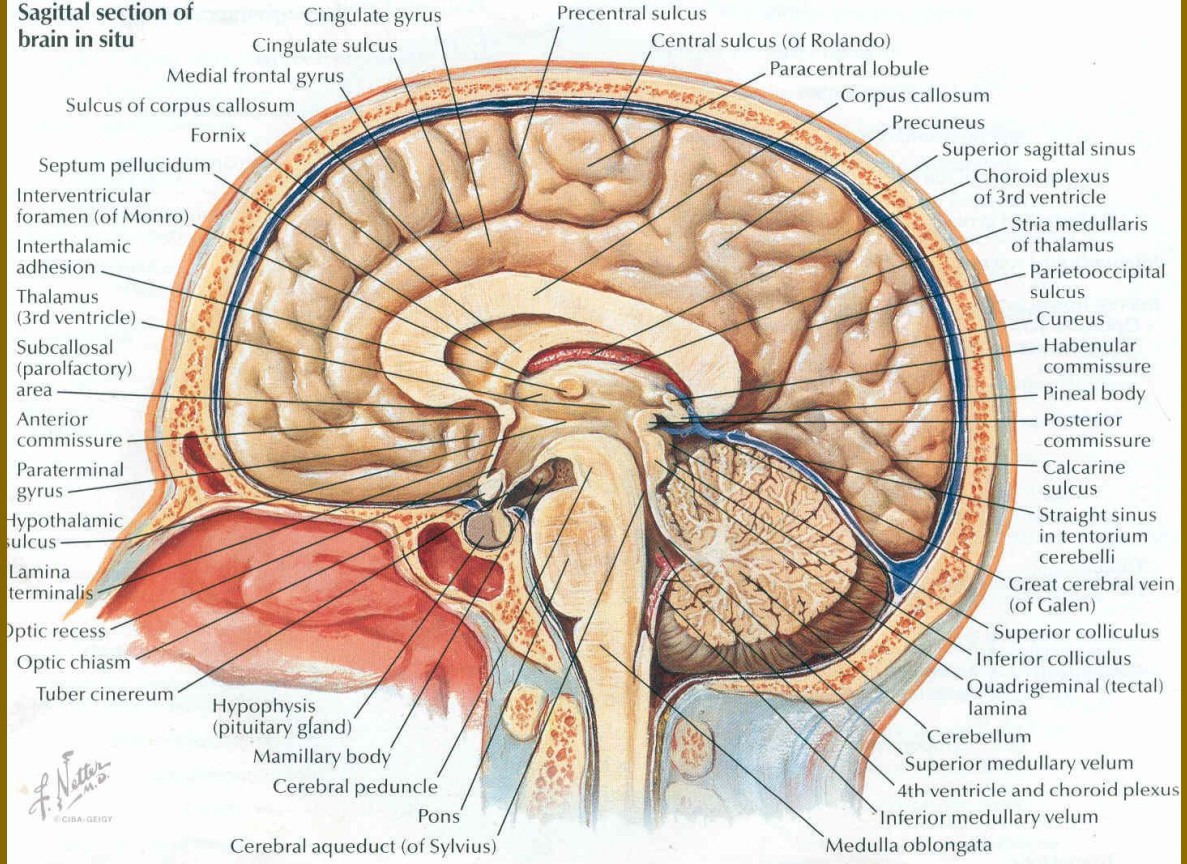
5. Cerebellum

- Vermis
- Hemisphere
- Dihubungkan dengan brain stem melalui : pedunculus cerebelli superior, medius dan inferior.

