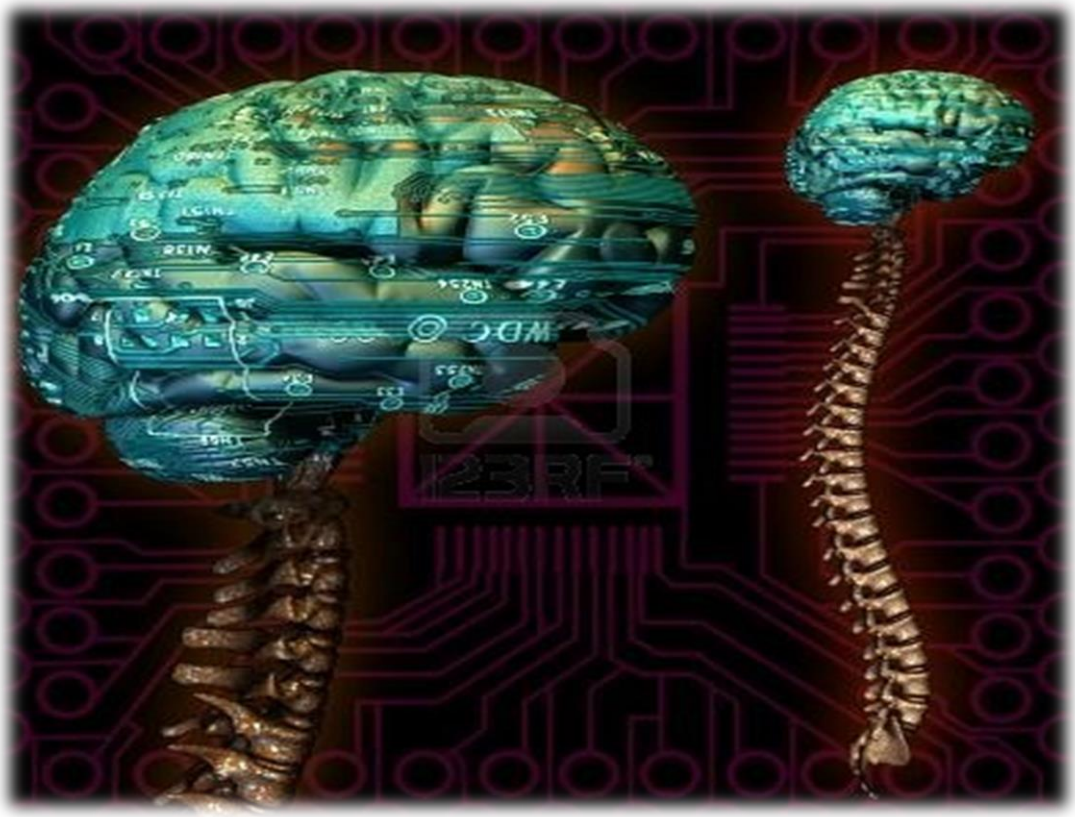
CNS Block



LECTURE (2)

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الملف شامل لجميع ما ذكر في السلايدز ولا يوجد فرق بين سلايدز البنات والأولاد

If there is any mistake please feel free to contact us:

Anatomyteam32@gmail.com

Both - Black
Male Notes - BLUE
Female Notes - GREEN
Explanation and additional notes - ORANGE
Very Important note - Red

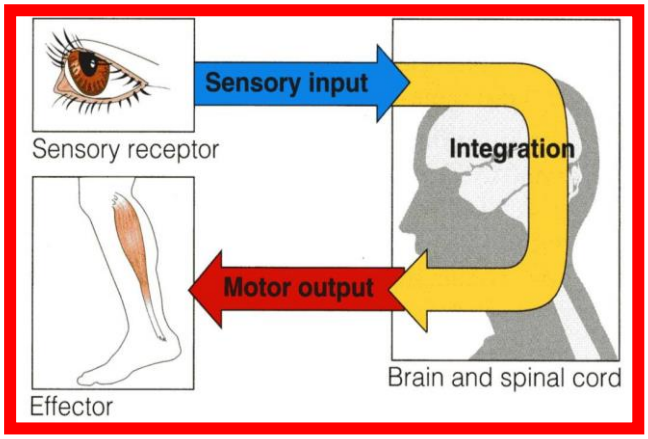
Objectives:

At the end of the lecture, the students should be able to:

- List the **parts** of the nervous system.
- List the **function** of the nervous system.
- Describe the **Structural & Functional Organizations.**
- **Define the terms**:
- Nervous tissue, grey matter, white matter, nucleus, ganglion, tract, nerve.
- List the **parts** of the brain.
- List the **structures protecting** the central nervous system.

