anatomy of cranial contents

Radiological anatomy

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anatomy of cranial contents

SKULL VAULT, CRANIAL CAVITY & MENINGES

• Cranial cavity contains:

○ Brain ○ Meninges ○ BVs and nerves that pass to and from the brain

• Surrounded by:

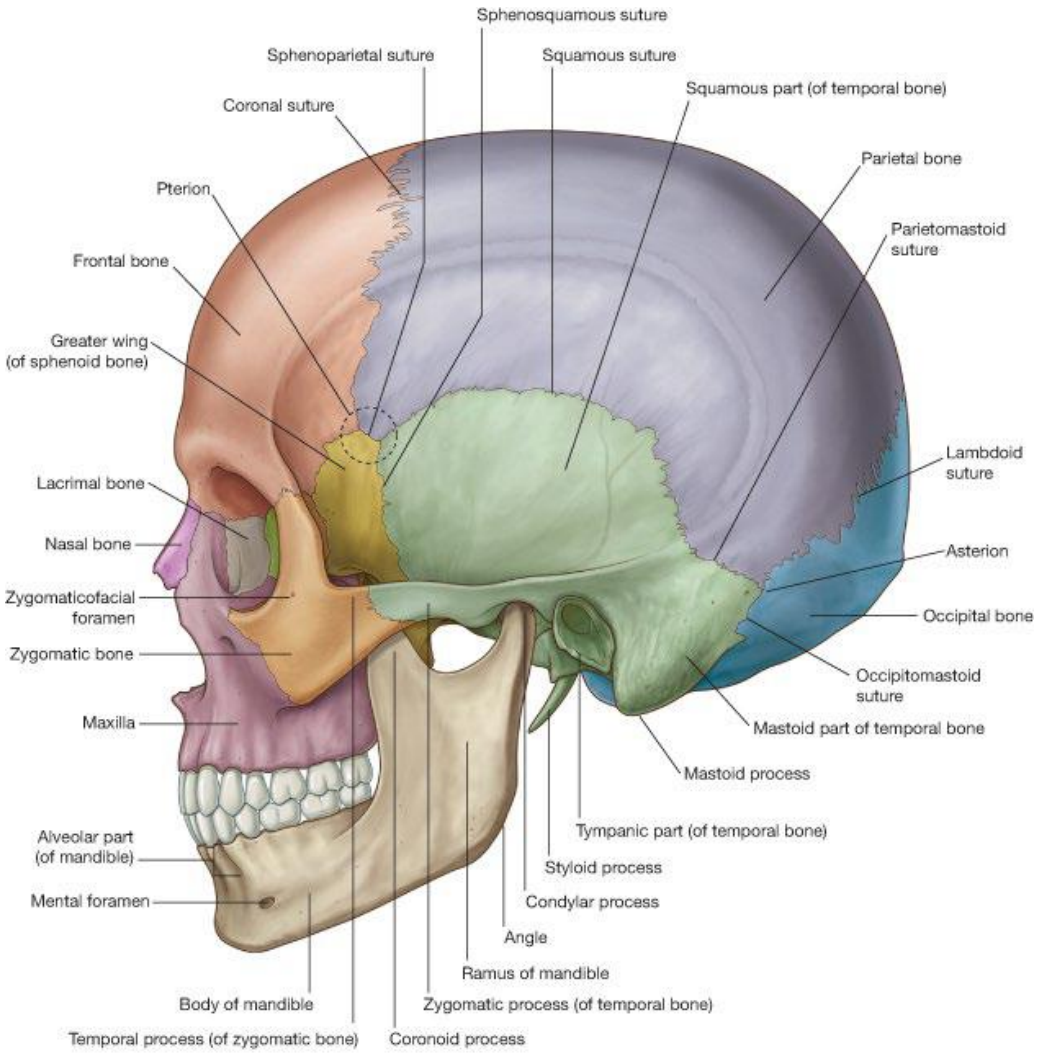
○ Vault bones at sides and above ○ Cranial base below

THE VAULT BONES:

• The skull vault is composed of several bones:

○ Frontal ○ Parietal ○ Occipital ○ temporal ○ Sphenoid

• Squamous temporal = flattened part of temporal bone



Sutures - interlocking fibrous joints which join the bones of the vault together

- **Coronal suture** : runs in the coronal plane: ○ Links the frontal and 2 parietals
- **Saggital suture** : runs in the saggital plane: ○ Between the 2 parietal bones
- **Metopic suture: a**t birth there is an additional suture in the midline, separating the frontal bone into 2. ○ Usually fuses by 2nd year of life.