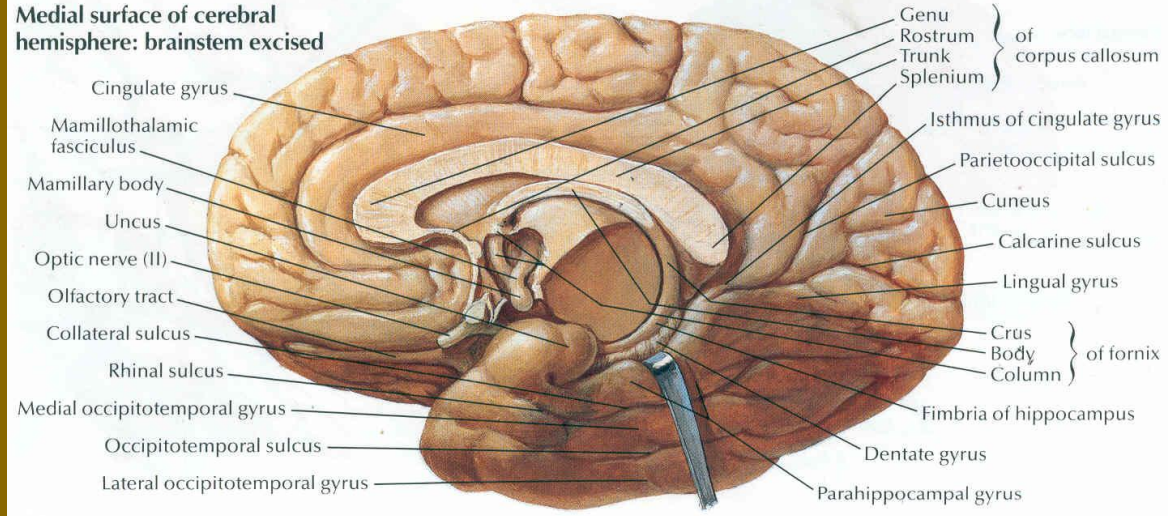


Section in plane of superior cerebellar peduncle

Sagittal section of brain in situ



Medial surface of cerebral hemisphere: brainstem excised



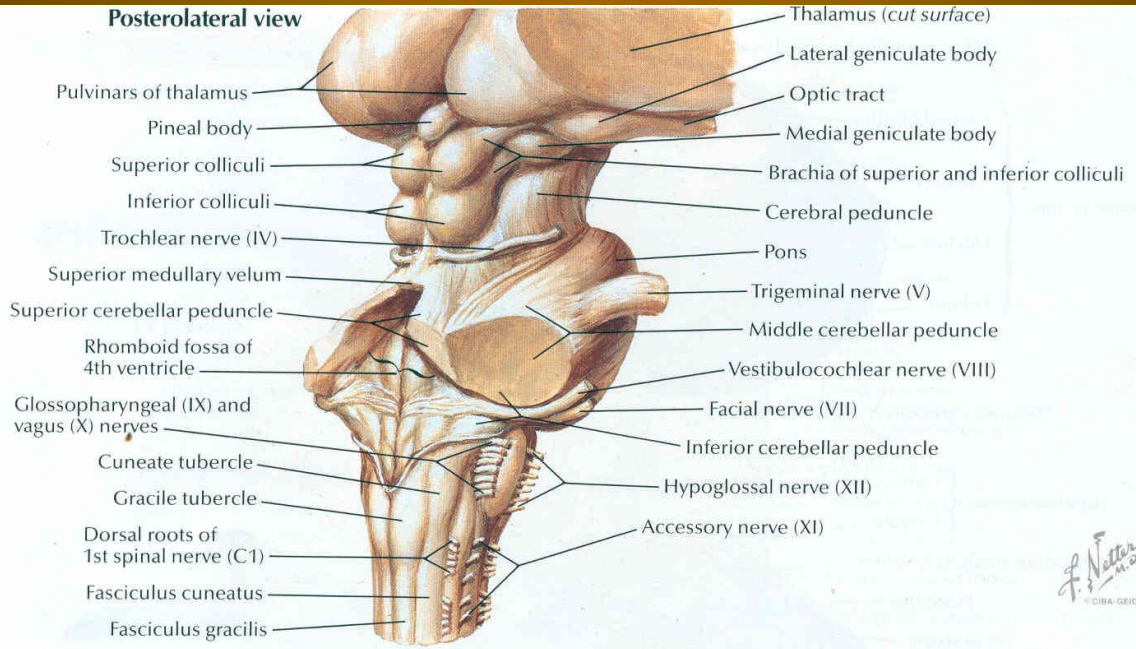
6. Medulla oblongata

* **Bagian anterior :** piramid, oliva → radix N.XII (hypoglossus) → keluar pada sulcus anterior lateralis

