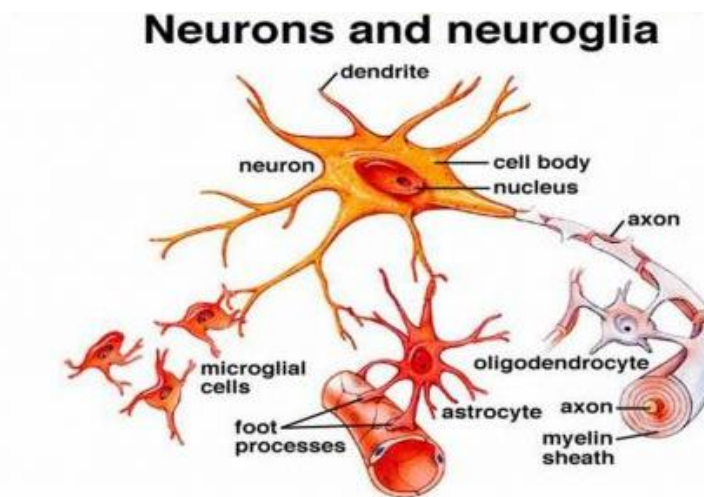


Nervous system

lecture 5&6

The basic unit of the nervous system is the neuron or nerve cell. This nerve cell has cell body, short processes called dendrites and single long process called axon. Dendrites carries the impulses towards the cell body; whereas, the axon transmits the impulses away from the cell body. Neuroglia is a supporting cells to the nervous tissue. There are three types of neuroglia: astrocytes, oligodendrocyte and the microglia. The function of the N.S can be summarized into:

- 1- Communication and coordination of the body structures.
- 2- Send messages to rest of the body.
- 3- Control body functions.

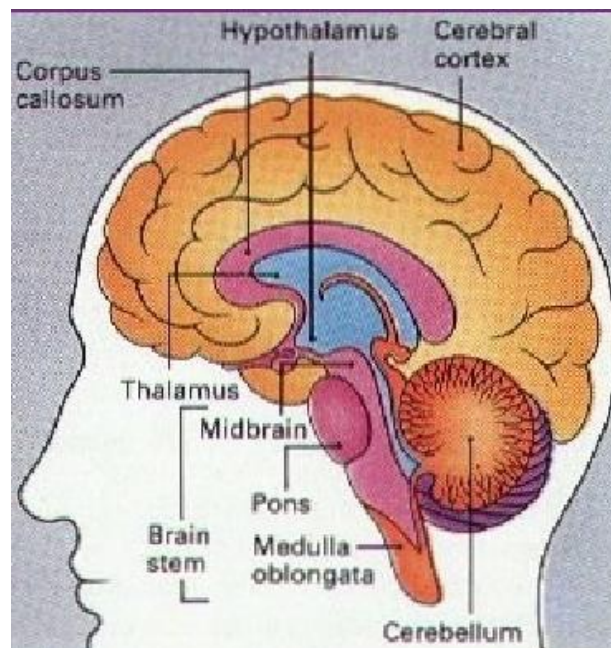


The interior of the central nervous system is organized into gray and white matter. Gray matter represents nerve cells embedded in neuroglia; whereas, white matter consists of nerve fibers embedded in neuroglia. Nervous system can be divided into central and peripheral nervous system. Central nervous system includes the brain and the spinal cord. The brain situated in the cranial cavity and the spinal cord in the vertebral canal. The peripheral nervous system involves the 12 pairs of cranial nerves and the 31 pairs of spinal nerves and associated ganglia. The motor nerves can be further divided into sympathetic and parasympathetic nerve fibers.

Central nervous system

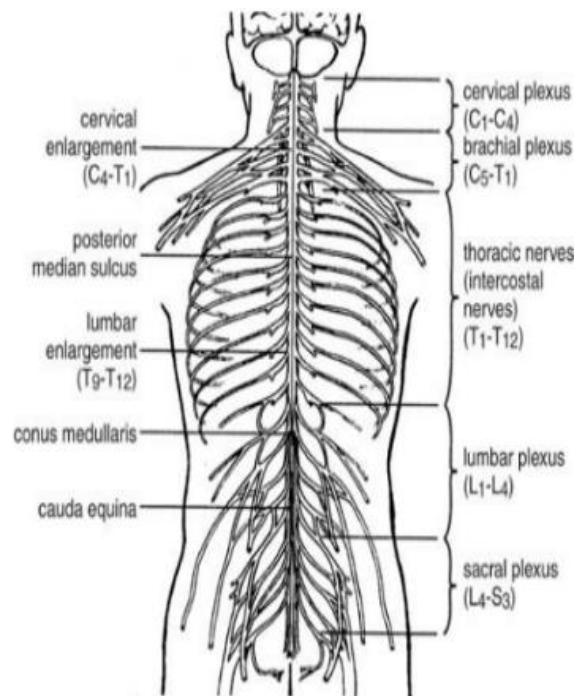
The brain is an organ of the soft nervous tissue contained in the skull of the vertebrates, functioning as the coordinating center of the body. Brain has four structures: the large domed shaped cerebrum, the deeper and inner is the Diencephalon, the cerebellum is the lower and back and the brain stem at the base. The cerebrum divided into two hemispheres left and right by the longitudinal fissure. These two hemispheres connected together by nerve fibers called corpus callosum. These two hemispheres are