• **Bregma:** point where the saggital and coronal sutures meet in an adult

• At birth the bones at the bregma are not fused – leaves a gap which is covered over with fibrous tissue, which fuses with the underlying dura.

• This gap is the **anterior frontanelle**

• Anterior frontanelle is easily palpated in neonates

• It closes in the 2nd year of life.

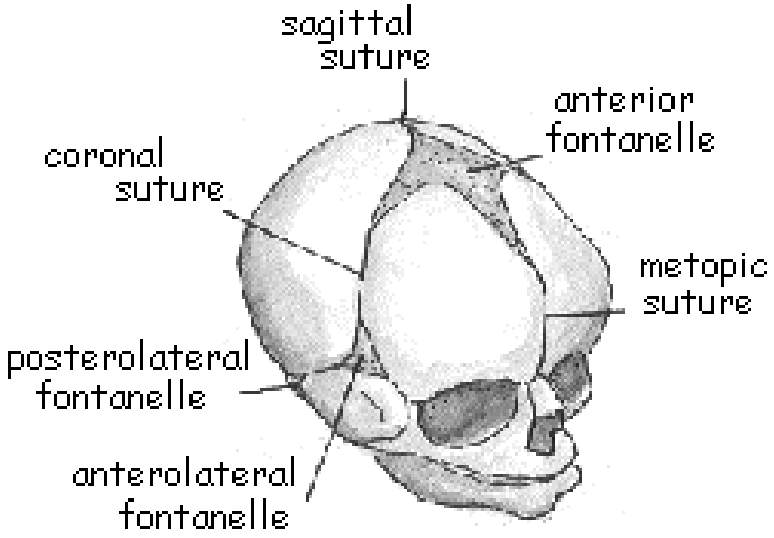
- **Lambdoid suture** ○ Runs inferiolaterally on each side towards the mastoid process ○ Looks like λ

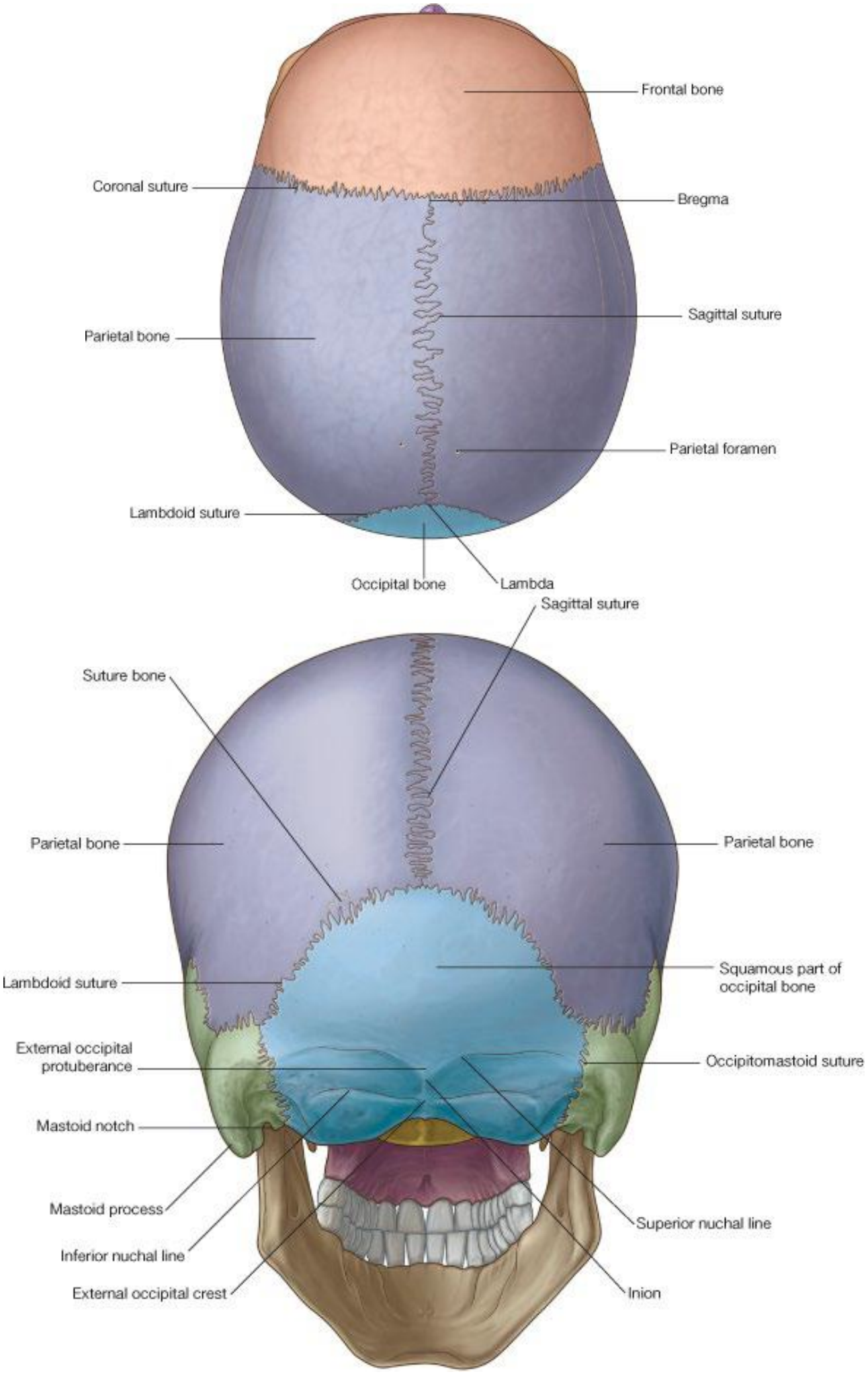
• **Lambda**: point at which the occipital bone meets the parietal bones in the midline

