



كلية المستقبل الجامعة
قسم الفيزياء الطبية
المرحلة الرابعة

Medical Physics

Neurophysics

Lecture 9

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Optic Impulse Transmission :

Optic Nerve :

The optic nerve is the second cranial nerve, responsible for transmitting the special sensory information for vision .

It is developed from the optic vesicle, an outpocketing of the brain. The optic nerve can therefore be considered part of the central nervous system, and examination of the nerve enables an assessment of intracranial health .

Optic nerves are of two types. These include cones and rods :

1- Cones : are the nerve cells that are more sensitive to bright light. They help in detailed central and color vision .

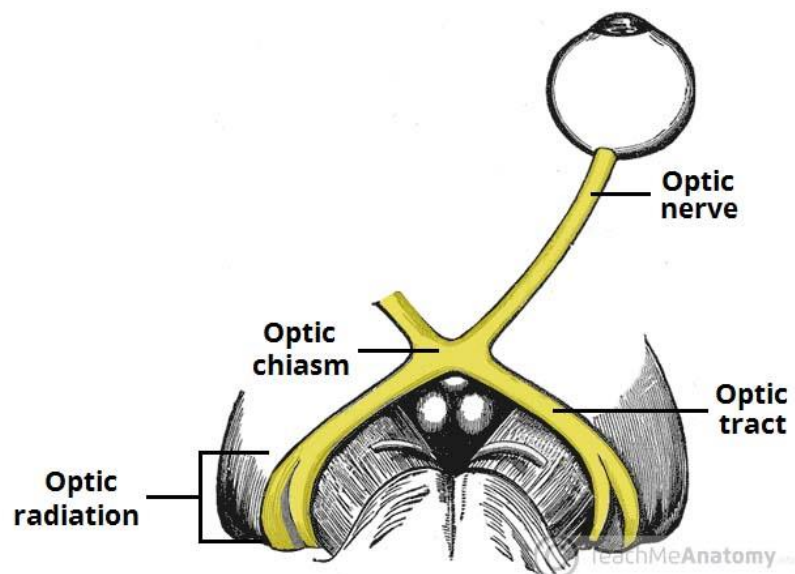
2- Rods: Rods are the optic nerve cells that are more sensitive to dim lights. They help in peripheral vision .



Anatomical Course :

The anatomical course of the optic nerve describes the transmission of special sensory information from the retina of the eye to the primary visual cortex of the brain. It can be divided into extracranial (outside the cranial cavity) and intracranial components :

Extracranial : The optic nerve is formed by the convergence of axons from the retinal ganglion cells. These cells in turn receive impulses from the photoreceptors of the eye (the rods and cones). **Intracranial (The Visual Pathway) .**



Morphologically and embryologically the optic nerve is comparable to sensory tract (white matter) of the brain, because of the following points :

- 1- The optic nerve is an outgrowth of the brain .
- 2- The fibers of optic nerve numbering about a million, are very fine, (2-10 μm) in diameter as compared to (20 μm) of the sensory nerve.
- 3- unlike peripheral nerves it is not covered by neurilemma (so it does not regenerate when cut) .
- 4- The optic nerve is surrounded by meninges .

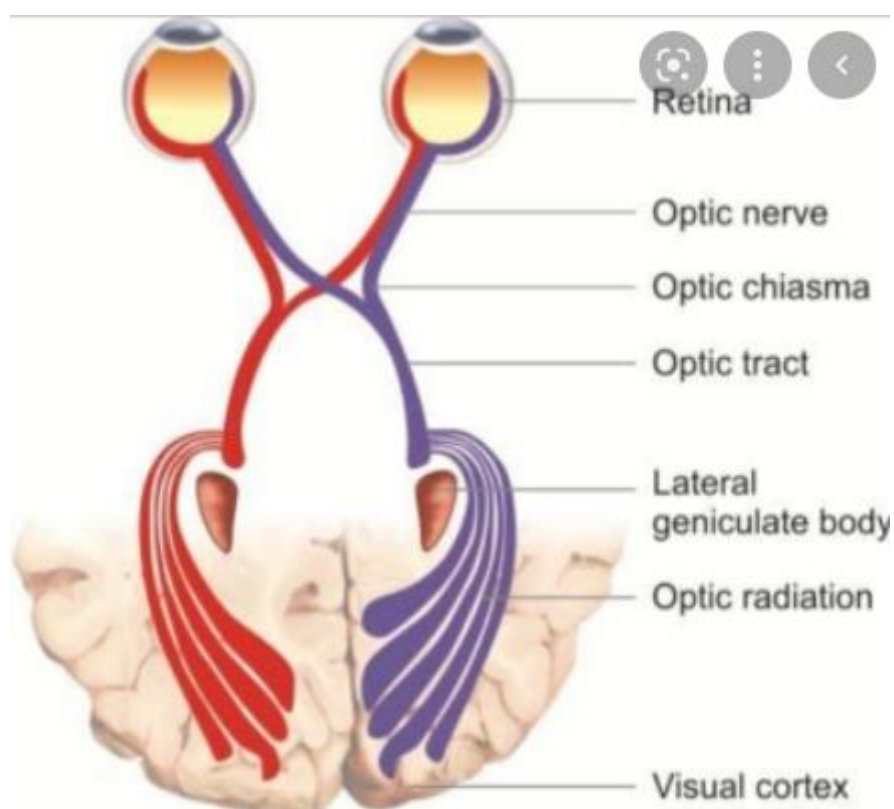
Visual Pathway :

