Spinal Cord

lower elongated part of CNS.

42cm → adult female 45 cm → Adult males

Extent : adults → from upper border of → posterior arch of C1.

to lower border of L_1 or intervertebral disc btw L_1 & L_2.

provides attatchment for 31 pairs of spinal nerves.

Functions

- Execution of simple reflexes.
- Transmit impulses to & from brain.

positional changes of S.C.

- upto 3rd month of IUL → Entire length of vertebral canal.
- At birth → extends → till L_3.
- adults → L_1 or Intervertebral disc btw L_1 & L_2.

Spinal meninges. → covered by 3 layered protective membrane

out to in.

① Dura mater → extends from foramen magnum → lower border of S_2.

- only has meningeal layer
- no fold formed.

Arachnoid mater → avascular layer.

Extends from foramen magnum till lower border of S_2.

- internal vertebral venous plexus
- semiliquid fat
- loose areolar tissue

⇒ Space between
- dura & vertebral canal → epidural space.
- dura & arachnoid → subdural space. → capillary layer of fluid.
- arachnoid & pia → subarachnoid space. → CSF.

pia mater

→ highly vascular
→ closely related to spinal cord.
→ continues below S.C as **filum terminale**.
→ Subarachnoid space around filum terminale, below termination of SC → becomes roomy.

lumbar cistern.

lumbar puncture is done here to withdraw CSF.

horizontal line joining highest point of iliac crest passes at LVI of spine of L_4, between L_3 & L_4 → favoured site.

Processes of Pia mater / Special parts of Pia mater.

① Filum terminale.

- a white glistening thread like structure extending from tip of conus medullaris to first coccygeal vertebrae
- non nervous tissue {mostly}
- 20cm length.
- 2 parts
  - filum terminale internum: 15cm. (within dural sac)
  - filum terminale externum: 5cm (outside dural sac)
- central canal is present in first 5mm.

② Subarachnoid septum.

- pial septum that connects dorsal surface of spinal cord to arachnoid mater.

③ Linea splendens.

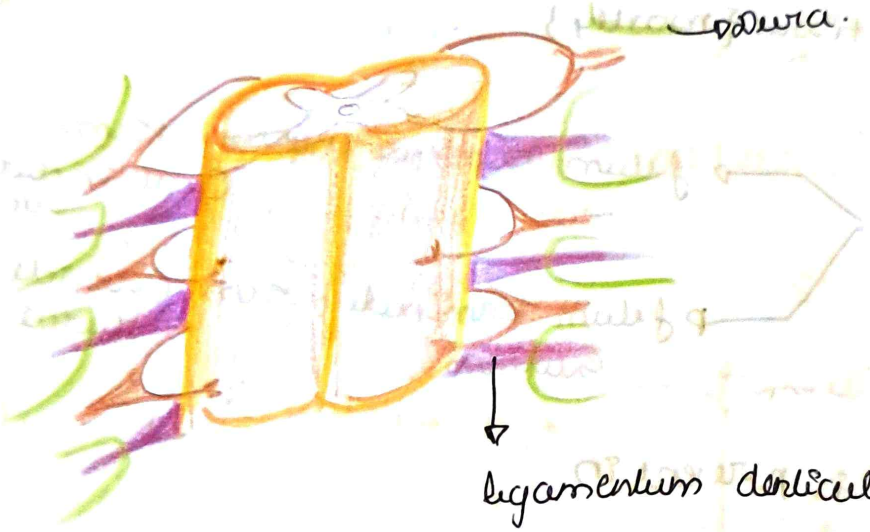
- Thickening of pia mater along ventral surface of spinal cord.

④ Ligamenta denticulata

- ribbon / tooth like bands of pia mater. extending laterally on outer side between the posterior & anterior nerve roots of ~~spinal cord~~

- 21 in number.
- they pierce arachnoid mater & attaches to dura, between emergens of spinal nerves

- First tooth → foramen magnum
  last → between T12 & L1 spinal nerves.



