

SPINAL CORD & TRACTS

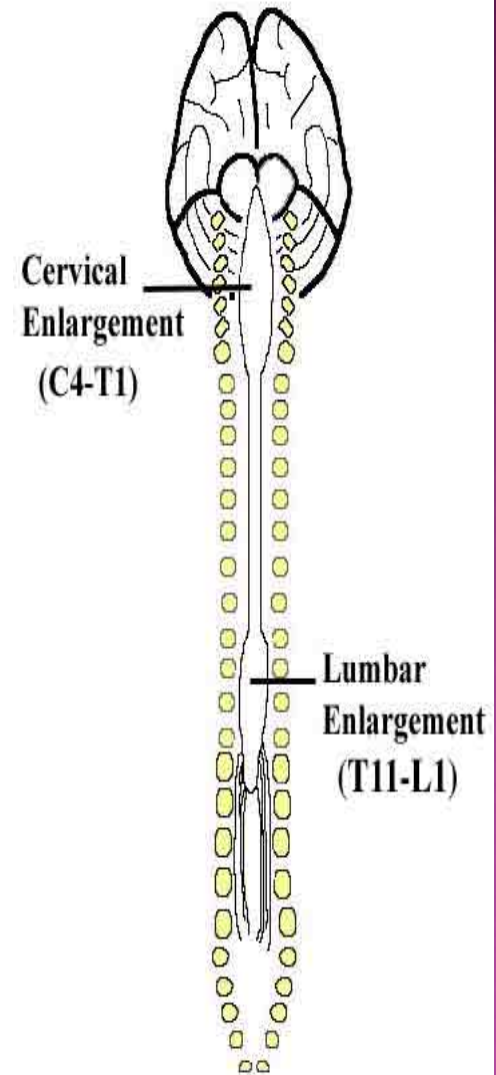
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OVERVIEW

- Spinal cord gross anatomy
- Spinal meninges
- Sectional anatomy
- Tracts
- Clinical implications

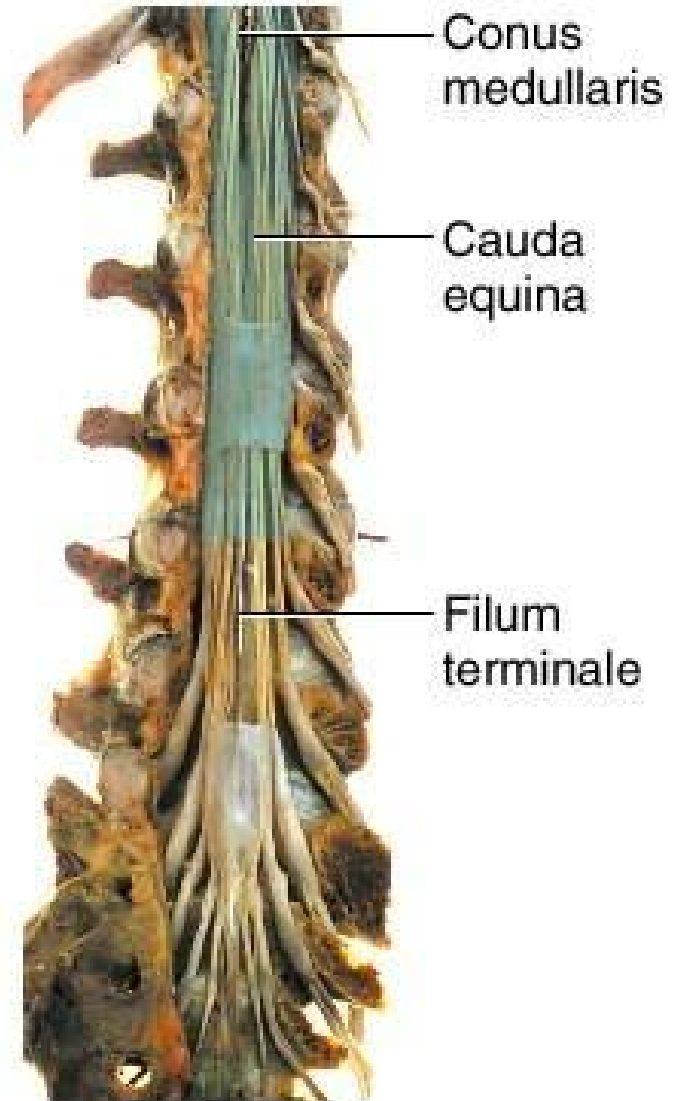
THE ADULT SPINAL CORD

- Approx. 18 inches (45cm) long
- ½ inch (14mm) wide
- Begins at C1 vertebrae
- 2 enlargements: cervical & Lumbar
- 31 segments (31 pairs of spinal nerves)
- Ends at L1 -L2



