

Gross and Intrinsic Spinal Cord Overview

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Spinal cord Functions

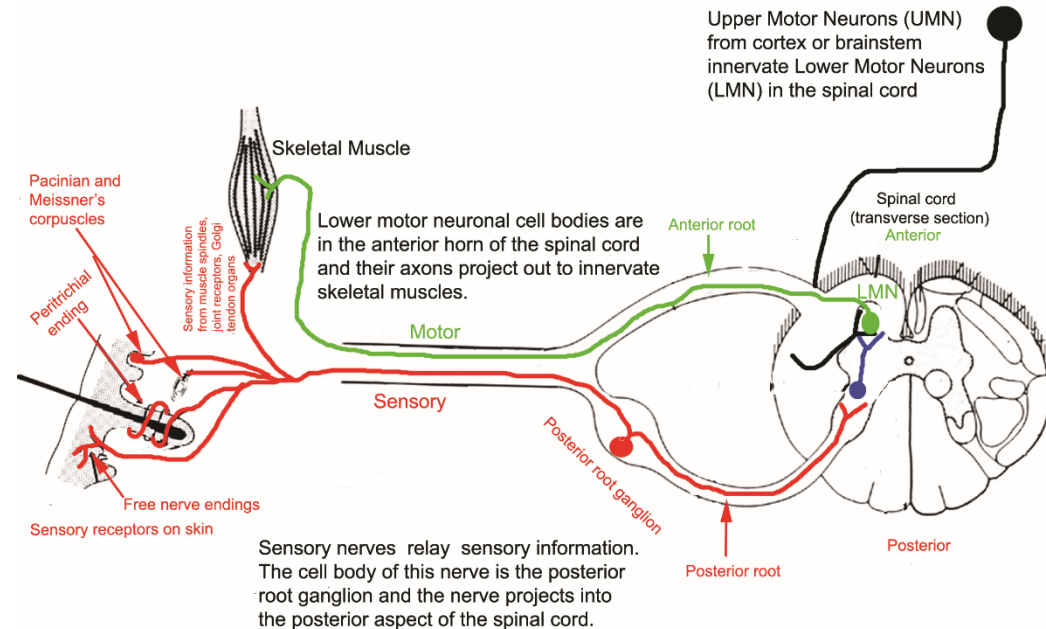
The spinal cord has 4 basic functions:

1. Receives sensory input

2. Contains somatic and visceral motor neuronal cell bodies that project axons to muscles.

3. The spinal reflex

4. Contains ascending sensory and descending motor axons.
Spinal cord relays information to and from the brain.



Terminology

Spinal cord = Nervous tissue

Spine/vertebrae/vertebral column =
bones that surround the spinal cord

Spinal cord Segments

There are 31 spinal cord segments.

8 Cervical spinal cord segments

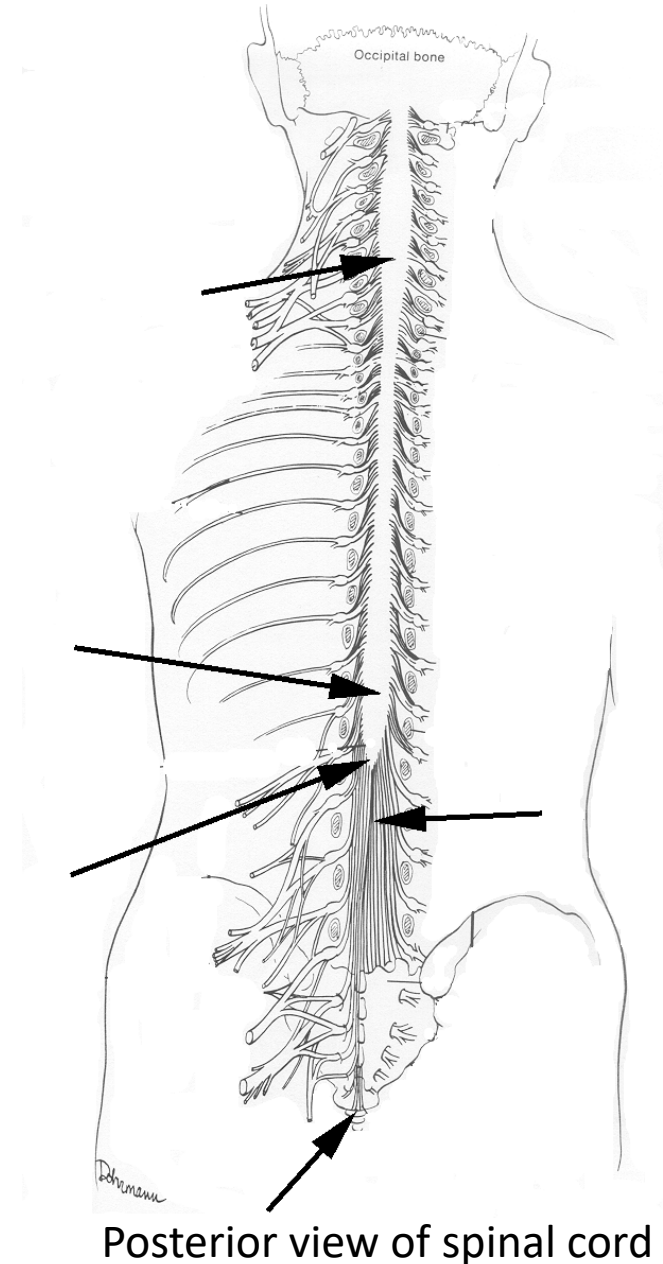
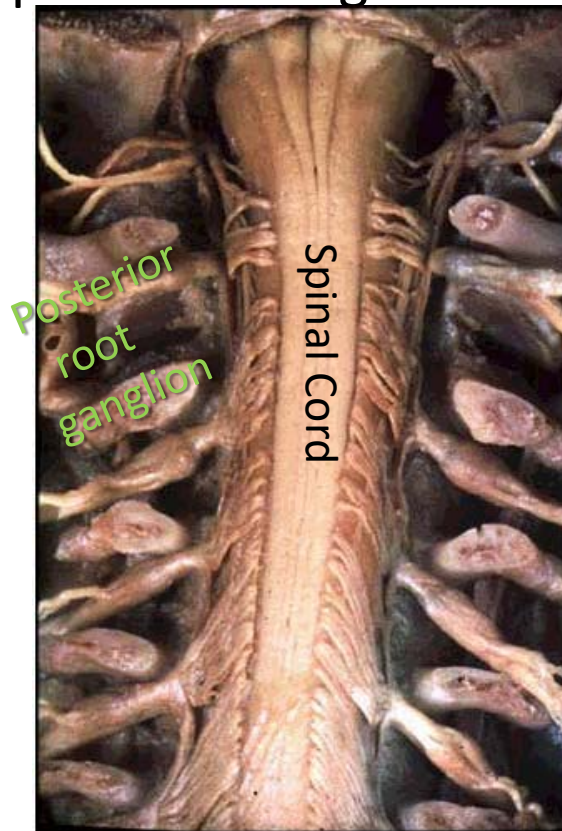
12 Thoracic spinal cord segments