#Clinical significance → lowest teeth → fork like.
& (L1) spinal nerve lies close.
∴ Identification landmark for neurosurgeons

External features

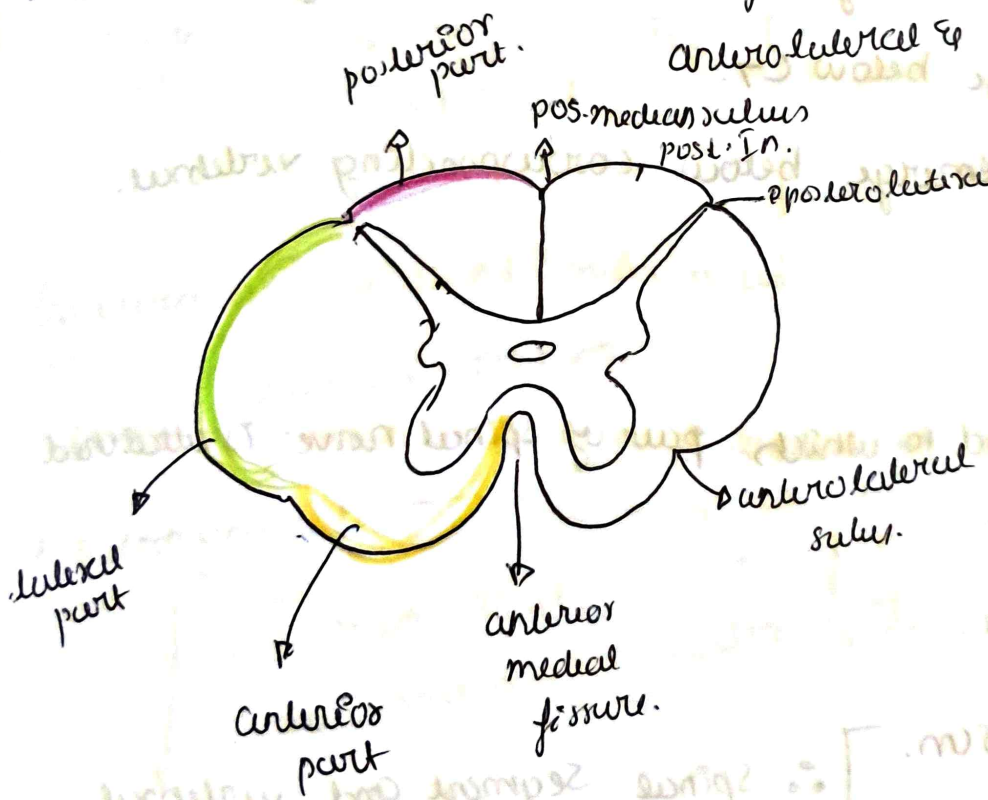
(1) Fissure & Sulci
(2) Attachment of Spinal nerves.
(3) Enlargements
(4) Cauda Equina.

① Fissure & sulci.

- Anterior surface → 1 deep anterior median fissure.
  2 anterolateral sulci.

- posterior surface → posteriomedian sulcus.
  2 posterolateral.
  2 posterointermediate sulci.

- Each half is subdivided into - anterior, lateral & posterior regions by anterolateral & posterolateral sulci



★ Ventral root emerge S.C through AL sulcus

★ Dorsal root enter S.C through PL sulcus.

Attachment of spinal nerves.

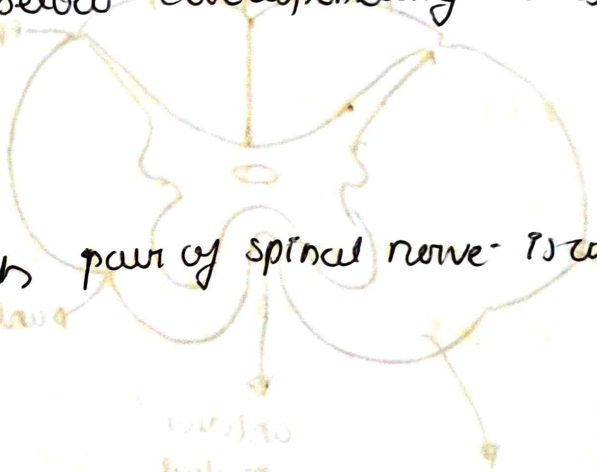
→ 31 pairs of spinal nerve.

8 - cervical.
12 - thoracic.
5 - lumbar
5 - sacral.
1 - coccygeal.

from $C_1 - C_7$ they emerge above corresponding vertebrae.

C_8 → emerge below C_7.

$T_1 - C_1$ → emerge below corresponding vertebrae.



Spinal Segments.

- part of spinal cord to which pair of spinal nerve is attached.

1 spinal segment.