DISTAL END

- ❖ **Conus medullaris**
 - thin, conical end of cord
- ❖ **Cauda equina**
 - nerve roots extending below conus medullaris
- ❖ **Filum terminale**
 - thin thread of fibrous tissue end of conus medullaris
 - attaches to coccygeal ligament

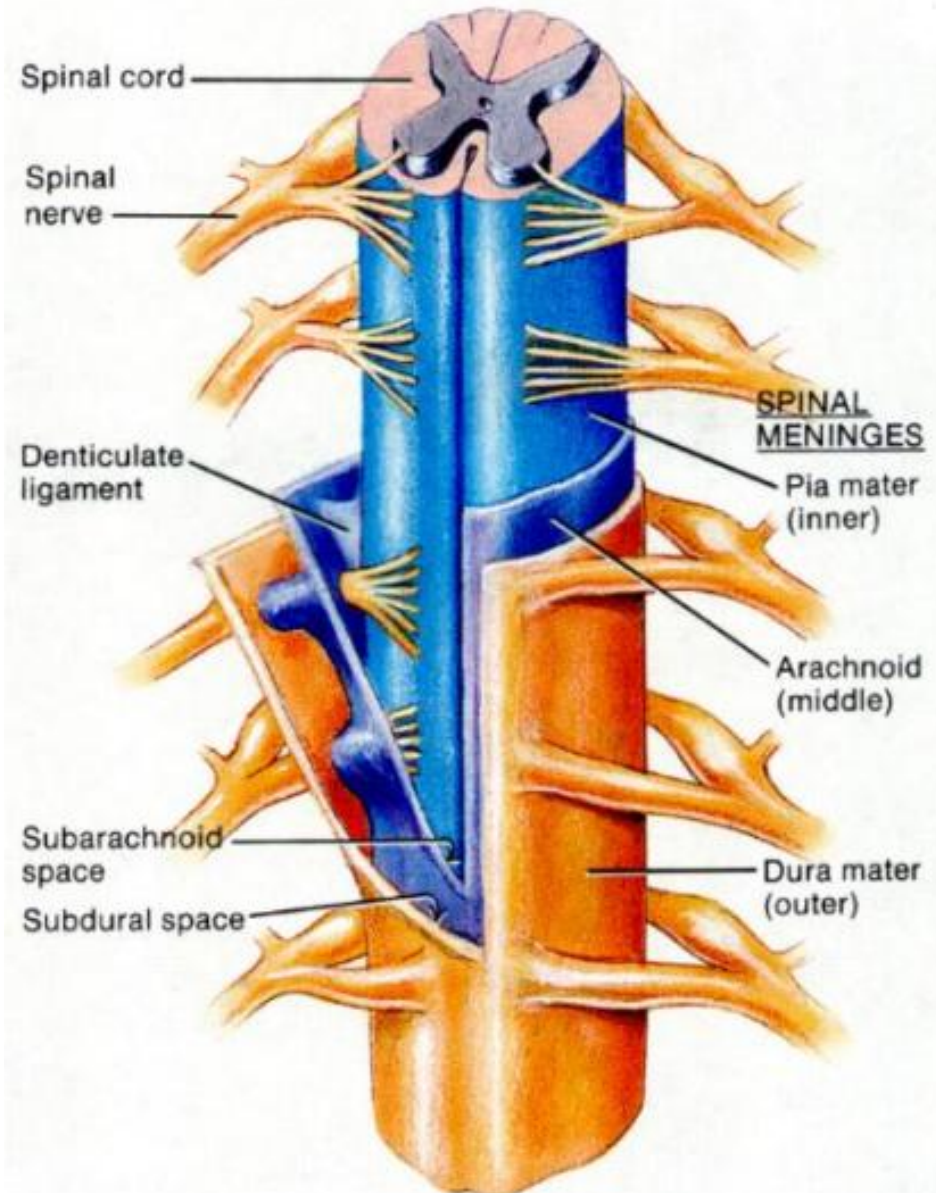


SPINAL MENINGES

- protect spinal cord
- Carry blood supply
- Continuous with cranial meninges

SPINAL MENINGES

- ⦿ Dura mater
- ⦿ Arachnoid mater
- ⦿ Pia mater- denticulate ligament



SPINAL DURA MATER

- Tough & fibrous
- Cranially: fuses with periosteum of occipital bone
 - Continous with cranial dura
- Caudually
 - tapers to dense collagen fibers
 - joins filum terminale in coccygeal ligament (for longitudinal stability)

