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18/MHS07/019

PHARMACOLOGY

PHS 212

Discuss the somatosensory pathways

SENSORY PATHWAYS

Nervous pathways of sensations are called the sensory pathways. These pathways carry the impulses from receptors in different parts of the body to centers in brain.

Sensory pathways are of two types:

1. Pathways of somatosensory system
2. Pathways of viscerosensory system.

Pathways of somatosensory system convey the information from sensory receptors in skin, skeletal muscles and joints. Pathways of this system are constituted by somatic nerve fibers called somatic afferent nerve fibers.

Pathways of viscerosensory system convey the information from receptors of the viscera. Pathways of this system are constituted by visceral or autonomic fibers.

Somatosensory Pathways

Each sensory pathway is constituted by two or three groups of neurons:

- i. First order neurons
- ii. Second order neurons
- iii. Third order neurons.

Pathways of some sensations like kinesthetic sensation have only first and second order neurons.

SENSORY FIBERS OF TRIGEMINAL NERVE

Trigeminal nerve carries somatosensory information from face, teeth, periodontal tissues (tissues around teeth), oral cavity, nasal cavity, cranial dura mater and major part of scalp to sensory cortex. It also conveys proprioceptive impulses from the extrinsic muscles of the eyeball.

Origin

Sensory fibers of trigeminal nerve arise from the trigeminal ganglion situated near temporal bone. Peripheral processes of neurons in this ganglion form three divisions of trigeminal nerve, namely ophthalmic, mandibular and maxillary divisions.

Central processes from neurons of trigeminal ganglion enter pons in the form of sensory root.

Termination

After reaching the pons, fibers of sensory root divide into two groups, namely descending fibers and ascending fibers. Descending fibers terminate on primary sensory nucleus and spinal nucleus of trigeminal nerve. Primary sensory nucleus is situated in pons. Spinal nucleus of trigeminal nerve is situated below the primary sensory nucleus and extends up to the upper segments of spinal cord.

Ascending fibers of sensory root terminate in the mesencephalic nucleus of trigeminal nerve, situated in brainstem above the level of primary sensory nucleus

Central Connections

Majority of fibers from the primary sensory nucleus and spinal nucleus of trigeminal nerve ascend in the form of trigeminal lemniscus and terminate in ventral posteromedial nucleus of thalamus in the opposite side. Remaining fibers from these two nuclei terminate on the thalamic nucleus of

same side. From thalamus, the fibers pass via superior thalamic radiation and reach the somatosensory areas of cerebral cortex.

Primary sensory nucleus and spinal nucleus of trigeminal nerve relay the sensations of touch, pressure, pain and temperature from the regions mentioned above.

Fibers from mesencephalic nucleus form the trigeminocerebellar tract that enters spinocerebellum via the superior cerebellar peduncle of the same side. This nucleus conveys proprioceptive impulses from facial muscles, muscles of mastication and ocular muscles.

LEMNISCUS

Lemniscus or fillet is the prominent bundle of sensory nerves in brain.

Lemniscus is of four types:

1. Spinal lemniscus formed by spinothalamic tracts in medulla oblongata
2. Lateral lemniscus formed by the fibers carrying sensation of hearing from cochlear nuclei to inferior colliculus and medial geniculate body
3. Medial lemniscus formed by fibers arising from nucleus cuneatus and nucleus gracilis
4. Trigeminal lemniscus formed by fibers from sensory nuclei of trigeminal nerve. This lemniscus carries general senses from head, neck, face, mouth, eyeballs and ears.