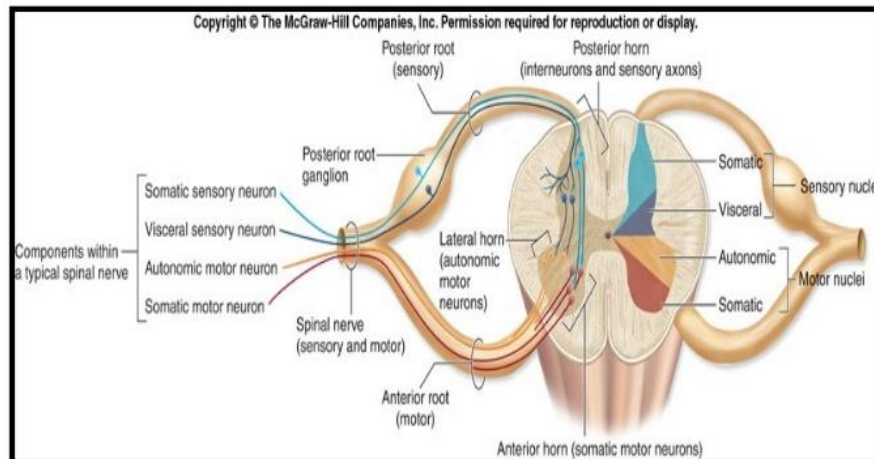
further divided into four lobes: frontal, parietal, occipital and temporal. The cerebellum is the area controls musculoskeletal movement such as posture, balance and muscle tone. The brain stem consists of mid brain, pons and medulla oblongata. The diencephalon contains thalamus, hypothalamus, epithalamus and ventral thalamus. Brain can be divided into forebrain, midbrain and hind brain according to the function and placement. The forebrain involves the cerebrum , thalamus and hypothalamus. The mid brain is responsible for hearing and movement reflexes. The hind brain includes cerebellum, pons and medulla oblongata. The brain is covered with a tough membrane, the meninges. The meninges are of three layers: the outer layer is the dura matter, the middle is the arachnoid and the inner layer is the pia matter. The subarachnoid space is the space below the arachnoid layer in which cerebrospinal fluid (C.S.F) flows. The brain has three fissure: longitudinal fissure separates between the two hemispheres; lateral fissure situated between the temporal lobe and the frontal and parietal lobes; and the transverse fissure lies between the cerebellum and cerebrum.



The spinal cord has 31 pairs of nerves which can be divided according to the region into: Cervical 8, Thoracic 12, Lumbar 5, Sacral 5, Coccygeal 1. It can be noted that the number of the spinal nerves is less than that of the vertebrae. This due to the differences in the growth of the vertebral column and the spinal cord, as the growth of the vertebral column is faster than that of the spinal cord. The spinal nerves in the cervical region are short and horizontal; whereas those arising in the thoracic and lumbar regions are long and vertical. These nerves (thoracic and lumbar) join together to form a long tail like structure called cauda equina.

The spinal nerve arises from the spinal cord as two roots: dorsal and ventral roots. The dorsal root carries impulses to the C.N.S. and called afferent fibers. These nerve fibers are called sensory fibers because they are concerned with information about sensation of touch, pain, temperature and vibration. The cell bodies of these nerve fibers are situated in a swelling on the posterior root called posterior root ganglia. The nerve fibers of the ventral root carries impulses away from the C.N.S. and called efferent fibers. The efferent fibers that supply the skeletal muscles and contract them are called motor fibers. The two roots of the spinal nerve meet together in the intervertebral foramen and then divided into large anterior ramus and small posterior ramus. The ventral and dorsal rami carry mixed nerve fibers (motor and sensory nerve fibers). The dorsal ramus innervates the skin and muscle of the back and the anterior ramus supplies the anterolateral body wall and all muscles and skin of the limbs. In addition to the anterior and posterior rami, spinal cord gives a small meningeal branch that supplies the meninges of the spinal cord.





Plexus: the anterior roots of the spinal cord join together to form a complicated nerve called plexus at the root of the limbs. The cervical and brachial plexus in the upper limb and lumbar and sacral plexus in the lower limb.

Autonomic nervous system

Sympathetic system: this prepare the body for flight and fight. Neurons of the sympathetic system originate in the intermediolateral cell column of the spinal cord in the thoracic and upper lumbar segment (T1 to L2-L3). They referred as thoracolumbar outflow of the visceral efferent fibers. This system constricts the blood vessels, the sphincters, increase the heart rate, dilate the pupils and dilate the bronchi and bronchioles.

Parasympathetic system: this system restores energy of the body. Neurons of the parasympathetic system originate either in the brain in certain nuclei of the C.N III, VII and IX and X (cranial outflow) or in the sacral spine cord from the intermediolateral cell column of spinal nerve S2-S4(sacral outflow). Together called craniosacral outflow. This system dilate blood vessels, constricts the pupils, dilate the sphincters, increase glandular secretion and acts as a bronchoconstriction.