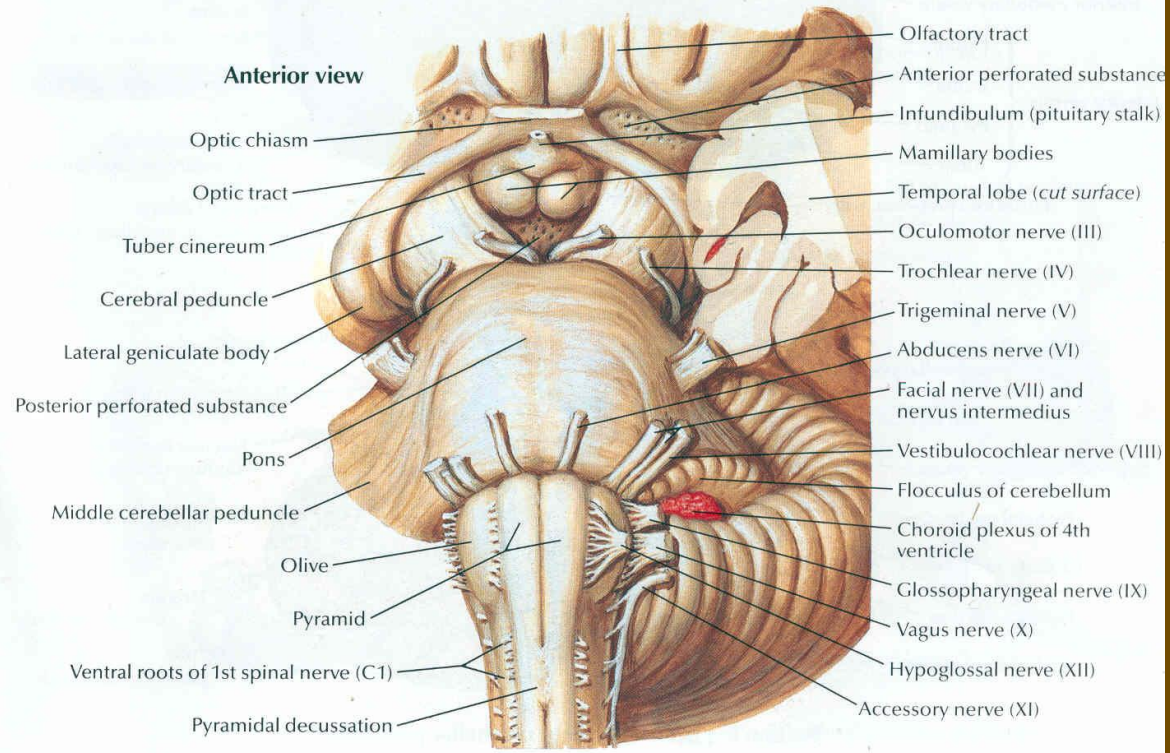
  Radix N.IX (glosso pharyngeus), N.X (vagus) dan N.XI (acessorius) → keluar pada sulcus posterior lateralis