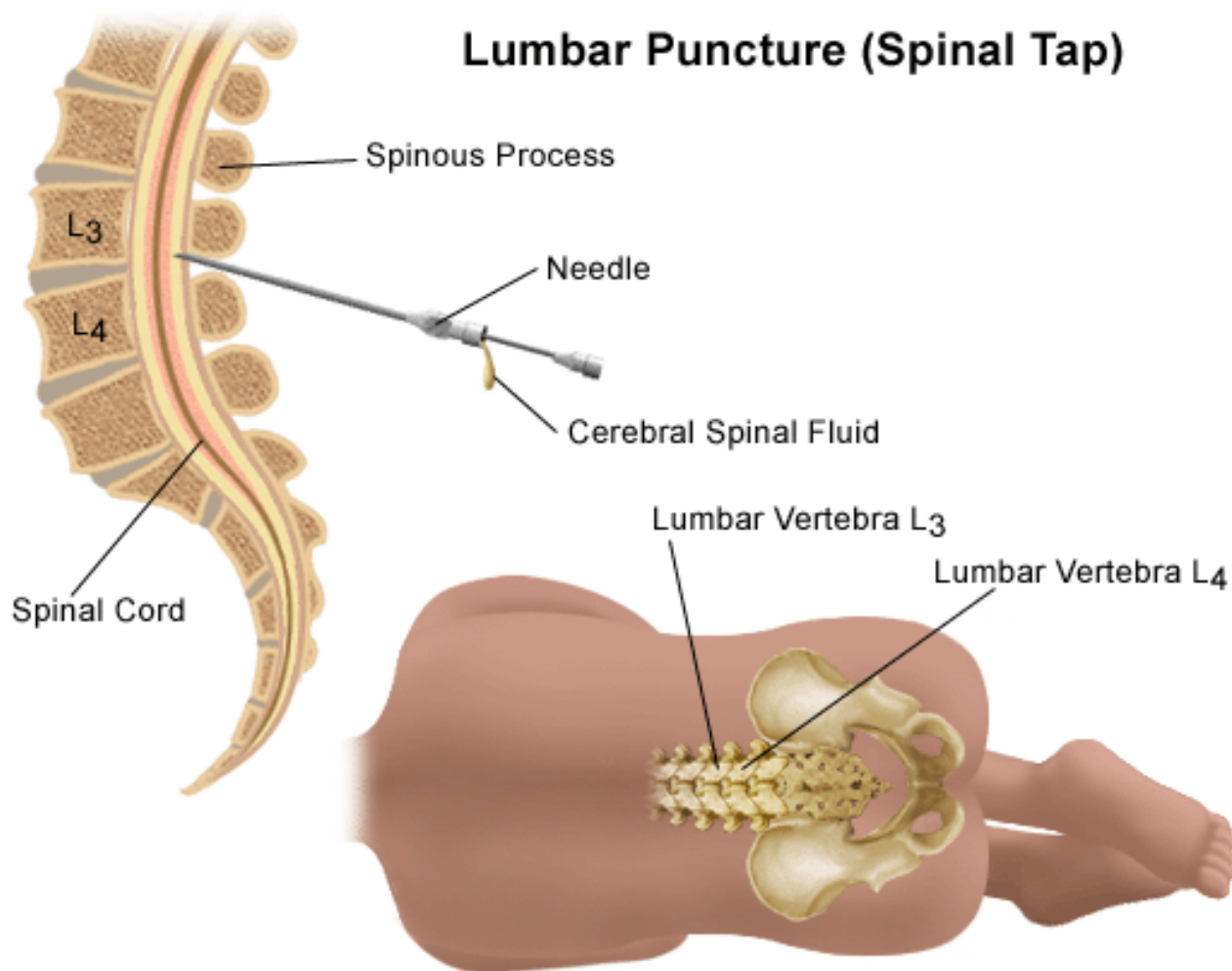
EPIDURAL SPACE

- ⦿ Between spinal dura and walls of vertebral canal
- ⦿ No such space in brain
- ⦿ Contains loose connective and adipose tissue
- ⦿ Anesthetic injection site