31 spinal segments.

- Spinal cord → 45cm.
  Vertebral column → 65cm

∴ spinal segment and vertebral segment does not lie at same level.

approximate vertebral levels of spinal cord segments.

Region	Spinal Segment	Vertebral Lvl	General rule.
• upper cervical.	C2.	C2	Same level.
• lower cervical	C6.	C5	one vertebral above.
• upper thoracic.	T5.	T3	Two vertebrae above.
• lower thoracic	T10.	T7	Three v above.
• lumbar.	L1 - L5	T10 - T11	three to 5 vertebrae above.
• sacral & coccygeal.	S1 - S5 Cx1	T12 - t1.	six to 10 vertebrae above.

Enlargements.

- average diameter - 1.25 cm.

2 enlargement → Cervical enlargement for supply of upper limb muscles.

↓

C4 - T1 spinal segments.

↓

lumbar enlargement.
for supply of lower limb muscle.

↓

Extends from L2 to S3 spinal segment.

Cauda equina

- nerve roots of $L_2 - L_5$, $S_1 - S_5$ & Cx 1 lies almost vertically around filum terminale
- these are called Cauda equina as they resemble a horse tail.

INTERNAL STRUCTURE OF SPINAL CORD

→ inner core of grey matter – H shaped.
→ outer white matter.

Grey matter

- right & left hay joined by → transverse commissure.
- surrounding central canal → substantia gelatinosa centralis
- divided → broad anterior horn.
  narrow posterior horn.
  from $T_1 - L_2$ → lateral horn.

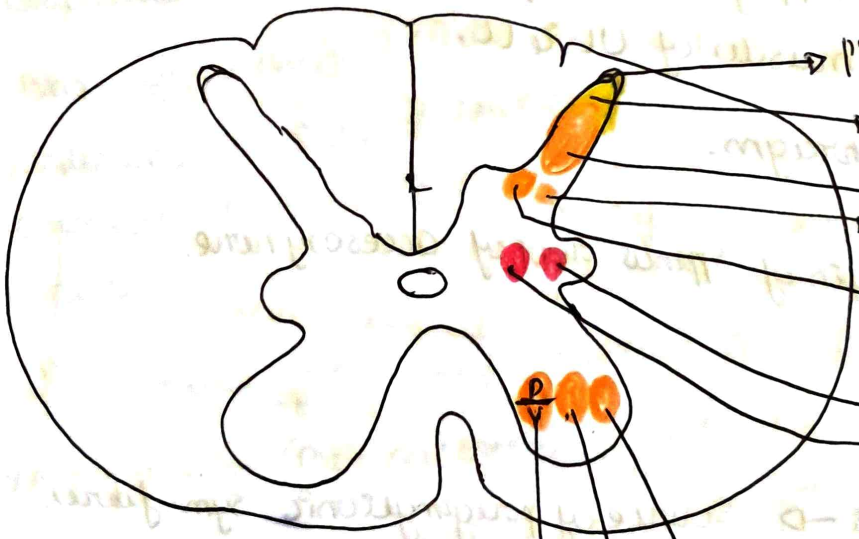
→ composed of neurons, neuroglia & blood vessels.

Neurons in grey matter.

(multipolar).

- structural classification
  - golgi I
  - golgi.
- Functional class
  - motor neurons.
    - anterior horn & lateral horn.
      - alpha motor neuron
      - γ
  - sensory neurons.
    - posterior horn.
      - forms ascending tracts
      - Intersegmental tract,
  - Interneurons
    - throughout
      - connect diff neurons.
      - {also association neurons}

Nerve cell groups in Grey colour of Spinal cord.



C6 in posterior grey column

C6 in intermediate grey column.

cell groups in anterior grey colum

Nuclei	Functions
Posterior horn.	relay nucleus for pain & temperature; modify. of transmission of sensory input.
• substantia gelatinosa.	
• Nucleus dorsalis. (Clarke's column)	Its axons form posterior spinocerebellar tract.
• Nucleus proprius.	
• visceral afferent. nucleus.	

Anterior horn.

medial group → supply muscles of head & neck.

lateral gp → muscles of UL & LL.

phrenic → diaphragm.

spinal accessory nucleus → origin of spinal root of accesory nerve.

Lateral horn

- Intermediolateral → Source of preganglionic sym. fibres.
- Intermediomedial → Source of preganglionic parasym. fibre