The visual pathway describes the anatomical pathway by which electrical signals generated by the retina are sent to the brain .

The visual pathway refers to the anatomical structures responsible for the transformation of light energy into electrical action potentials that can be converted by the brain .

Components of visual pathway : The visual pathway begins at the retina consist of :

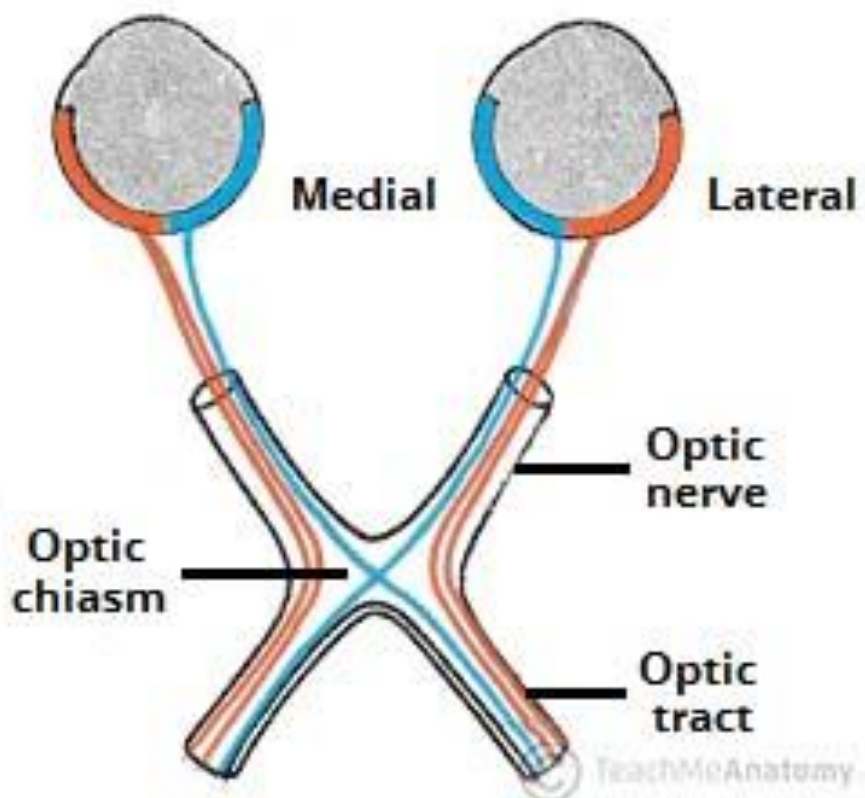
- 1- Two optic nerves .
- 2- An optic ic tracts .
- 3- Two lateral geniculate body .
- 4- Two optic radiations .
- 5- Visual cortex on each side .



Mechanism of Visual Pathway :

Within the middle cranial , the optic nerves from each eye unite to form the optic chiasm. At the chiasm, fibers from the nasal (medial) half of each retina cross over to the contralateral optic tract, while fibers from the temporal (lateral) halves remain ipsilateral :

- **Left optic tract** : contains fibers from the left temporal (lateral) retina, and the right nasal (medial) retina .
- **Right optic tract** : contains fibers from the right temporal retina, and the left nasal retina .



Each optic tract travels to its corresponding cerebral hemisphere to reach the lateral geniculate nucleus (LGN), a relay system located in the thalamus, the fibers synapse here .

Optic Radiation :

Axons from the lateral geniculate nucleus (LGN) then carry visual information via a pathway known as the optic radiation. The pathway itself can be divided into :

1- Upper optic radiation :

Carries fibers from the superior retinal quadrants . It travels through the parietal lobe to reach the visual cortex .

2- Lower optic radiation :

Carries fibers from the inferior retinal quadrants (corresponding to the superior visual field quadrants). It travels through the temporal lobe, via a pathway known as Meyers' loop, to reach the visual cortex .