* **Bagian posterior :** funiculus posterior

Posterolateral view

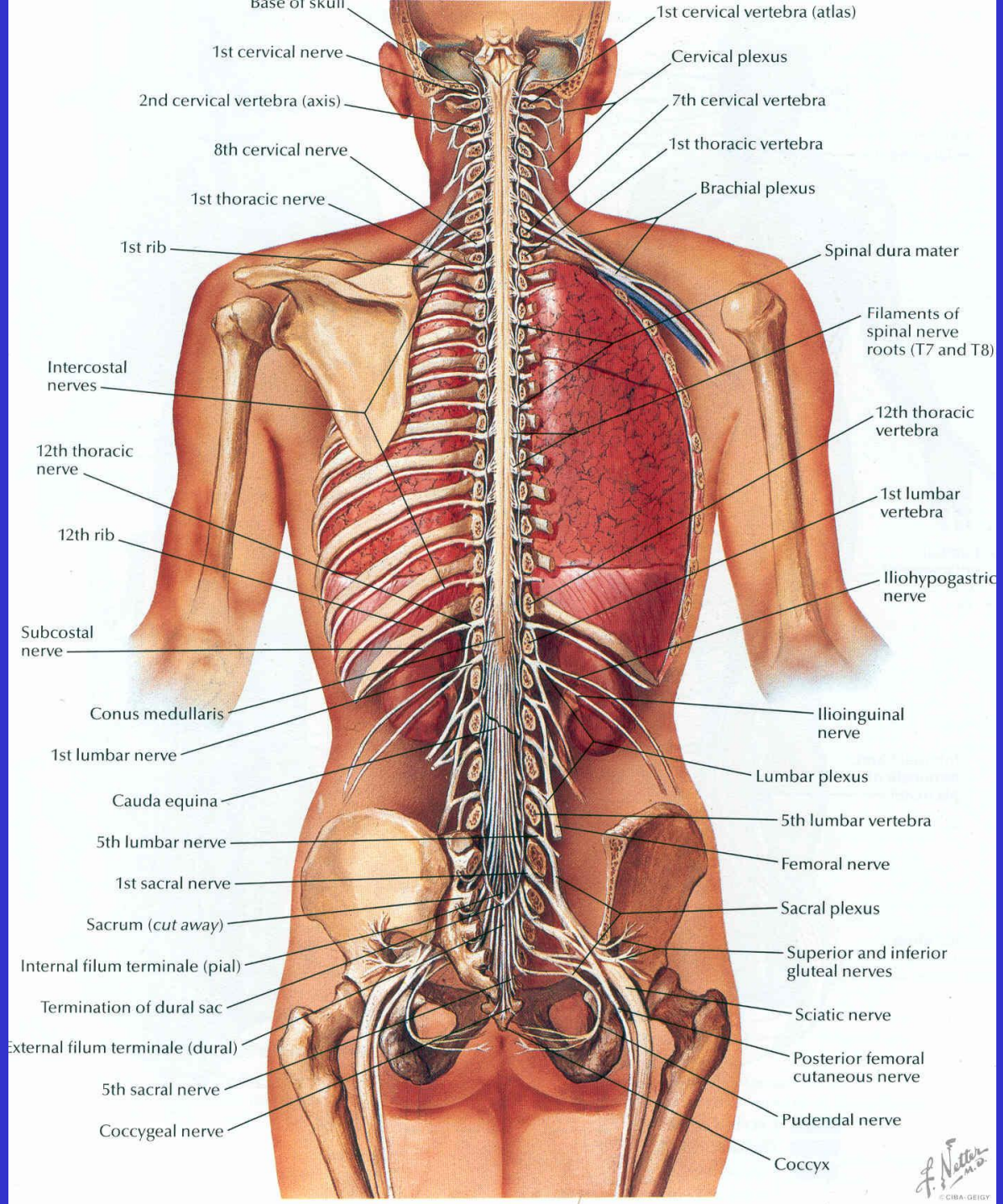


Anterior view



7. Medulla spinalis

- Conus medullaris → setinggi discus intervertebralis lumbal 1 dan 2
- Filum terminale internum
- Cauda equina
- Nervus spinalis