Functions of the nervous system:

1. **Collection of sensory input** →Identifies changes occurring inside or outside the body **by** using sensory receptors. These changes are **called stimuli.**
2. **Integration**→Processes, analyzes and interprets these changes and **makes decisions.**
3. **Motor output** → or **response by** activating muscles or glands (effectors).

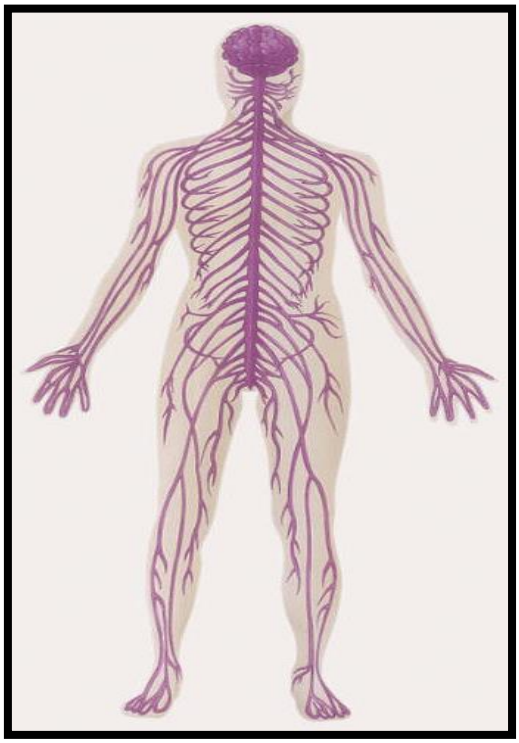


The importance of the nervous system:

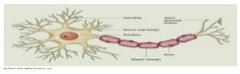
- It is the major controlling, regulatory & communicating system in the body.
- It is the center of all mental activity including:
- **Thought,**
- **Learning,**
- **Behavior and**
- **Memory**.
- Together with the endocrine system, the nervous system is responsible for regulating and maintaining **homeostasis.**

Classification

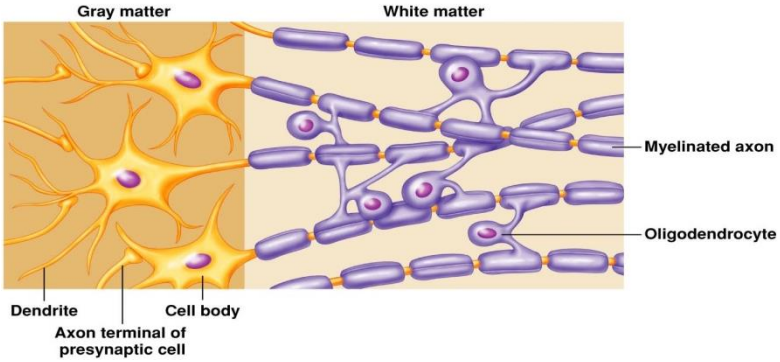
Anatomical		Physiological (functional)	
CNS	**PNS**	**Sensory (Afferent)**	**Motor (efferent)**
Brain And spinal cord occupying the body dorsal cavity	Nerves, ganglia and receptors	Consists of **nerve fibers** that convey impulses **from receptors** located **in various parts of the body**, **to the CNS.**	Consists of **nerve fibers** that convey impulses **from the CNS to the effector organs, muscles and glands.**
Acts as the integrating and command centers.	It is the part of the nervous system outside the CNS.	• **Both sensory and motor subdivisions are further divided into:** ▪ **Somatic** division: concerned with **skin, skeletal muscles** and **joints.** ▪ **Autonomic** division: concerned with the **visceral organs.**	



Nervous Tissue

Components		Orgnization	
Neurons (nerve cells) 	**Neuroglia (supporting cells)**	**Grey Matter**	**White matter**
• It is the basic structural (anatomical), functional and embryological unit of the nervous system. • The human nervous system is estimated to contain about 10^{10}. • They vary in their shape, size, and number of processes. • Most of the processes of the cell body are short with variable numbers and are receptive in function. They are known as Dendrites. • One of these processes leaving the cell body is called the axon which carries information away from the cell body. • Axons are highly variable in length and may divide into several branches or collaterals through which information can be distributed to a number of different destinations. • At the end of the axon, specializations called terminal	• Neuroglia, or glia cells constitute the other major cellular component of the nervous tissue. • It is a specialized connective tissue supporting framework for the nervous system. • Unlike neurones, *neuroglia do not have a direct role in information processing* but they are essential for the normal functioning of the neuron.	1-Cell bodies 2-Processes of the neurons. (Usually dendrites) 3-Neuroglia. 4-Blood vessels.	1-Processes of the neurons. (usually axons) 2-Neuroglia 3-Blood vessels ***NO cell bodies* in the white matter.**

buttons occur. • Here information is transferred to the dendrites of other neurones.			