- **Asterion** – point at which temporal, occipital and parietal bones meet
- **Pterion** - point at which frontal, parietal, temporal and sphenoid bones meet.

Neonates:

- Bregma – anterior frontanelle
- Lambda – posterior frontanelle
- Asterion – posterolateral frontanelle
- Pterion – anteriolateral frontanelle




Frontal bone
Coronal suture
Bregma
Sagittal suture
Parietal bone
Parietal foramen
Lambdoid suture
Occipital bone
Lambda
Sagittal suture
Suture bone
Parietal bone
Parietal bone
Squamous part of occipital bone
Lambdoid suture
External occipital protuberance
Occipitomastoid suture
Mastoid notch
Mastoid process
Superior nuchal line
Inferior nuchal line
External occipital crest
Inion

The brain:

is made up of many specialized areas that work together:

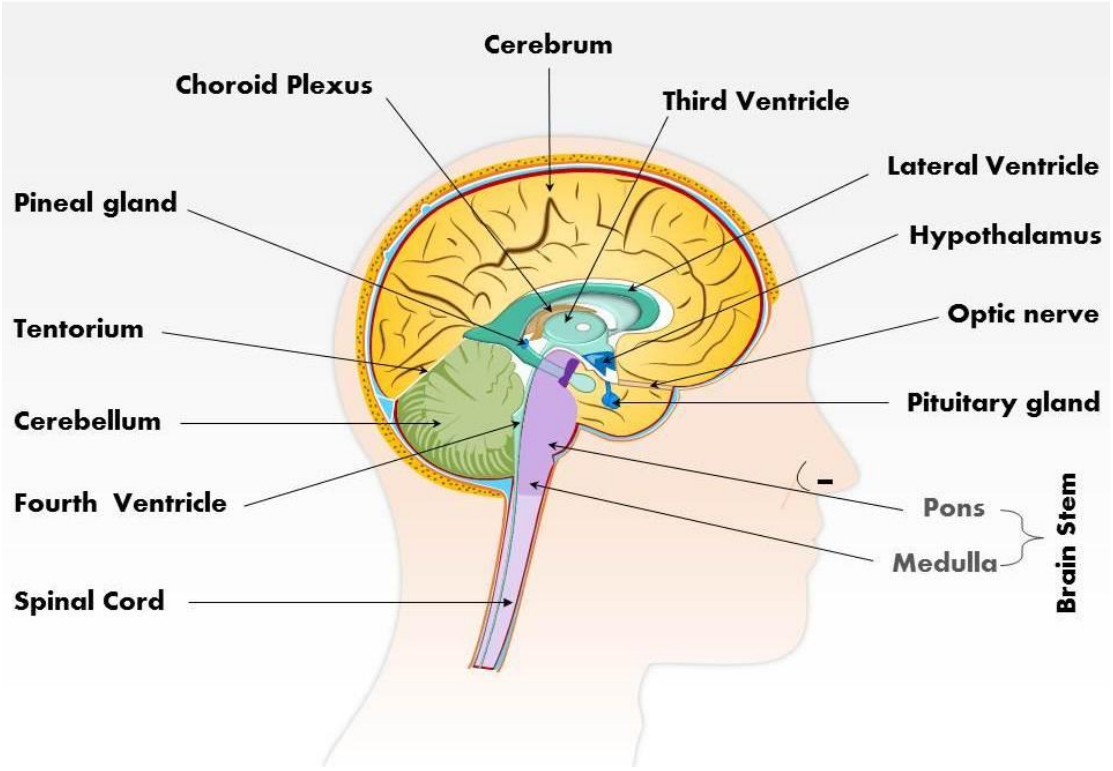
• The cortex is the outermost layer of brain cells. Thinking and voluntary movements begin in the cortex.