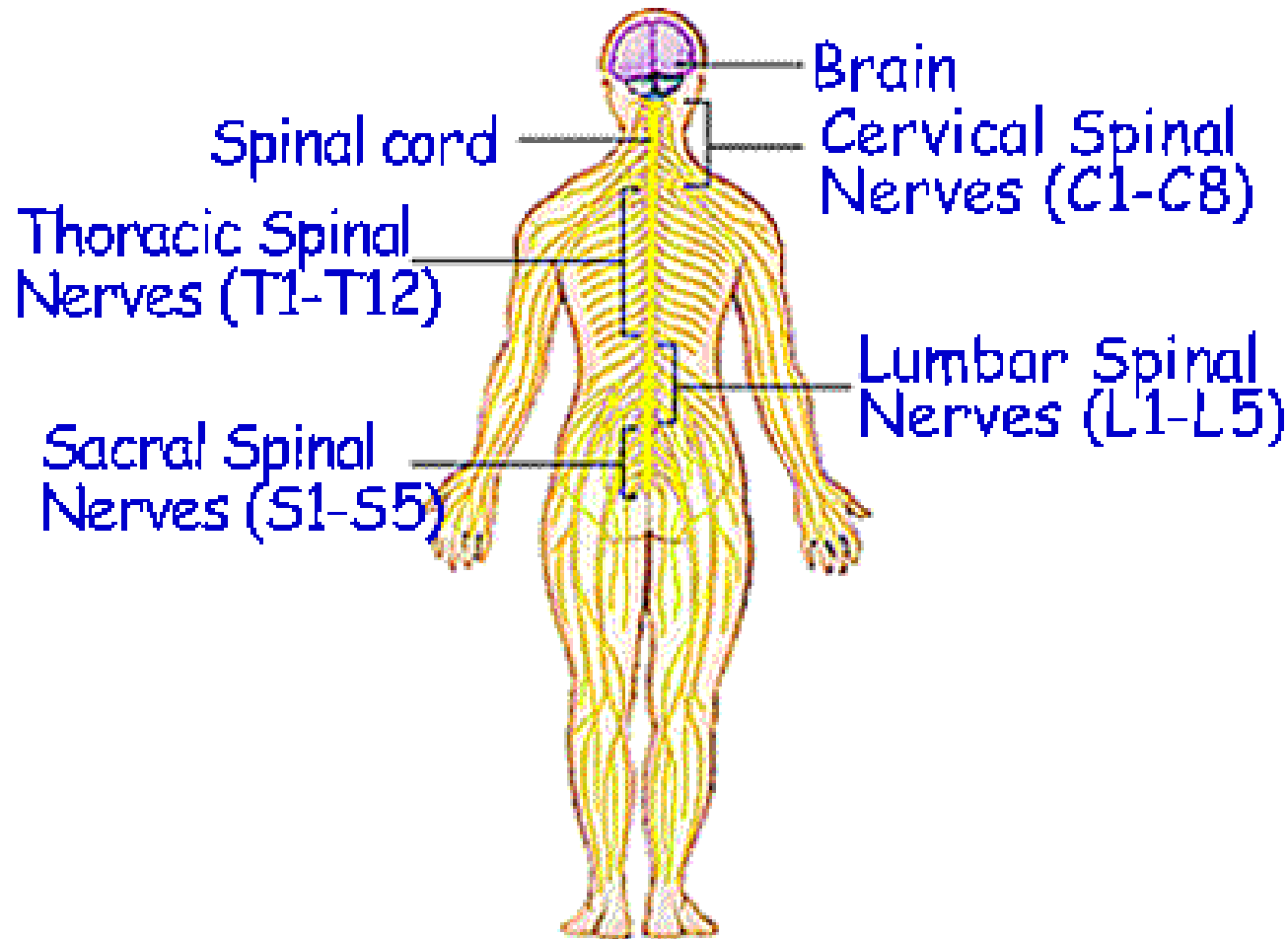
INTER-LAYER-SPACES

- ◉ Subdural space
- ◉ Subarachnoid space

LUMBAR PUNCTURE (SPINAL TAP)