The junction site of two neurons is called a **"synapse or relay".**

In the synapses the membranes of adjacent cells are in close **apposition** (**contiguity**=contact, not **continuity**). يعني الخلايا ما تدخل في بعضها، هي فقط تتلامس

Names change according to the location

	Inside the CNS	Outside the CNS
Neurons	**Nucleus**	**Ganglion**
Nerve fiber (axons)	**Tract**	**Nerves**

Autonomic nervous system

- Neurones that detect changes and control the activity of the viscera are collectively referred to as the autonomic nervous system.
- Its components are present in both the central and peripheral nervous systems.
- The autonomic nervous system is divided into two anatomically and functionally distinct parts: **1- Sympathetic → Thoracolumbar outflow 2- Parasympathetic → Craniosacral outflow.**
- Sympathetic and parasympathetic , divisions are generally have antagonistic effects on the structures that they innervate.
- The autonomic nervous system innervates → **Smooth muscles, Cardiac muscle and secretory glands.**
- It is an important part of the homeostatic mechanisms that control the internal environment of the body with the endocrine system.

Autonomic nervous system includes both the CNS & PNS because it originates in spinal cord & brain then sends outflow through spinal & cranial nerves (PNS).

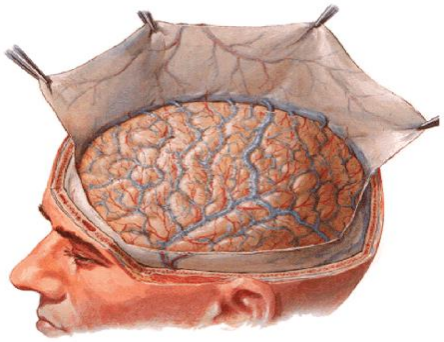
IMPORTANT

The Brain			
Cerebral Hemispheres	**Diencephalon**	**Cerebellum**	**Brain stem**
-The largest part of the brain. -They have elevations, called **gyri.** -Gyri are separated by depressions called **sulci.** -Each hemisphere is divided into 4 lobes named according to the bone above. -Lobes are separated by deeper grooves called **fissures or sulci.** -The outer layer is the gray matter or cortex -Deeper is located the white matter, or medulla, composed of bundles of nerve fibers, carrying impulses to and from the cortex -Basal nuclei are gray matter that are located deep within the white matter -They help the motor cortex in regulation of *voluntary motor activities*.	-The diencephalon is located between the 2 cerebral hemispheres and is linked to them and to the brainstem. -The major structures of the diencephalon are the Thalamus, Hypothalamus, Subthalamus and Epithalamus (pineal glands). -Brain tumors usually develop in the diencephalon which affects the hormonal activity since the hypothalamus is connected to the pituitary gland.	-Cerebellum has 2 cerebellar hemispheres with convoluted surface. -It has an outer cortex of gray matter and an inner region of white matter. -It provides precise coordination for body movements and helps maintain equilibrium. -Pons is connected to cerebellum by middle cerebral peduncle.	-It is connected to the cerebellum with 3 paired peduncles Superior, middle and inferior. -The brainstem has three parts: midbrain, Pons and medulla oblongata.

Cortex contains cells bodies while the medulla contains nerve fibers except for the basal nuclei.

MENINGES:

- There are **three** connective tissue membranes invest the brain and the spinal cord.
- These are from outward to inward are:



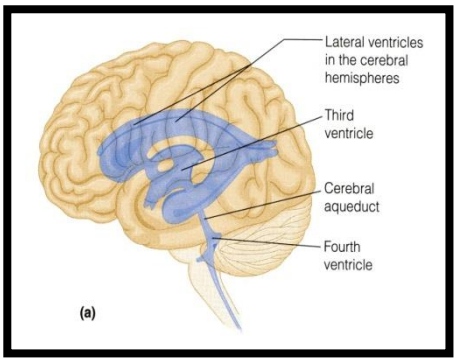
1- Dura mater. → Thickest layer

2- Arachnoid mater.

3- Pia mater. → Delicate and thin, rich in blood vessels and Directly attached to the brain.

BRAIN VENTRICLES:

- Brain is bathed by the cerebrospinal fluid (CSF).
- Inside the brain, there are 4 ventricles filled with CSF.
- The 4 ventricles are:
  - 2 lateral ventricles → One in each hemispheres.
  - 3rd ventricle→ in the Diencephalon.
  - 4th ventricle→ between Pons, Medulla oblongata & Cerebellum.