Base of skull
1st cervical nerve
2nd cervical vertebra (axis)
8th cervical nerve
1st thoracic nerve
1st rib
Intercostal nerves
12th thoracic nerve
12th rib
Subcostal nerve
Conus medullaris
1st lumbar nerve
Cauda equina
5th lumbar nerve
1st sacral nerve
Sacrum (cut away)
Internal filum terminale (pial)
Termination of dural sac
External filum terminale (dural)
5th sacral nerve
Coccygeal nerve
1st cervical vertebra (atlas)
Cervical plexus
7th cervical vertebra
1st thoracic vertebra
Brachial plexus
Spinal dura mater
Filaments of spinal nerve roots (T7 and T8)
12th thoracic vertebra
1st lumbar vertebra
Iliohypogastric nerve
Ilioinguinal nerve
Lumbar plexus
5th lumbar vertebra
Femoral nerve
Sacral plexus
Superior and inferior gluteal nerves
Sciatic nerve
Posterior femoral cutaneous nerve
Pudendal nerve
Coccyx
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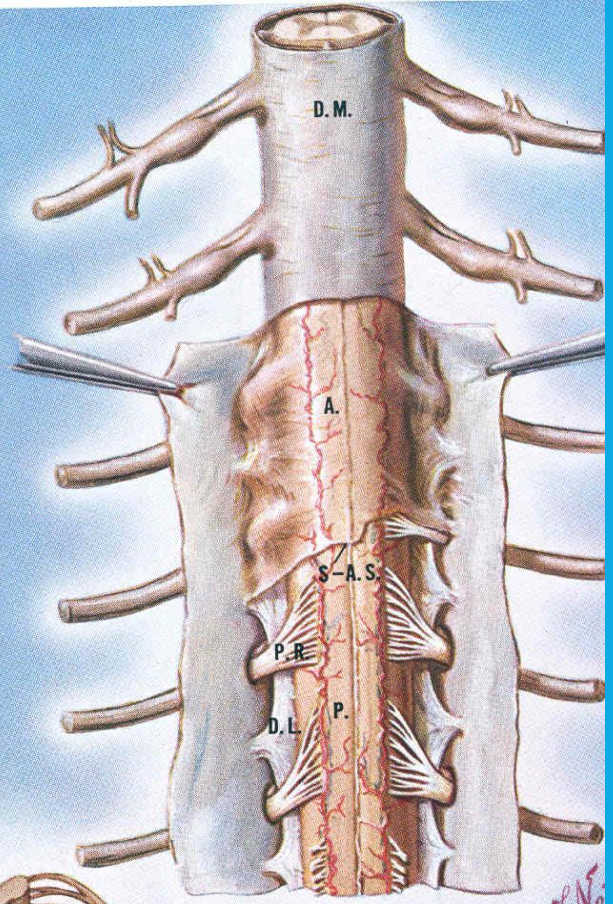
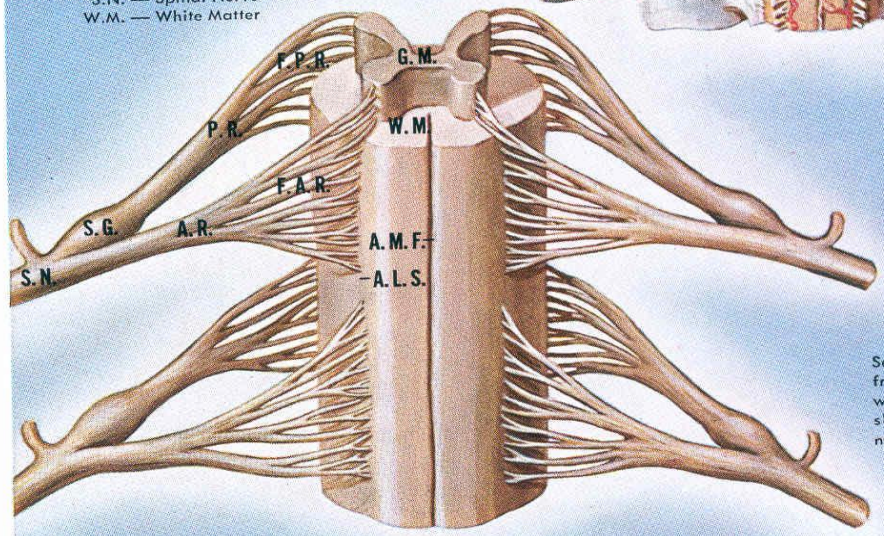
Segment of spinal cord viewed from behind, with portions of dura mater and arachnoid removed.