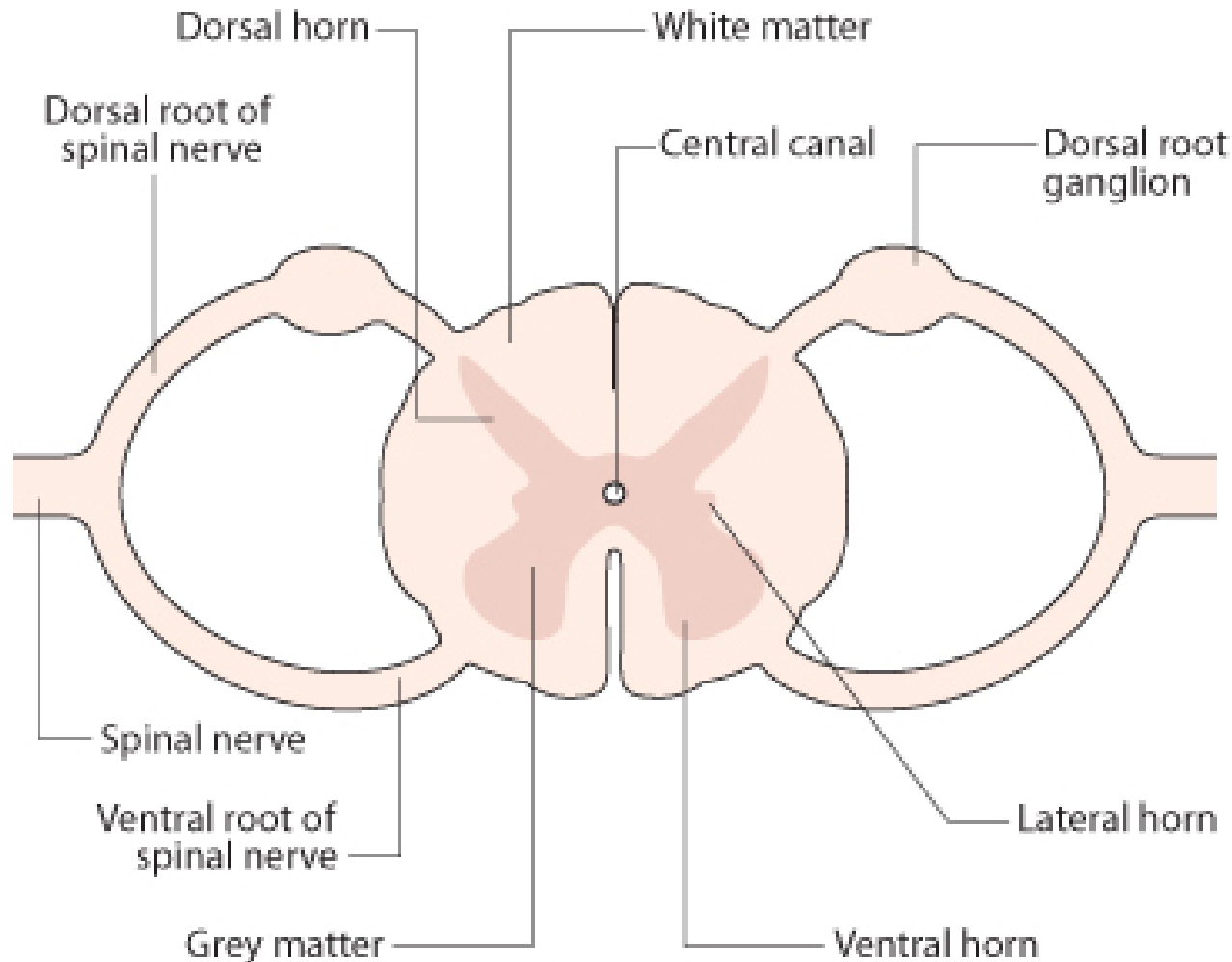
SPINAL SEGMENTS



ROOTS

- 2 branches of spinal nerves:
 - ventral root: contains axons of **motor neurons**
 - dorsal root: contains axons of **sensory neurons**
- **Dorsal root ganglion**: contain cell bodies of sensory neurons
- **Mixed nerve**

SECTIONAL ANATOMY OF SPINAL CORD



GREY MATTER OF SPINAL CORD

- ◉ Consists of a central core of grey matter
- ◉ H-shaped
- ◉ Within grey matter, 3 horns:
 - dorsal horn: contains somatic & visceral sensory nuclei
 - lateral horn: are in thoracic and lumbar segments only
 - Ventral horn: contains motor neurons
 - contain visceral motor nuclei