• The brain stem is between the spinal cord and the rest of the brain. Basic functions like breathing and sleep are controlled here.

• The basal ganglia are a cluster of structures in the center of the brain. The basal ganglia coordinate messages between multiple other brain areas.

• The cerebellum is at the base and the back of the brain. The cerebellum is responsible for coordination and balance.

The brain is surrounded by a layer of tissue called the meninges. The skull (cranium) helps protect the brain from injury.



Brain consist of the following parts :

1.Cerebrum: is the largest part of the brain and is composed of right and left hemispheres. It performs higher functions like interpreting touch, vision and hearing, as well as speech, reasoning, emotions, learning, and fine control of movement.

two hemispheres joined by tracts = corpus callosum

largest grooves = fissures

each hemisphere:

a. outer gray matter

b. inner white matter

c. nuclei = islands of gray matter in interior of brain

largest grooves = fissures: divide each hemisphere into 4 regions named after bones they lie under:

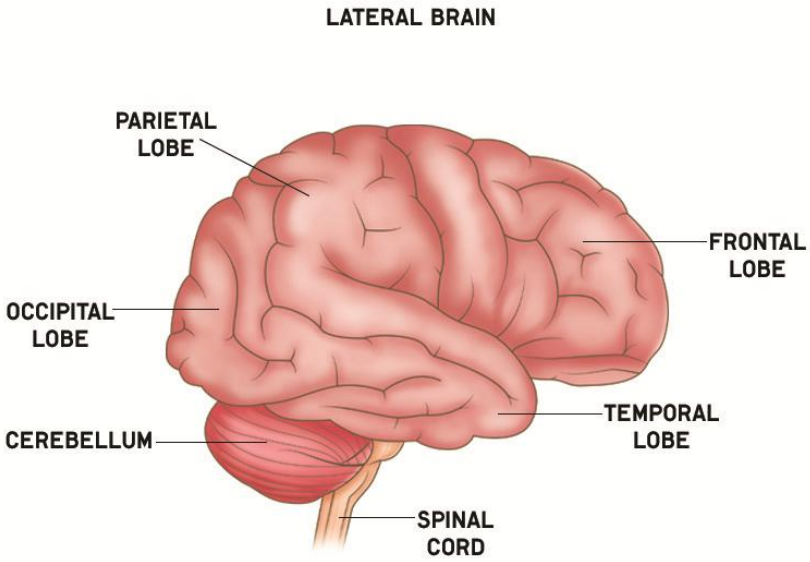
it is divided into several lobes

1.The frontal lobes are responsible for problem solving and judgment and motor function