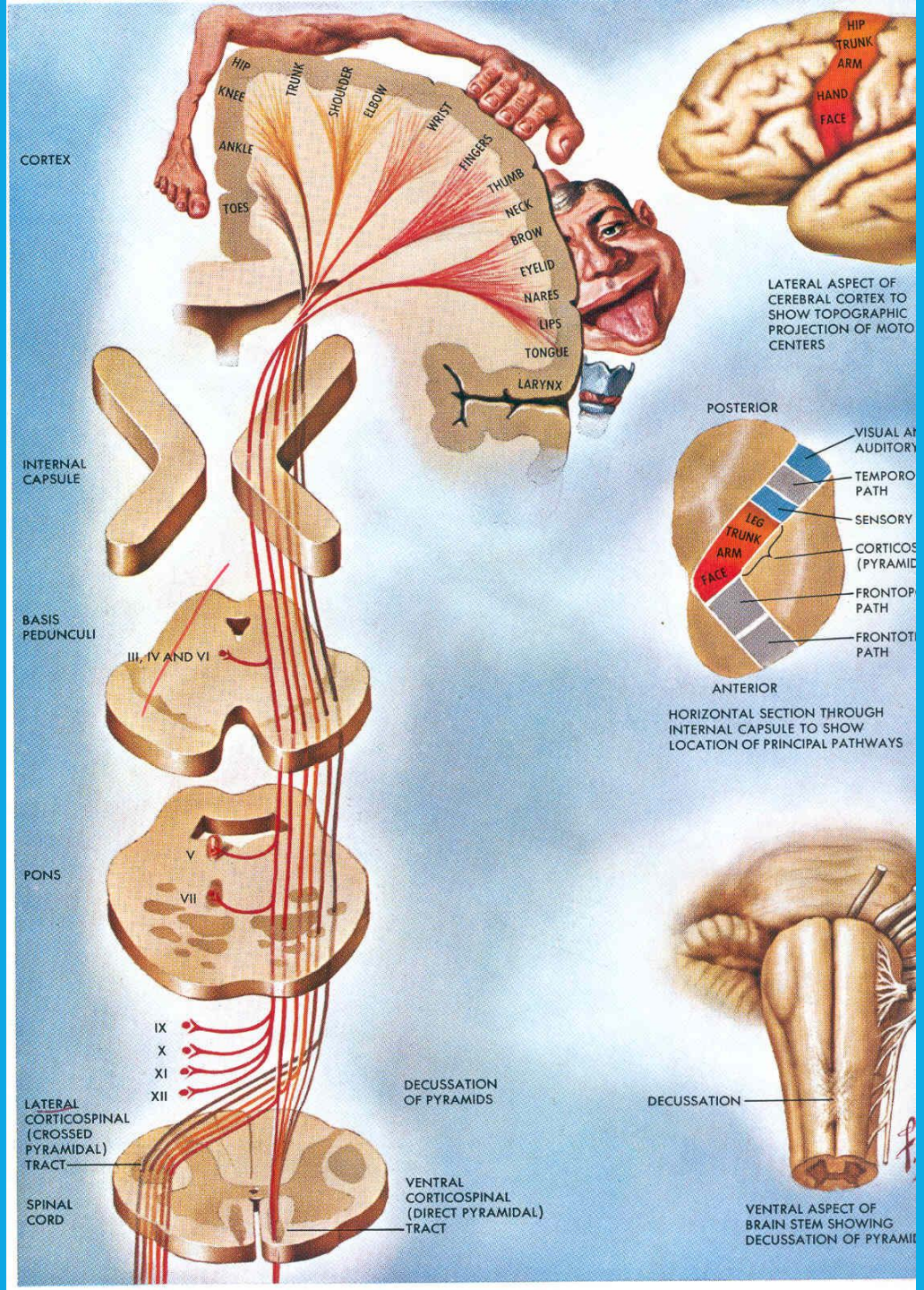
A. — Arachnoid
D.L. — Dentate Ligament
D.M. — Dura Mater
P. — Pia Mater Overlying Spinal Cord
P.R. — Posterior Root
S-A.S. — Subarachnoid Septum

