Spinal Cord – Gross Anatomy

Location

- Enclosed within the vertebral column
- Extends from the foramen magnum to the upper border of L2

Protection

- Vertebrae
- Meninges
  - Duramater
    - Epidural space contains adipose tissue and blood vessels
  - Arachnoid matter
    - Subarachnoid space contains CSF
  - Pia mater
    - Delicate and closely associated with the spinal cord surface

Spinal Cord – Gross Anatomy

Structure

- Long and cylindrical
- 42cm in length and 1.8cm thick
- Has two enlarged portions
  - Cervical enlargement (C4 and T1)
    - Receives sensory input from the upper limbs
    - Sends motor output to the upper limbs
  - Lumbar enlargement (T9 and T12)
    - Receives sensory input from the lower limbs
    - Sends motor output to the lower limbs
- Ends in a cone-shaped structure called the conus medullaris from where a fibrous extension of the pia, filum terminale, mater extends inferiorly to anchor the cord to the coccyx
- Lumbar and sacral spinal nerves project downward and extend inferiorly before exiting through the intervertebral foramina
- Below the SC these nerves are called cauda equina
- SC is divided into 31 segments based on the origins of the spinal nerves
- The cervical nerves exit just above their corresponding vertebrae
- All other spinal nerves exit just below their corresponding vertebrae

Spinal Cord - Functions

- Conducts sensory signals up the cord
• Conducts motor signals down the cord
• Integrate certain reflexes

Spinal Cord – Cross Section

• Flat from front to back and elliptical in shape
• Has two grooves that run its length separating it into right and left halves
  o Anterior (Ventral) median fissure
  o Posterior (Dorsal) median sulcus
• The central portion has a canal called the central canal
• Each cord segment is associated with a pair of ganglia called the dorsal root ganglion
• Ganglia are located just outside the SC
• They contain cell bodies of sensory neurons
• Axons of these neurons enter the cord via the dorsal root
• Ventral root contains axons from motor neurons that carry information from cell bodies in the CNS to the periphery
• The dorsal and ventral root merge and exit as the spinal nerve through the intervertebral foramina

• Gray matter
  o A butterfly shaped structure that occupies the central portion of the cord
  o The two lateral masses are connected by the gray commissure that surrounds the central canal
  o The posterior horn projects posteriorly, the anterior horn anteriorly and the small lateral horns laterally
  o Consists of cell bodies of interneurons and motor neurons, neuroglia cells and unmyelinated axons

• White matter
  o The area surrounding the gray mater
  o Divided into three columns namely, anterior, posterior and lateral funiculus
  o Consists almost entirely of myelinated motor and sensory axons
  o Columns of white mater carry information either up or down the cord
  o Fibers run in three directions – ascending, descending, and transversely
  o Divided into three funiculi (columns) – posterior, lateral, and anterior
  o Each funiculus contains several fiber tracks
  o Fiber tract names reveal their origin and destination
  o Fiber tracts are composed of axons with similar functions

• Pathway generalizations
  o Pathways decussate
  o Most consist of two or three neurons
  o Most exhibit somatotopy (precise spatial relationships)
  o Pathways are paired (one on each side of the spinal cord or brain)