Spinal Cord, Spinal Nerves

A&P lab
Dr. Kandula
Anatomy of Spinal Cord
Meninges

- Connective tissue membranes that protect and surround brain and spinal cord
- Outermost layer is **dura mater**, dense irregular connective tissue
- Middle layer is **arachnoid mater**; avascular thin layer; elastic and collagen fibers
- Inner layer is **pia mater**; elastic and collagen fibers adheres to surface of brain and spinal cord; richly vascular; has **denticulate ligaments** that attach to vertebrae
Meninges and Spaces

(b) Transverse section of the spinal cord within a cervical vertebra
Spaces

- **Epidural space** - This is a space between the dura mater and the vertebral bone; it is filled with adipose tissue and connective tissue.
- **Subdural space** – found between dura mater and arachnoid; contains interstitial fluid.
- **Subarachnoid space** – between pia mater and arachnoid; contains cerebrospinal fluid.
(a) Anterior view and transverse section through spinal cord
Denticulate ligaments

- Extensions of pia mater connect the spinal cord to the dura mater and the vertebral bodies
- Help to hold the spinal cord in position
Functions of the Spinal Cord

1. Process reflexes
2. Integrates EPSPs* and IPSPs**
3. Conducts sensory impulses to the brain and motor impulses to effectors

* Excitatory postsynaptic potentials
** Inhibitory postsynaptic potentials
Anatomy of Spinal Cord
Spinal cord

- Begins at foramen magnum
- 16 – 18 inches long
- Ends at level of lumbar vertebra L1 or L2 in a conical end called conus medullaris
- Below this in the vertebral column – cauda equina
- Filum terminale – pia mater extension
CERVICAL PLEXUS (C1–C5):
- Lesser occipital nerve
- Great auricular
- Ansa cervicalis
- Transverse cervical nerve
- Supraclavicular nerve
- Phrenic nerve

BRACHIAL PLEXUS (C5–T1):
- Musculocutaneous nerve
- Axillary nerve
- Median nerve
- Radial nerve
- Ulnar nerve

THORACIC NERVES (12 pairs):
- Intercostal (thoracic) nerves
- Subcostal nerve (intercostal nerve 12)
- Second lumbar vertebra

LUMBAR PLEXUS (L1–L4):
- Iliohypogastric nerve
- Ilioinguinal nerve
- Genitofemoral nerve
- Lateral femoral cutaneous nerve
- Femoral nerve
- Obturator nerve

SACRAL PLEXUS (L4–S4):
- Superior gluteal nerve
- Inferior gluteal nerve
- Sciatic nerve:
  - Common fibular nerve
  - Tibial nerve
  - Posterior cutaneous nerve of thigh
  - Pudendal nerve

CERVICAL NERVES (8 pairs)
- Cervical enlargement
- First thoracic vertebra

LUMBAR NERVES (5 pairs)
- Cauda equina
- First lumbar vertebra
- Conus medullaris

SACRAL NERVES (5 pairs)
- Sacrum
- Filum terminale

COCCYGEAL NERVES (1 pair)
- Ilium of hip bone

Posterior view of entire spinal cord and portions of spinal nerves
Spinal cord

- 2 enlargements in transverse section
  - cervical
  - lumbar
- Anterior surface – anterior median fissure
- Posterior surface – posterior median sulcus
- Central hollow tube – central canal filled with CSF
Spinal cord

- Gray matter on the inside
- White matter on the outside
- Gray matter is composed of neuron bodies
  - Found in center of spinal cord and looks like a butterfly
  - Dorsal, ventral and lateral horns
  - Gray commissure
Spinal cord

- White matter is composed of axons covered in myelin
- 3 columns of white matter are called **funiculi**
  - Posterior, anterior and lateral
  - Each contains several tracts of axons.
Spinal Nerves

- Spinal nerves connect the CNS to sensory receptors, muscles, and glands and are part of the peripheral nervous system.
- 31 pairs of spinal nerves
- Anterior and posterior roots attach a spinal nerve to a segment of the spinal cord.
Spinal nerves

- 31 pairs of spinal nerves (all pairs)
  - 8 cervical
  - 12 thoracic
  - 5 lumbar
  - 5 sacral
  - 1 coccygeal
Spinal Nerve

- Attached to spinal cord by 2 roots
- Dorsal root
- Ventral root
- Dorsal root has a ganglion on it – dorsal root ganglion – neuron cell bodies of sensory neurons
Spinal Nerve
Spinal nerve

After emerging from intervertebral foramen divides into

- **Dorsal ramus** – supplies skin and muscles of back
- **Ventral ramus** – skin and muscles of front of trunk and upper and lower limbs
- **Meningeal branch** – vertebrae, ligaments, meninges
- **Ramus communicantes** – communicates with autonomic nervous system / ANS.
Plexuses and nerves

- **Cervical plexus**: C₁ – C₄ and C₅; includes phrenic nerve (C₃ – C₅)
- **Brachial plexus**: C₄; C₅ – T₁; includes axillary N. (deltoid); ulnar N.; median N.; radial N.
- **Thoracic nerves** – 12 pairs
- **Lumbar plexus**: L₁ – L₄; femoral N.
- **Sacral plexus**: L₄ – S₄; sciatic nerve