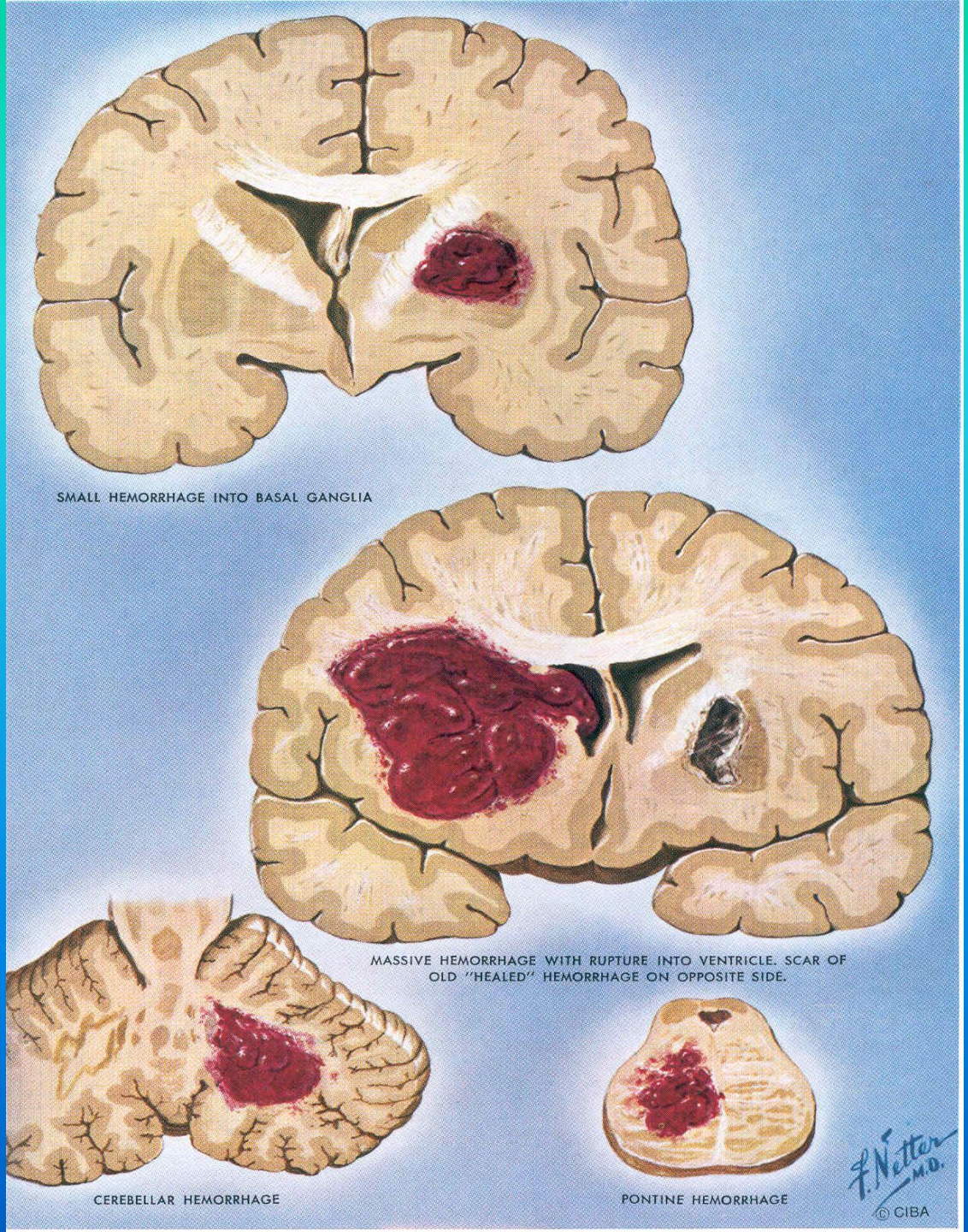


A.L.S. — Anterior Lateral Sulcus
A.M.F. — Anterior Median Fissure
A.R. — Anterior Root
F.A.R. — Fila of Anterior Root
F.P.R. — Fila of Posterior Root
G.M. — Gray Matter
S.G. — Spinal Ganglion
S.N. — Spinal Nerve
W.M. — White Matter



Segment of spinal cord, vi
from in front with porti
white matter removed
showing origin of s
nerves.


CORTEX
HIP
KNEE
ANKLE
TOES
TRUNK
SHOULDER
ELBOW
WRIST
FINGERS
THUMB
NECK
BROW
EYELID
NARES
LIPS
TONGUE
LARYNX
INTERNAL CAPSULE
BASIS PEDUNCULI
III, IV AND VI
PONS
V
VII
IX
X
XI
XII
LATERAL CORTICOSPINAL (CROSSED PYRAMIDAL) TRACT
SPINAL CORD
DECUSSATION OF PYRAMIDS
VENTRAL CORTICOSPINAL (DIRECT PYRAMIDAL) TRACT
HIP
TRUNK
ARM
HAND
FACE
LATERAL ASPECT OF CEREBRAL CORTEX TO SHOW TOPOGRAPHIC PROJECTION OF MOTO CENTERS
POSTERIOR
VISUAL A
AUDITORY
TEMPORO PATH
SENSORY
LEG
TRUNK
ARM
FACE
CORTICOS (PYRAMID
FRONTOP PATH
FRONTOT PATH
ANTERIOR
HORIZONTAL SECTION THROUGH INTERNAL CAPSULE TO SHOW LOCATION OF PRINCIPAL PATHWAYS
DECUSSATION
VENTRAL ASPECT OF BRAIN STEM SHOWING DECUSSATION OF PYRAMI


SMALL HEMORRHAGE INTO BASAL GANGLIA
MASSIVE HEMORRHAGE WITH RUPTURE INTO VENTRICLE. SCAR OF OLD "HEALED" HEMORRHAGE ON OPPOSITE SIDE.
CEREBELLAR HEMORRHAGE
PONTINE HEMORRHAGE
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