N.B. Cerebral aqueduct: connects the 3rd to the 4th ventricle. (it is only a channel. Not considered as a ventricle)

CEREBROSPINAL FLUID: IMPORTANT

Production: CSF is constantly produced by the **choroid plexuses** (clusters of capillaries from the roof) inside the ventricle.

Flow: from the lateral ventricles to the 3rd and 4th ventricles.

Drainage: From the 4th ventricle, part of the CSF flows down in the **central canal of the spinal cord.** Most of the CSF drains from the 4th ventricle to distribute in the **subarachnoid space** around the brain

Final destination: Returns to the **dural sinuses** through the **arachnoids villi.**

- **Arachnoid villi** are small protrusions of the arachnoid (the second layer covering the brain) through the dura.
- Villi absorb cerebrospinal fluid and return it to the **dural venous circulation. (Final destination).**

Review Questions

- **What does the peripheral nervous system consist of?**
  All spinal and cranial nerves + ganglia + receptors

- **What is the function of the sensory division?**
  Carrying impulses from **receptors** in the body to the **CNS**

- **What is the function of the motor division?**
  Carrying impulses from the **CNS** to **effector organs.**

- **What is the nervous tissue composed of?**
  1. Neurons
  2. Neuroglia

- **Name the component the grey matter has but not the white matter?**
  Cell bodies.

- **Which system works along with the autonomic nervous system to maintain homeostasis?**
  Endocrine system.

- **Name the parts of the brain?**
  1. Cerebral hemispheres
  2. Diencephalon
  3. Cerebellum
  4. Brain stem

- **What is the other name of the epithalamus?**
  Pineal gland.

- **Name the three connective tissue layers investing the brain and spinal cord?**
  1. Dura matter.
  2. Arachnoid matter.
  3. Pia matter.
- **Describe the production, flow, final destination of the CSF?**
  Produced inside the ventricles by the choroid plexuses → flows to lateral ventricles → flows to 3rd and 4th ventricles → PART OF IT flows down the central canal of spinal cord, BUT MOST OF IT drains in the subarachnoid space → returns to the dural sinuses by the arachnoid villi.

Quiz

1) **Which cavity does the CNS occupy?**
   A. Ventral body cavity
   B. Frontal body cavity
   C. Dorsal body cavity
   D. Superior body cavity

2) **Which of the following is true about the somatic division of the nervous system?**
   A. Concerned with the visceral organs.
   B. Cannot be controlled voluntarily.
   C. Is a subdivision of only the motor division.
   D. Concerned with skeletal muscles and skin.

3) **Which of the following is false regarding the function of neuroglia?**
   A. They support and provide nourishment for the neurons.
   B. Participate in the formation of the blood-brain barrier.
   C. Formation of myelin sheath in the CNS
   D. Transmission of impulses.

4) **A ganglion is a term describing?**
   A. A group of neurons within the CNS.
   B. A group of nerve fibers within the CNS.
   C. A group of neurons outside the CNS.
   D. A group of nerve fibers outside the CNS.

5) **Which of the following is receptive in function?**
   A. Axons.
   B. Dendrites.
   C. Microglia.
   D. Oligodendrocyte.

6) **What is the outflow of the sympathetic nervous system?**
   A. Thoracolumbar
   B. Craniosacral
   C. Spinalthalamic
   D. Corticomedullary

7) **How many lobes are the cerebral hemispheres divided into?**
   A. 2
   B. 4
   C. 8
   D. 3

Quiz

8) Basal nuclei are located in?

A. White matter of the brain.
B. Grey matter of the brain.
C. White matter of the spinal cord.
D. Grey matter of the spinal cord.

9) The brainstem is connected to cerebellum by structures called?

A. Ligaments.
B. Tendons.
C. Peduncles.
D. Muscles.

10) The main function of the cerebellum is?

A. Consciousness.
B. Memory.
C. Behavior.
D. Coordination of the body.

11) The 3rd ventricle is located in?

A. Diencephalon.
B. Between pons, medulla oblongata & cerebellum.
C. In the right hemisphere.
D. In the left hemisphere.

12) The CSF is absorbed by _____ to return to the dural sinuses?

A. Dural villi.
B. Pia villi.
C. Arachnoid villi.
D. Spinal villi.

13) CSF is produced in?

A. Subarachnoid space.
B. Ventricles.
C. Dural sinuses.
D. Cerebral aqueducts.

14) Lobes of the cerebral hemispheres are separated by?

A. Gyri.
B. Fissures.
C. Bones.
D. Fibers.

Question	Answer
1	C
2	D
3	D
4	C
5	B
6	A
7	B
8	A
9	C
10	D
11	A
12	C
13	B
14	B

GOOD LUCK

Anatomy Team Leaders:

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