5 Lumbar spinal cord segments

5 Sacral spinal cord segments

1 Coccygeal spinal cord segment

Each segment has a pair of spinal nerves.



Spinal cord gross anatomy

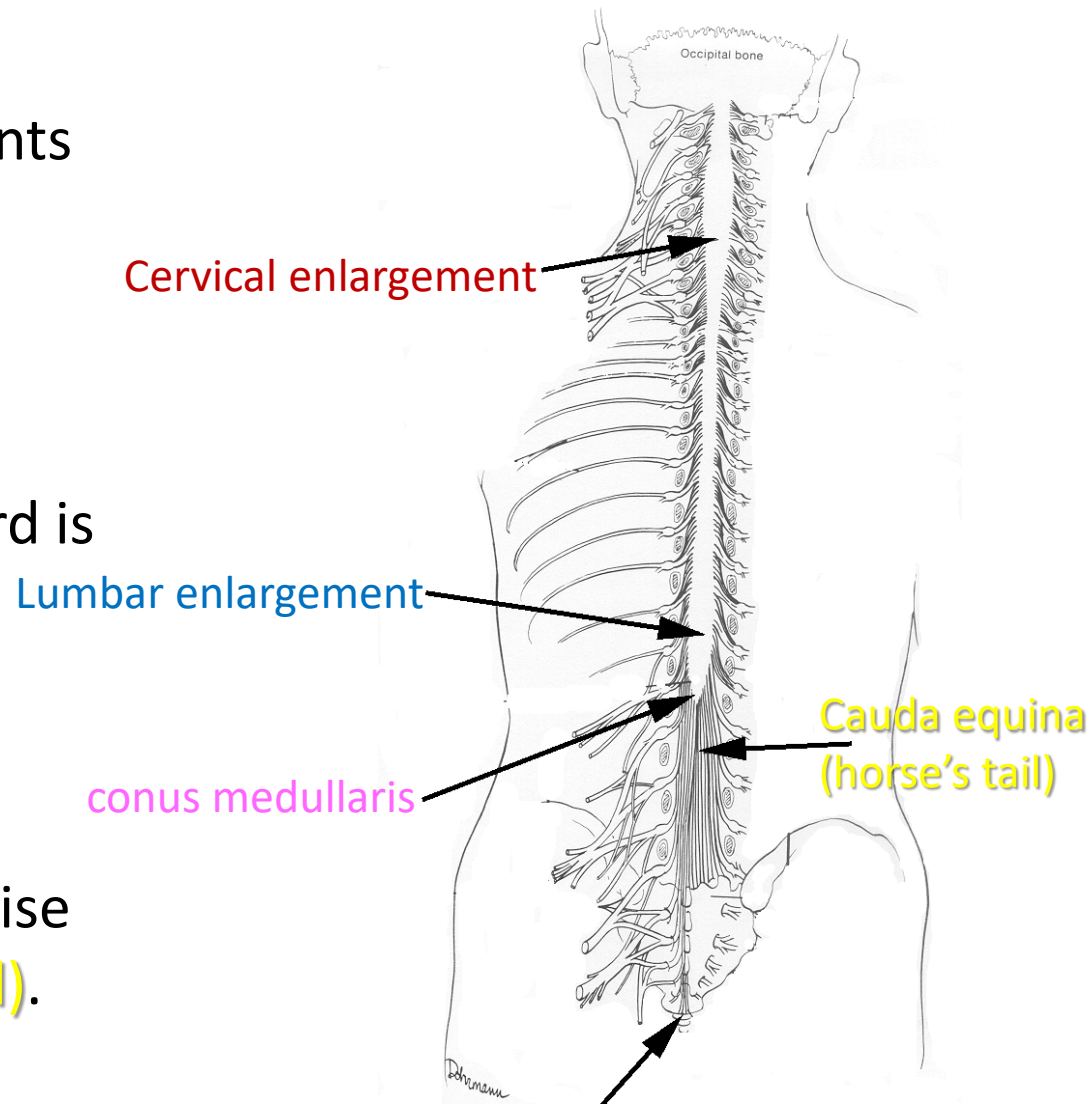
There are 2 major enlargements on the spinal cord:

Cervical enlargement

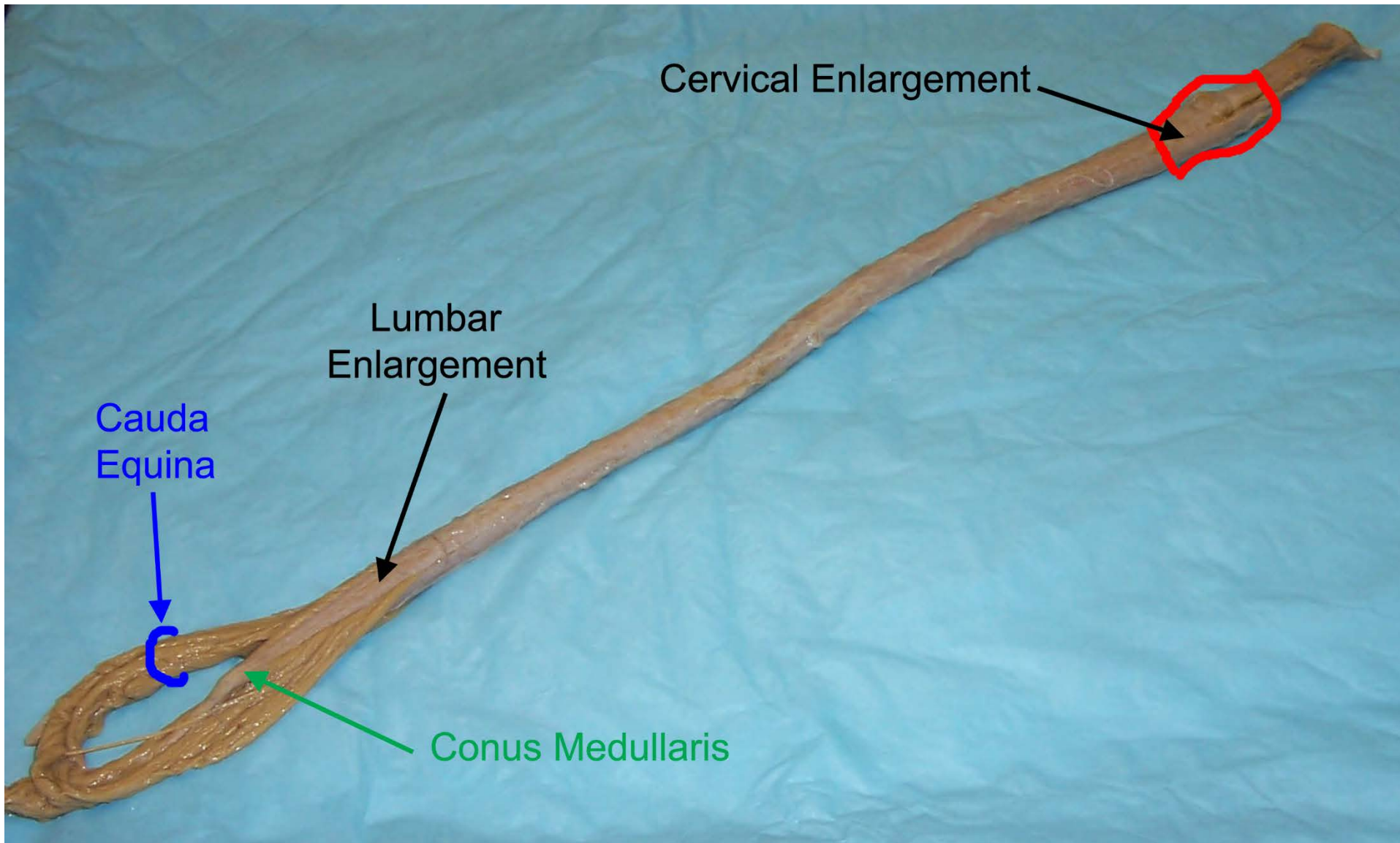
Lumbar enlargement

The very end of the spinal cord is tapered called the **conus medullaris**.

Spinal nerves L1 – Co1 comprise the **Cauda equina (horse's tail)**.



Spinal cord gross anatomy



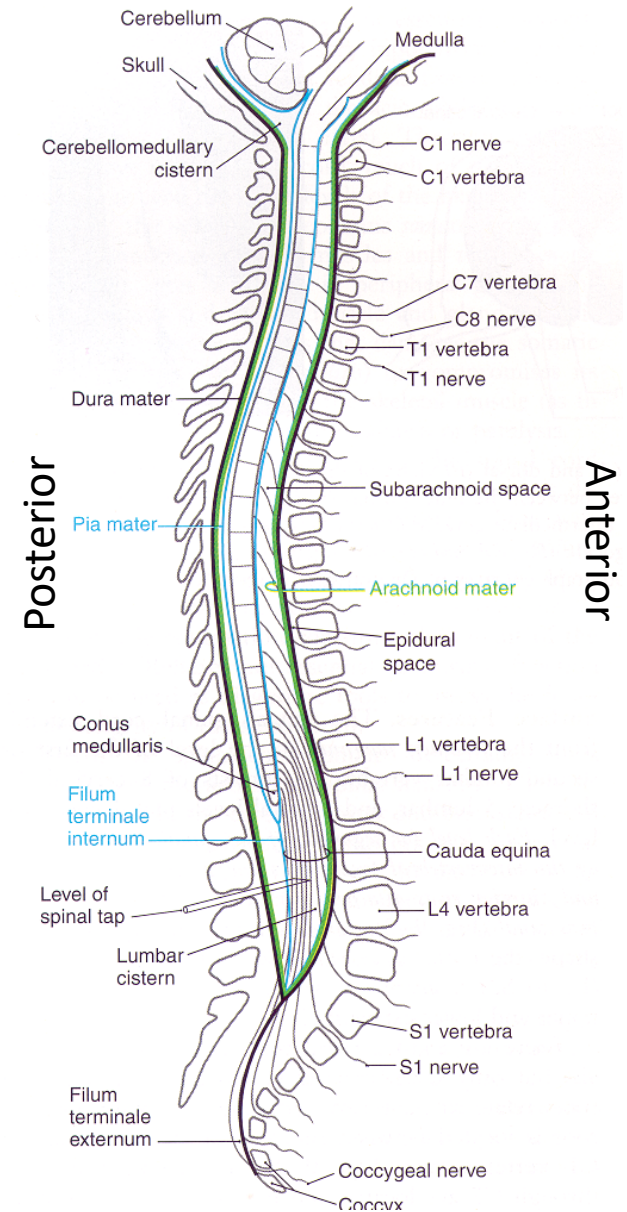
Meninges

The organization of the meninges around the cord is the same as it was around the brain:

Pia mater = innermost layer, tightly adhered to spinal cord

Arachnoid layer = middle layer, contains a space which holds CSF

Dura mater = outermost thick layer



Right lateral view of spinal cord, meninges, and vertebrae

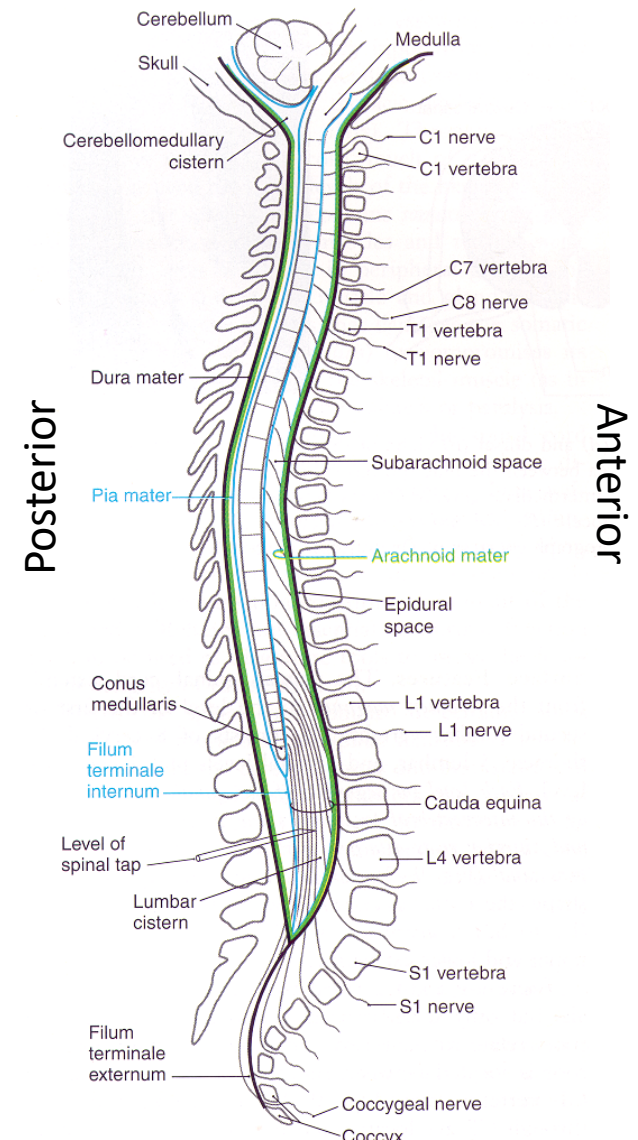
Spinal cord, Dura, and Vertebrae Relationships

The end of the spinal cord (conus medullaris) aligns with the **L1 vertebral bone**.

The end of the dura mater aligns with the **S1 vertebral bone**.

The **subarachnoid space** located between the end of the **conus medullaris** to the end of the dural sac is called the **lumbar cistern**.

The **lumbar cistern** holds a large amount of CSF. The cauda equina nerves are passing through the lumbar cistern as well.



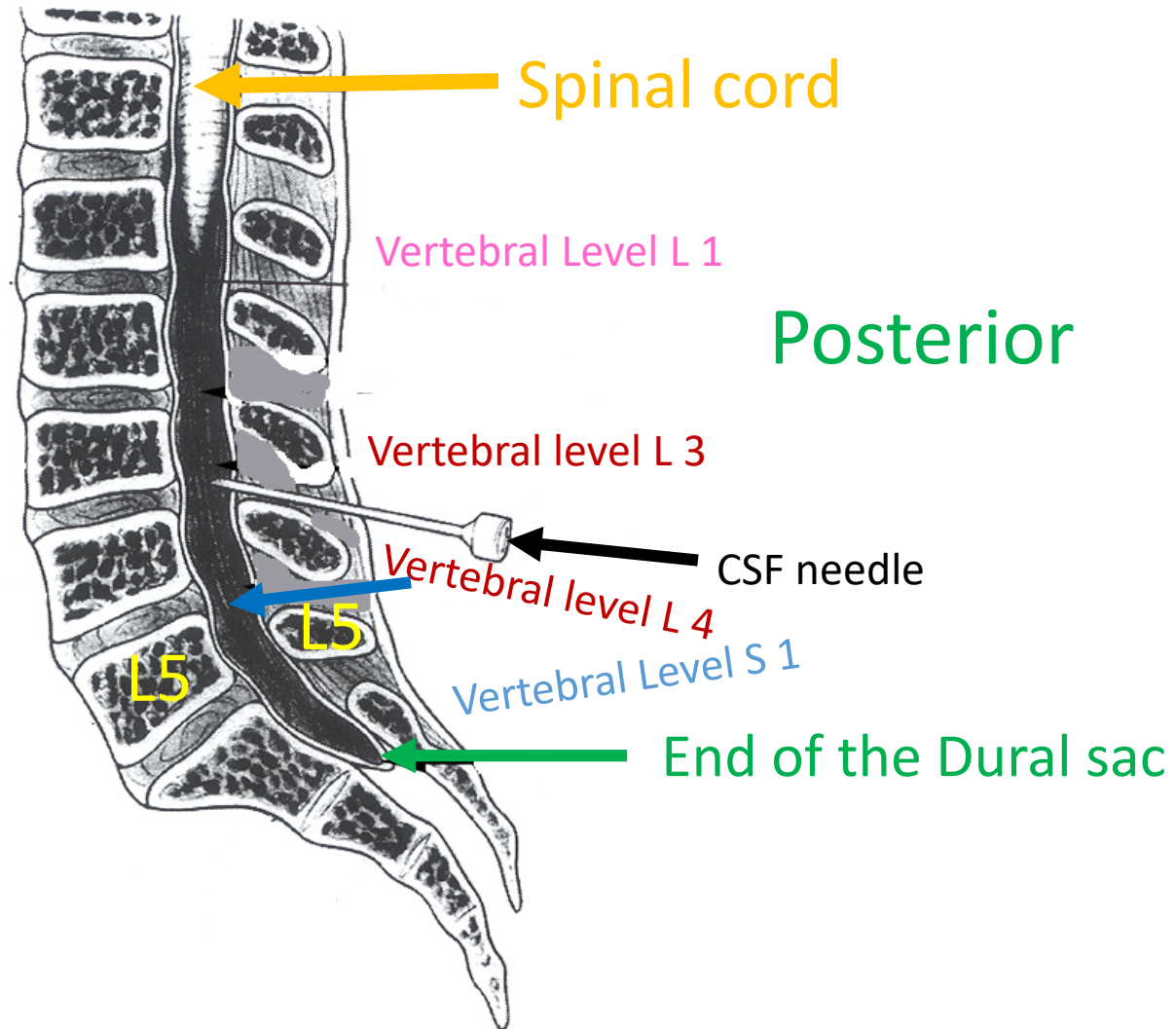
Right lateral view of spinal cord, meninges, and vertebrae