WHITE MATTER OF SPINAL CORD

- ◉ White matter completely surrounds the grey matter of spinal cord.
- ◉ 3 columns on each side of spinal cord
 - posterior white columns
 - anterior white columns
 - lateral white columns

TRACTS

- Tracts (or fasciculi)
 - bundles of axons in white columns
 - relay certain type of information in same direction
- 2 types of tracts:
 - Ascending tracts:** carry information to brain
 - Descending tracts:** carry motor commands to spinal cord

GENERAL OVERVIEW

- Ascending tracts
 - Sensory
- Descending tracts
 - Motor
- **General arrangement of both tracts**
- 1st order neuron
- 2nd order neuron
- 3rd order neuron
- The only difference is the different locations where each order of neuron ends.
- Decussation is the cross-over of the tract from one side to the other. Therefore, there are instances where the left side of the body is controlled by the right brain hemisphere. Decussation occurs at different locations for each tracts.

ASCENDING TRACTS

- ◉ Spinothalamic tracts
 - Lateral
 - pain & temperature
 - Anterior
 - light touch & pressure
- ◉ Dorsal column tract
 - deep touch & pressure
 - proprioception
 - vibration sensation
- ◉ Spinocerebellar tract
 - posture & coordination

DESCENDING TRACTS

○ Pyramidal

- Corticospinal: control of voluntary, discrete, skilled movements, especially those of the distal parts of limb.
- corticobulbar

○ Extrapyramidal

- Rubrospinal tract: controls limb flexor muscles
Originates from red nucleus
- Tectospinal tract: reflex responses to visual input.
Originates from contralateral superior colliculus,
fibres cross in dorsal tegmental decussation

DESCENDING TRACTS

○ Extrapyramidal

- Vestibulospinal tract: descend from vestibular nuclei. Lateral tract originates from ipsilateral vestibular nucleus , mediates excitation of limb extensor muscles
- Reticulospinal tracts: descend from pons & medulla. Involved in control of reflex activities, muscle tone & vital functions

The Spinal Tracts

sensory tracts Ascending tracts

Fasciculus gracilis
Fasciculus cuneatus
Posterior
spinocerebellar tract
Anterior
spinocerebellar tract
Lateral spinothalamic tract
Anterior spinothalamic tract

Often called the posterior white columns.
Carry discriminative touch and conscious proprioception.

Lead to the thalamus, the pathway for crude touch, pain, temperature, pressure.

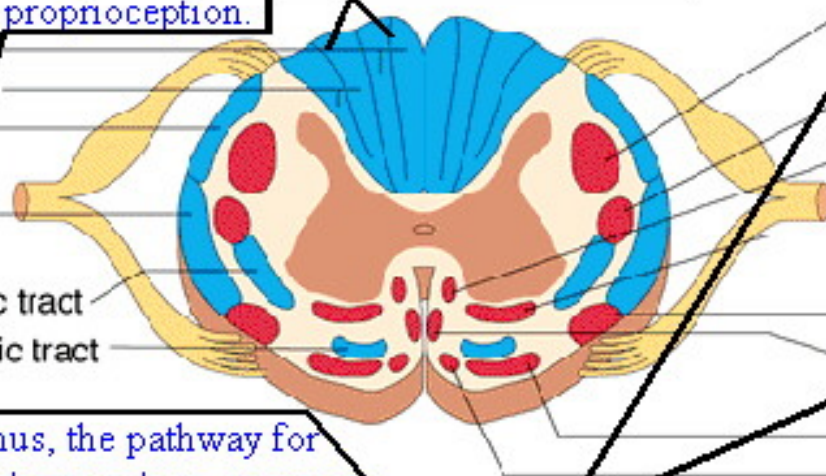
From the spinal cord to the cerebellum.
Carry subconscious proprioceptive stimuli. Proprioception is "body sense" and "muscle sense", the perception of body position and muscle position necessary for coordinating movements.