2.The parietal lobes manage sensation, handwriting, and body position

3.The temporal lobes are involved with memory and hearing

4.The occipital lobes contain the brain's visual processing system



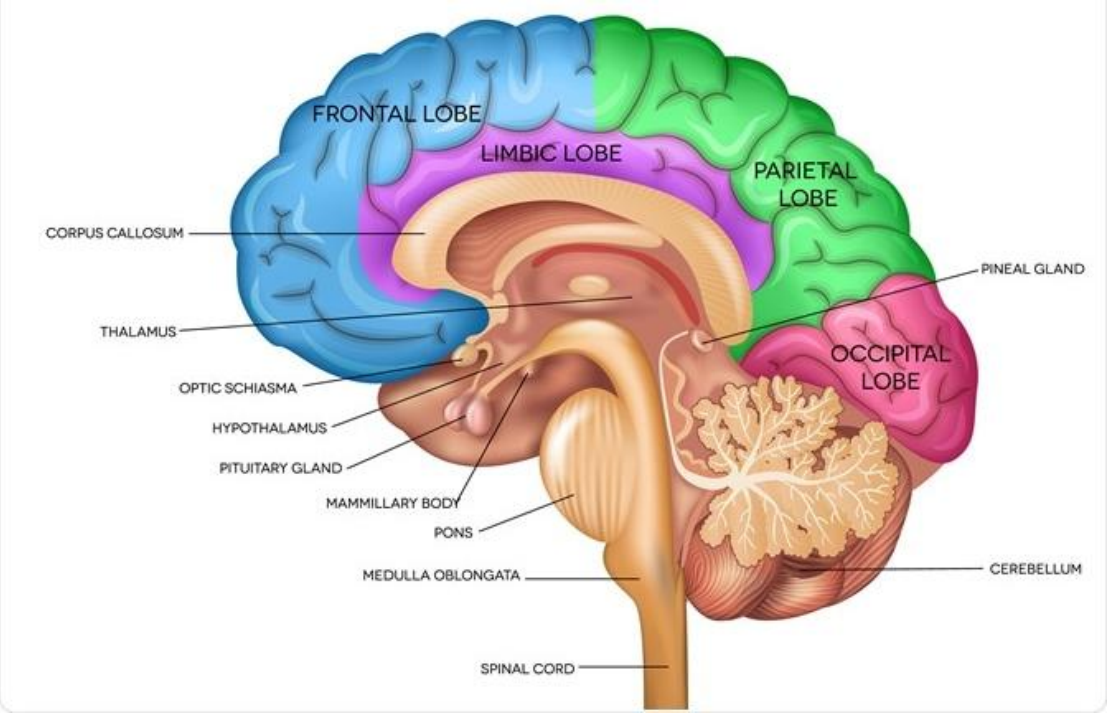
2. Diencephalon - moods, memory, manages internal environment epithalamus thalamus hypothalamus

*Epithalamus i:ncludes roof of 3rd ventricle mainly pineal gland

**Thalamus: 4/5 ths of diencephalon forms lateral walls of 3rd ventricle

***Hypothalamus** :

part of the brain most involved in regulating internal environment no blood brain barrier forms floor and part of lateral walls of 3rd ventricle



3.Cerebellum: is located under the cerebrum. Its function is to coordinate muscle movements, maintain posture, and balance.

2nd largest part of brain

just below and posterior to cerebrum

only other part of brain that is highly folded

consists of 2 hemispheres

grey matter outside highly folded

white matter inside (tree of life)

4.Brainstem: acts as a relay center connecting the cerebrum and cerebellum to the spinal cord. It performs many automatic functions such as breathing, heart rate, body temperature, wake and sleep cycles, digestion, sneezing, coughing, vomiting, and swallowing.

1.mid brain : in the form of 4 lobes above and behind pons= Corpora Quadrigemina

upper 2 lobes = Superior Colliculi control center for some visual reflexes

lower two lobes = Inferior Colliculi control center for some auditory reflexes

2.Pons . above medulla bridge connecting spinal cord with brain

3.medulla oblongata.(Which continue to pass through foramen magnum to the beginning of the spinal cord).

Some general terminology:

1.gray matter = thin myelin; mostly cell bodies dendrites outer layer of brain inner layer of spinal cord

2.White matter = thick insulation; mostly axons inner layers of brain outer layer of spinal cord