Needle placement for CSF withdrawal

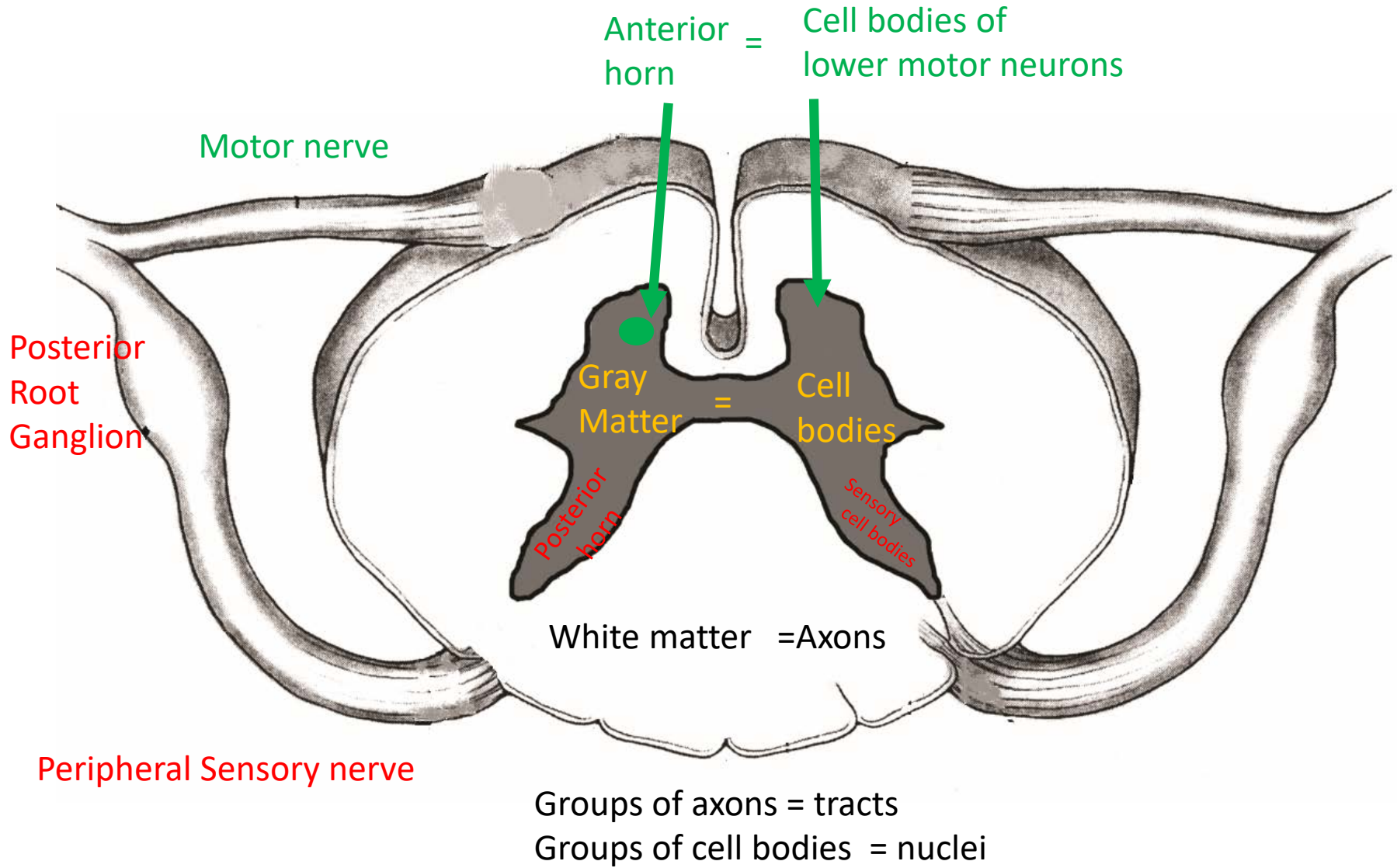
Conus Medullaris

Anterior

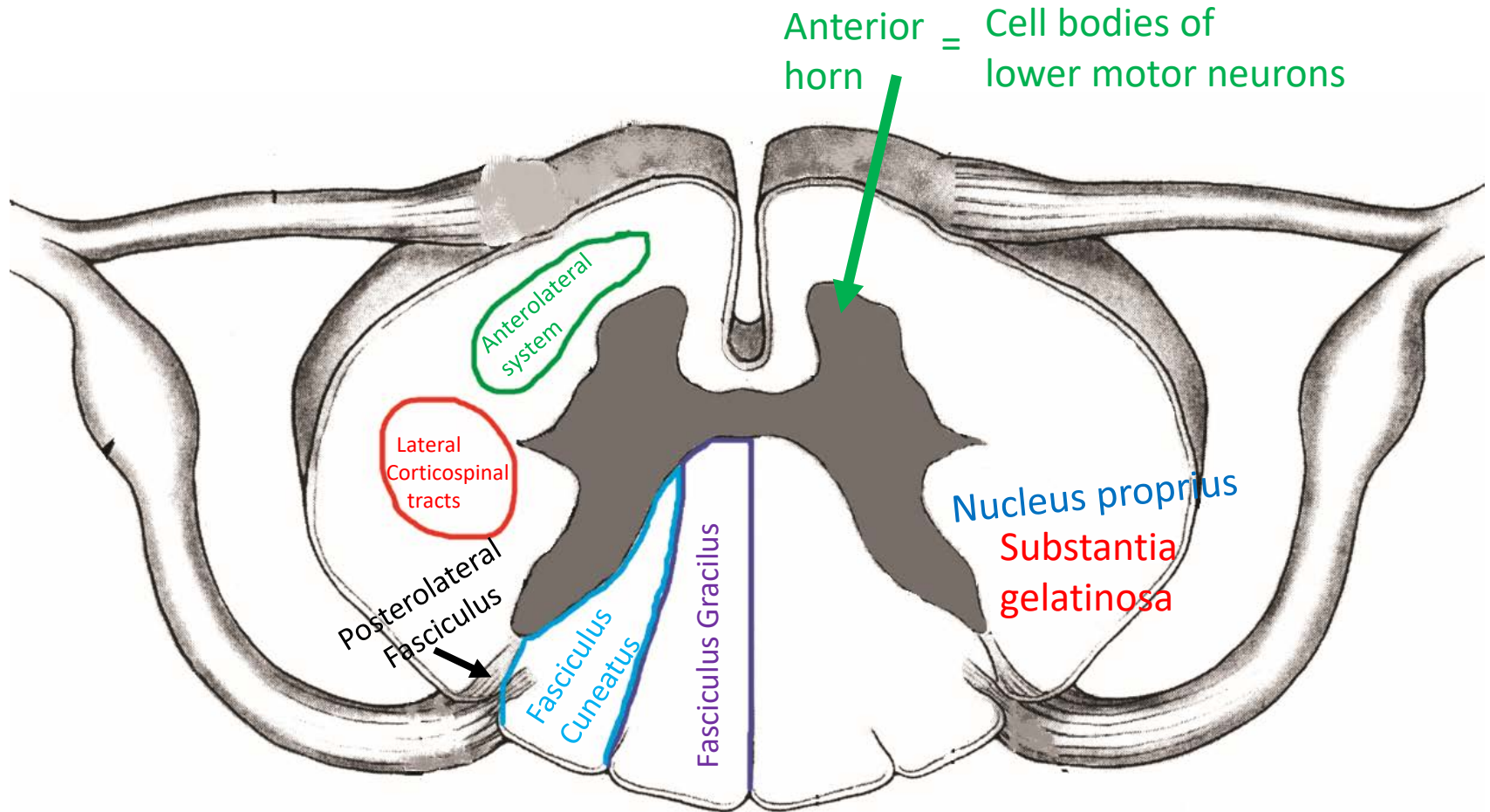
The best place to insert a needle to obtain a CSF sample is between vertebral levels L3/L4 or L4/L5.