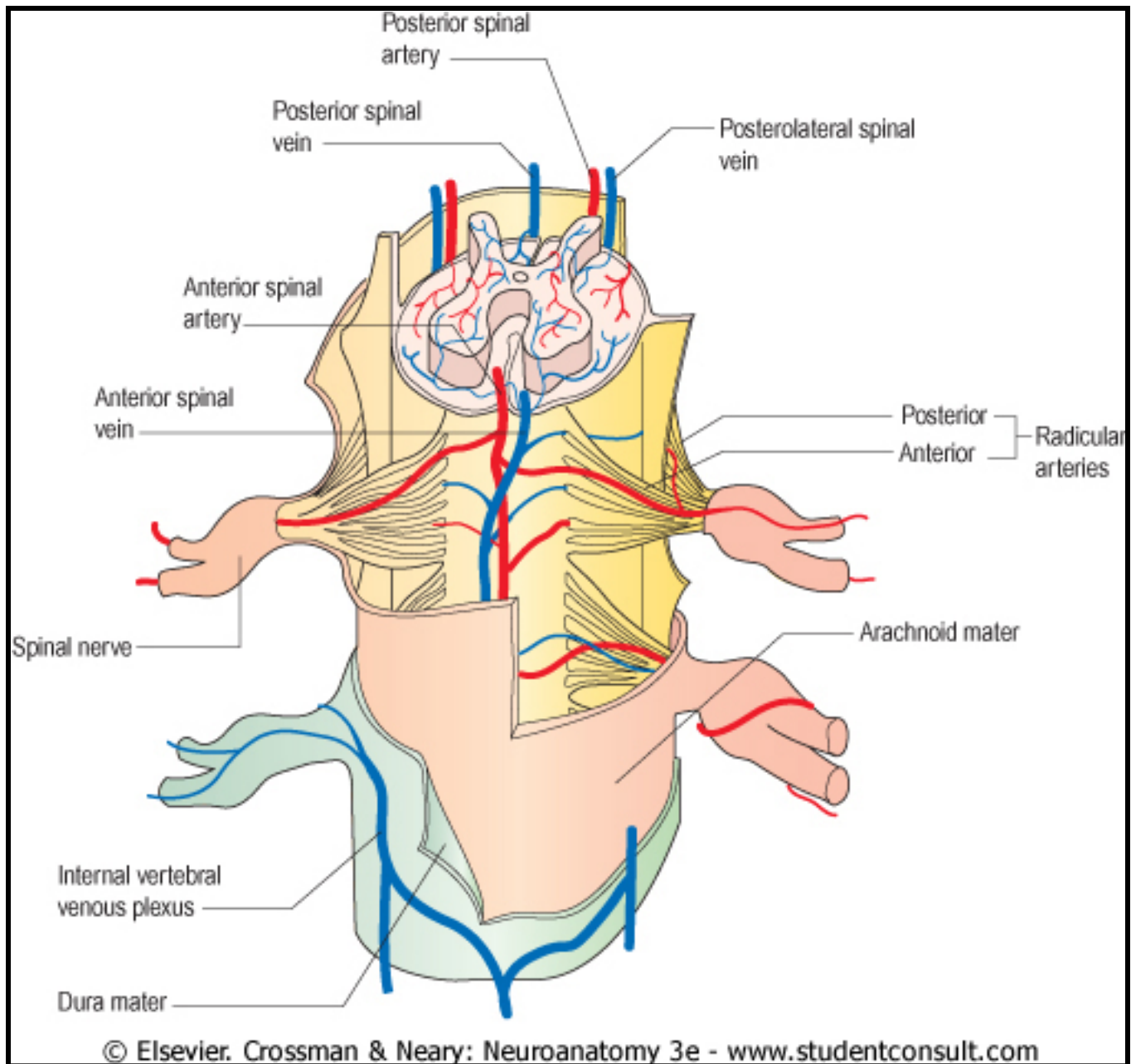
motor tracts Descending tracts

Lateral corticospinal tract
Rubrospinal tract
Anterior reticulospinal tract
Lateral reticulospinal tract
Olivospinal tract
Anterior corticospinal tract
Vestibulospinal tract
Tectospinal tract

These tracts come from a variety of locations in the brain, as a group are termed the "extra-pyramidal tracts", and are generally associated with balance and muscle tone.

The corticospinal tracts carry voluntary motor stimuli from the cerebral cortex to motor neurons in the spinal cord. They are also called the "pyramidal tracts" because some of them cross in the pyramids of the medulla.





CLINICAL APPLICATIONS

- ⦿ Traumatic or non-traumatic injury to the Spinal Cord.
- ⦿ Quadriplegic
- ⦿ Paraplegic
- ⦿ Complete and incomplete injury

QUESTIONS