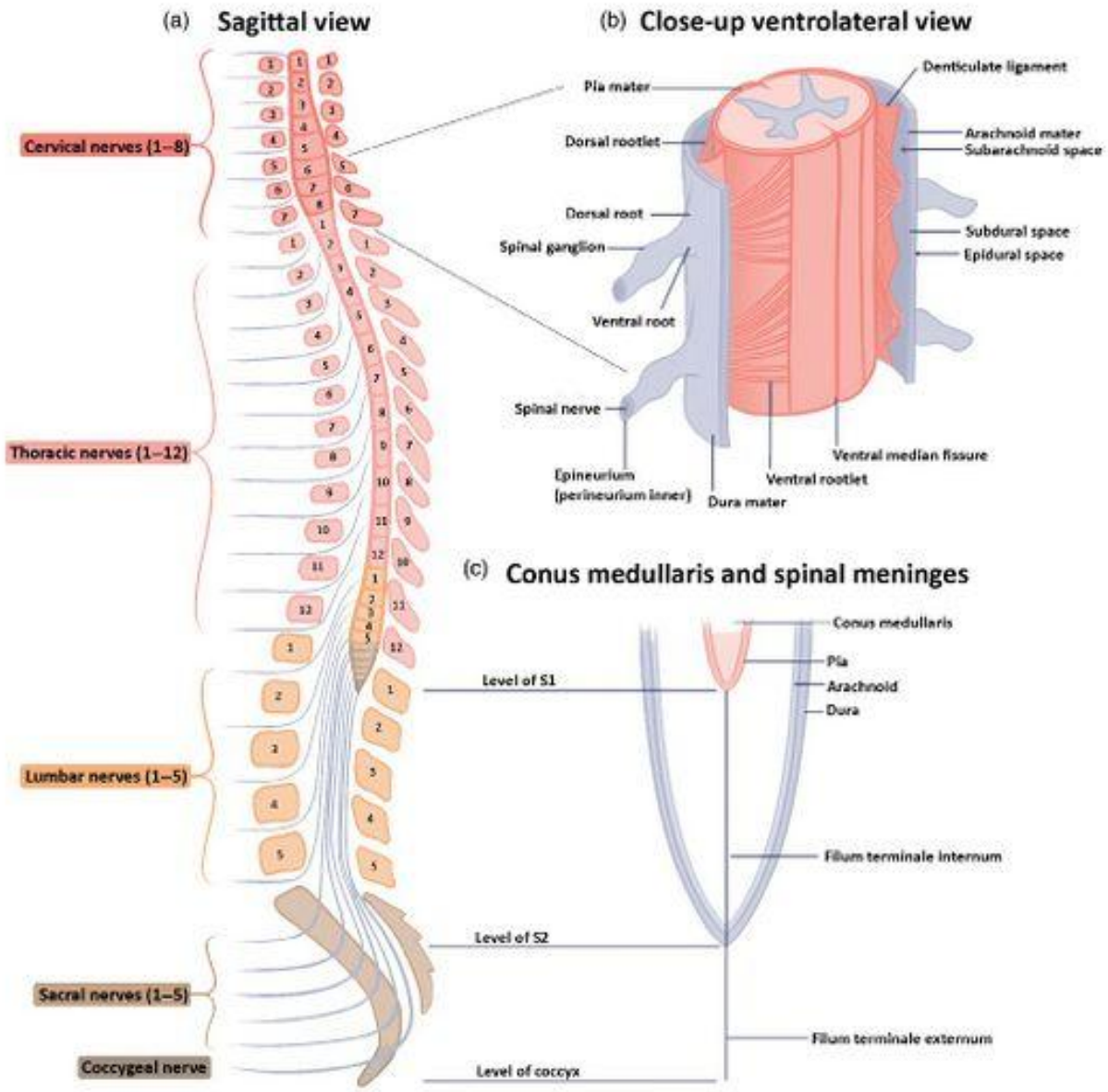
Spinal Cord : located in the spinal canal of the vertebral column

17 – 18 inches long

extends from foramen magnum to lower border of 1st lumbar vertebrae

subdivided into cervical, thoracic, lumbar, sacral regions

spinal cord terminates in a bundle of nerves = cauda equina


(a) Sagittal view
Cervical nerves (1–8)
Thoracic nerves (1–12)
Lumbar nerves (1–5)
Sacral nerves (1–5)
Coccygeal nerve
(b) Close-up ventrolateral view
Pia mater
Dorsal rootlet
Dorsal root
Spinal ganglion
Ventral root
Spinal nerve
Epineurium (perineurium inner)
Dura mater
Ventral rootlet
Ventral median fissure
Denticulate ligament
Arachnoid mater
Subarachnoid space
Subdural space
Epidural space
(c) Conus medullaris and spinal meninges
Conus medullaris
Pia
Arachnoid
Dura
Level of S1
Filum terminale internum
Level of S2
Filum terminale externum
Level of coccyx

The Meninges:

Three protective membranes or meninges surround the brain in the skull: the dura mater, the arachnoid mater, and the pia mater

1- Dura Mater of the Brain :The dura mater is conventionally described as two layers: the endosteal layer and the meningeal layer.

2- Arachnoid Mater of the Brain: The arachnoid mater is a delicate, impermeable membrane covering the brain and lying between the pia mater internally and the dura mater externally.

3- Pia Mater of the Brain :The pia mater is a vascular membrane that closely invests the brain.