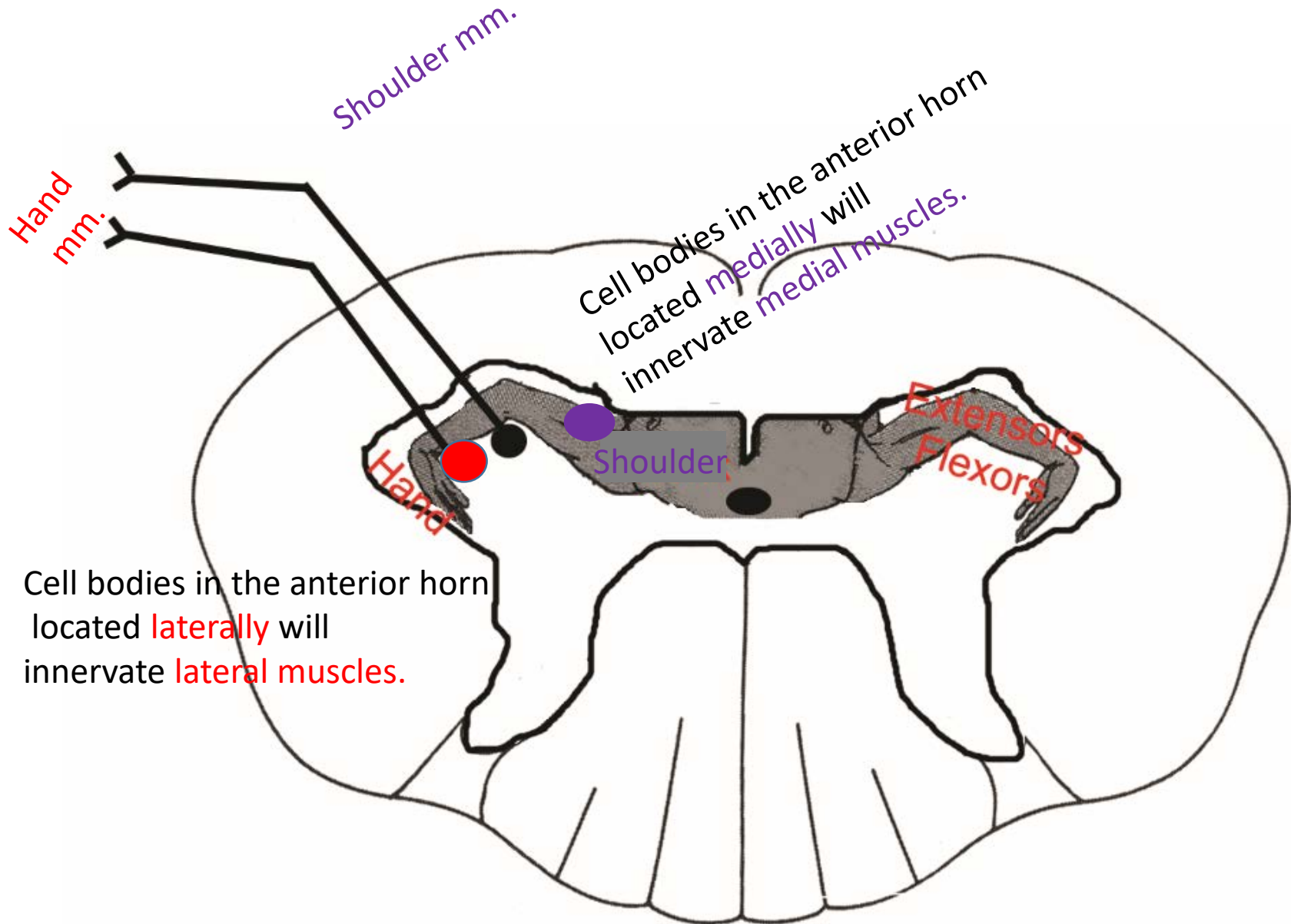
Spinal cord: Gray and White matter



Spinal cord Tracts and Nuclei



Somatotopic Organization of the Anterior Horn



Spinal Cord Section Differences

There are 4 classic spinal cord sections:

Cervical
Thoracic
Lumbar
Sacral

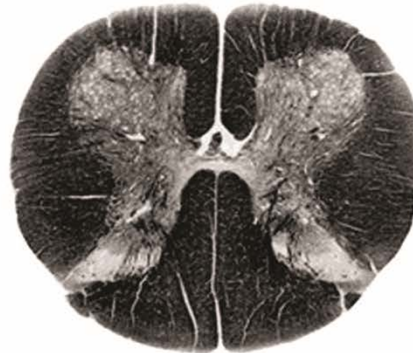
Note: These sections are
in clinical orientation and
are myelin stained.
(white matter is stained
black)



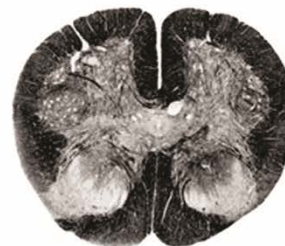
Cervical section:
Oval in shape
Large anterior horns
Large amount of white matter



