Human Anatomy

Lecture 4 **Assist. Prof. Dr. Dalya Basil**

Nervous System

The nervous system can be divided into the central and peripheral nervous system.

The nervous system is involved in most body functions, such as:

1- Sensory input

2- Integration

3- Motor output

Central Nervous System

The central nervous system (CNS) consists of the brain and the spinal cord.

The brain is located within the skull. It is one of the largest organs in the body, that coordinates most body activities.

Cerebrum is the largest section of the brain, it is located in the upper portion of the brain and is the area that processes thoughts, judgment, memory, problem solving, and language. The outer layer of the cerebrum is the cerebral cortex, which is composed of folds of gray matter.

The cerebrum is subdivided into the left and right halves called cerebral hemispheres. Each hemisphere has 4 lobes.

Frontal lobe, Parietal lobe, Occipital lobe, and Temporal lobe.

Cerebellum is the second largest portion of the brain, located beneath the posterior part of the cerebrum. The cerebellum aids in coordinating voluntary body movements and maintaining balance and equilibrium.

Brain stem

- Midbrain—acts as a pathway for impulses to be conducted between the brain and the spinal cord.
- Pons — means bridge—connects the cerebellum to the rest of the brain.
- Medulla oblongata—most inferior positioned portion of the brain; it connects the brain to the spinal cord.

Spinal Cord: The spinal cord is located within the vertebral canal, it connects to the brain at the level of foramen magnum and extend inferiorly in the vertebral canal to level L1-L2 of the vertebral column. It is considerably shorter than the vertebral column because it doesn't grow as rapidly as the vertebral column during development.

The spinal cord gives rise to 31 pairs of spinal nerves, which exit the vertebral column through intervertebral and sacral foramina.

The spinal cord is not uniform in diameter throughout its length. The cervical enlargement, in the inferior cervical region is where spinal nerves supplying the upper limbs arise. The lumbosacral enlargement in the inferior thoracic, lumber, and superior sacral regions is the site where spinal nerves supplying the lower limbs arise.

Immediately inferior to the lumbar enlargement, the spinal cord tapers to form a conelike region called the **conus medullaris.** Its tip is the inferior end of the spinal cord and extends to the level of the second lumbar vertebra.

The conus medullaris and the numerous nerves extending inferiorly from it, within the vertebral canal, resemble a horse's tail and are therefore called the **cauda equina.**

Meninges of the spinal cord

- Dura mater: outermost layer; continuous with epineurium of the spinal nerves
- Arachnoid mater: thin and wispy
- Pia mater: bound tightly to surface

Peripheral Nervous System

The peripheral nervous system (PNS) is external to the CNS. It consists of sensory receptors and nerves.

Sensory receptors are the endings of nerve cells or specialized cells that detect temperature, pain, touch, pressure, light, sound, odors, and other stimuli.

Sensory receptors are located in the skin, muscles, joints, internal organs, and specialized sensory organs such as the eyes and ears.

The PNS is divided into two divisions:

1- The sensory (afferent) division transmits signals to the CNS from sensory receptors.

2- The motor (efferent) division transmits signals from the CNS to effector organs, such as muscles and glands.

Neurons

Neurons are specific type of the cells of nervous system which receiving and transmit signals to other neurons or to effector organs.

Each neuron consists of a cell body, and two types of processes dendrites, and axons.

Types of neurons:

Neurons are classified according to their function or structure. The structural classification is based on the number of processes that extend from the neuron cell body.

The three major categories of neurons are:

1- Multipolar neurons: have many dendrites and a single axon. Most of the neurons within CNS and motor neurons are multipolar.

2- Bipolar neurons: have two processes one dendrite and one axon. Bipolar neurons are located in some sensory organs such as in the retina of the eye and in the nasal cavity.

3- Unipolar neurons: have a single process extending from the cell body.

Nerves:

A nerve is a bundle of axons and their sheathes. Twelve pairs of cranial nerves originate from the brain, and 31 pairs of spinal nerves originate from the spinal cord. Nerves transmit electrical signals

Cranial Nerves

- **I Olfactory nerve –** sensory for smell
- **II Optic nerve –** sensory for vision
- **III Oculomotor nerve –** motor fibers to eye muscles
- **IV Trochlear –** motor fiber to eye muscles
- **V Trigeminal nerve –** sensory for the face; motor fibers to chewing muscles
- **VI Abducens nerve –** motor fibers to eye muscles
- **VII Facial nerve –** sensory for taste; motor fibers to the face
- **VIII Vestibulocochlear nerve –**sensory for balance and hearing
- **IX Glossopharyngeal nerve –** sensory for taste; motor fibers to the pharynx
- **X Vagus nerves –** sensory and motor fibers for pharynx, larynx, and viscera
- **XI Accessory nerve –** motor fibers to neck and upper back
- **XII Hypoglossal nerve –** motor fibers to tongue

Spinal Nerves

Cervical spinal nerves, Thoracic spinal nerves, Lumber spinal nerves, Sacral spinal cords.