Thoracic section:
Small round shape
Contains lateral horns



Lumbar section:
Round shape
Large anterior horns



Sacral section:
Very small and round in shape
Mostly gray matter

Similarities between the 4 Spinal Cord Sections

Nuclei/gray matter:

Anterior horn

Posterior horn – substantia gelatinosa

Posterior horn – nucleus proprius

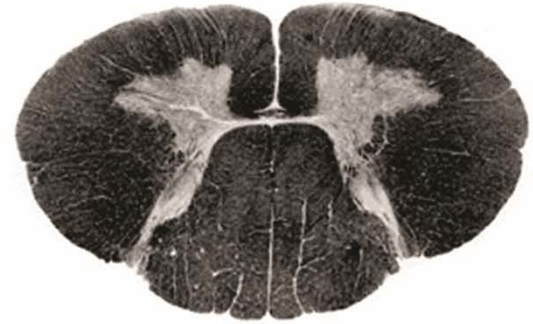
Tracts /white matter (stained black):

Anterolateral system (spinothalamic tracts)

Lateral corticospinal tracts

Fasciculus gracilis

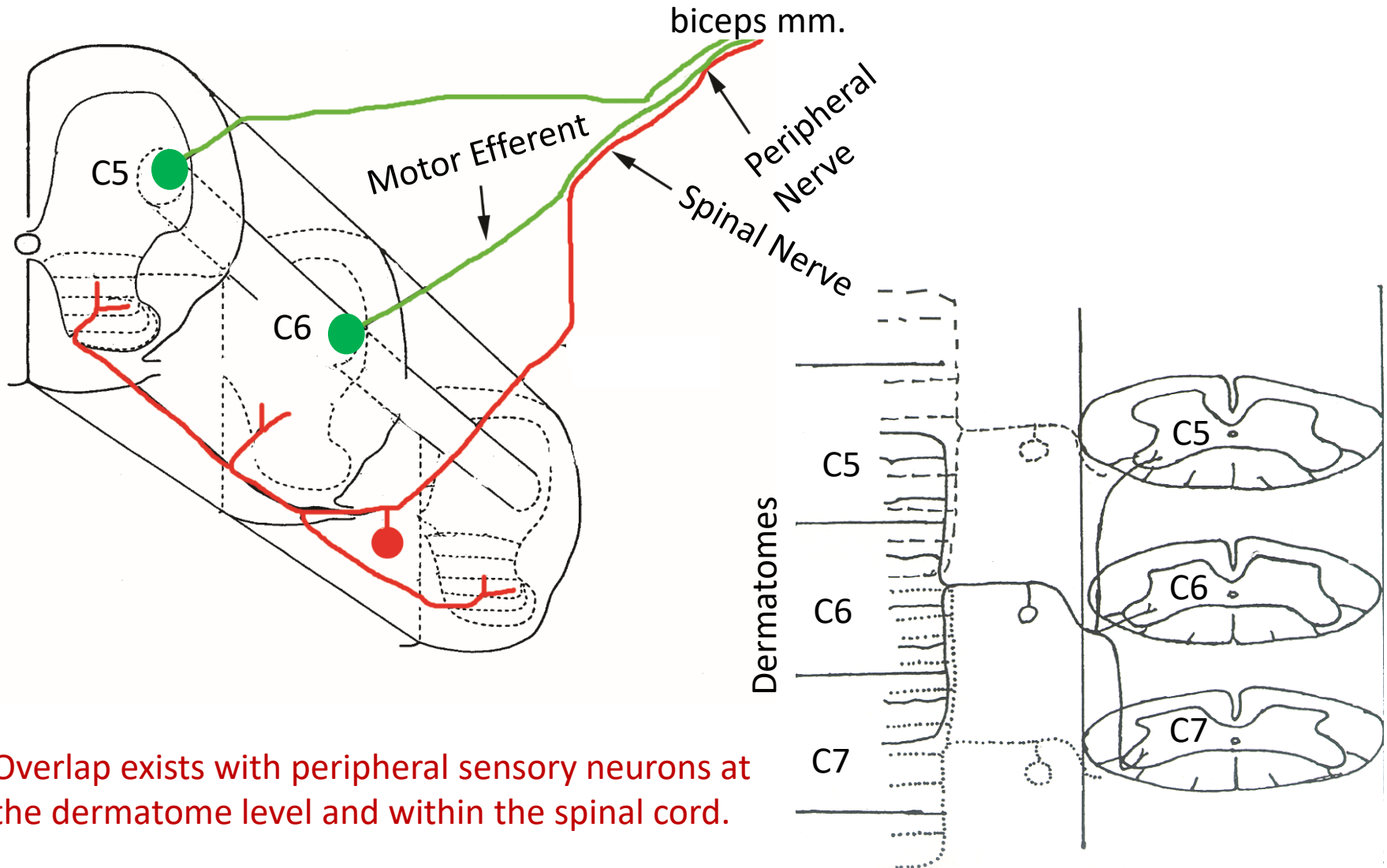
Posterolateral fasciculus



Branching Concept

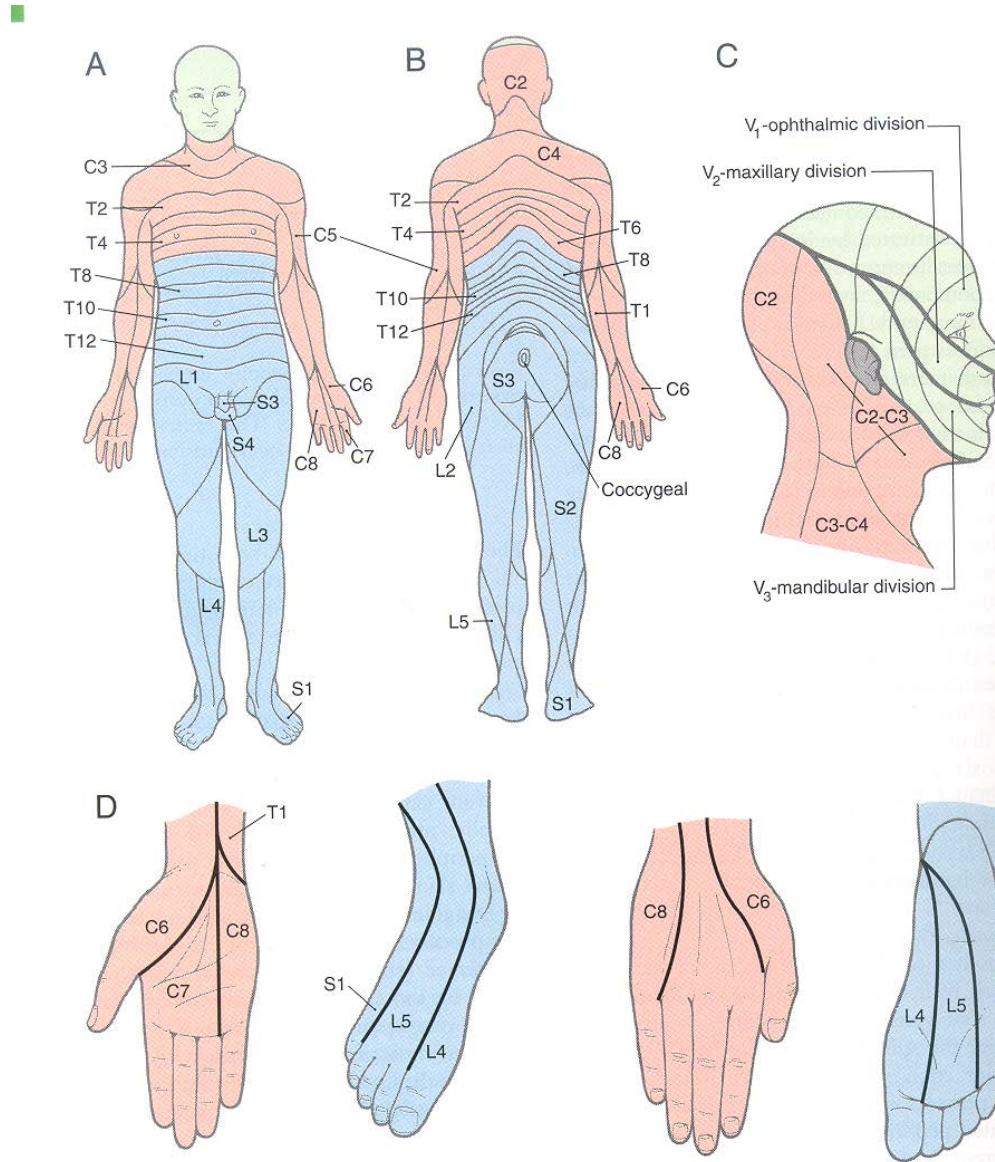
A muscle may be innervated by several spinal cord sections.

i.e. the biceps muscle is innervated by spinal nerves from spinal cord sections C 5 and C6.

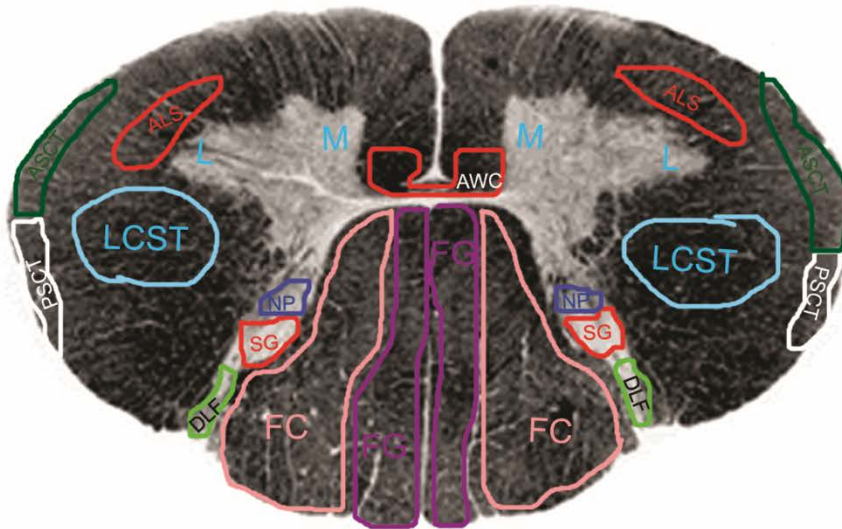


Overlap exists with peripheral sensory neurons at the dermatome level and within the spinal cord.

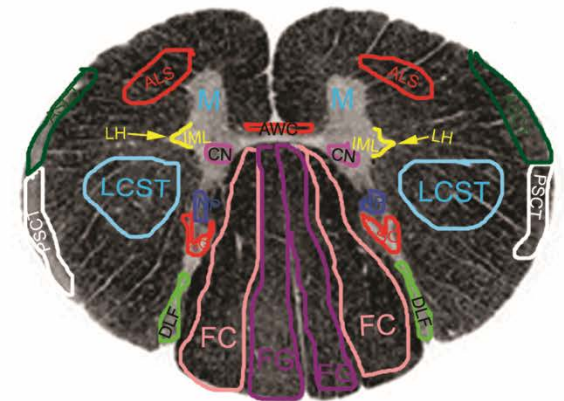
Dermatome Map



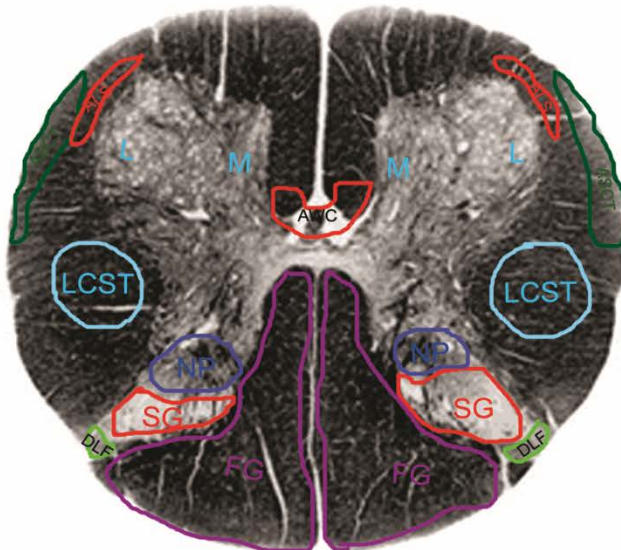
Cervical spinal cord



Thoracic spinal cord



Lumbar spinal cord



Sacral spinal cord

