

CNS Block

*Anatomy Team-430*



*3rd lecture*

*\*Sensory Or Ascending Tract\**

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\***Grey matter** of the spinal cord is completely surrounded by **white matter**, which consists of :

1-**Ascending Nerve Fibers.**

2-**Descending Nerve Fibers.**

→ The **White Matter** is Divided into:

1-*Dorsal Column* (Funiculus).

2-*Lateral Column* (Funiculus).

3- *Ventral Column* (Funiculus) .

☆ *white matter tracts:-*

- They are Bundles or fasciculi of fibers that occupy more or less definite positions in the white matter.
- They have the same **Origin, Termination** and carry the same **Function**.
- They serve to join the **brain** to the **spinal cord**.

★ They are classified into:

\*Short Tracts

(intersegmental):.

- Fibers that interconnect adjacent or distant segments of the spinal cord.
- They lie close to the grey matter.

\*Long Tracts:-

-Divided into :

- 1-Ascending(**sensory or afferent**).
- 2-Descending(**motor or efferent**).

★Ascending Tracts;

- Carry impulses from pain, thermal, tactile, muscle and joint receptors to the brain.
- Some of this information eventually reaches a **conscious level (the cerebral cortex)**, while some is destined for **subconscious level (e.g. the cerebellum)**.

*\*Ascending(sensory or afferent) Tracts;*

<u>*Tract*</u>	<u>*Function*</u>	<u>*1<sup>st</sup> Order Neuron*</u>	<u>*2<sup>nd</sup> Order Neuron*</u>	<u>*3<sup>rd</sup> Order Neuron*</u>	<u>*consci ous Or Sub-consci ous*</u>
<i>Dorsal column tracts</i>	<p><b>-Proprioceptive</b> (deep sensations), (sense of movement, position, vibration)</p> <p><b>-Fine touch</b> sensations of (tactile localization, discrimination &amp; stereognosis).</p>	dorsal root ganglion	<p>-spinal grey matter.</p> <p>-Or medulla oblongata of the brain stem in (<b>Nucleus Gracilis and nucleus Cuneatus</b>).</p>	<p><b>-the ventral posterior (VP) nucleus</b> of the thalamus</p>	- Consci ous
<i>Lateral spino thalamic tracts</i>	<b>pain and temperature</b> sensations.	Small cells in the dorsal root ganglia	<b>-Cells of substantia gelatinosa</b> in the posterior horn.	<b>-Cells of (VP) nucleus</b> of the thalamus	Consci ous

<i>ventral spinothalamic tracts</i>	<b>crude touch and pressure.</b>	Medium sized cells in the dorsal root ganglia	<b>nucleus proprius.</b>	<b>Cells of (VP) nucleus of the thalamus</b>	Conscious
<i>Dorsal (Direct) + ventral(in direct) spino cerebellar tracts</i>	control of <b>posture &amp; coordination</b> of movement.	Large cells of dorsal root ganglia.	cells of the <b>nucleus dorsalis (Clark's nucleus).</b>	————	Sub - Conscious
<i>Spino Olivary Tracts</i>	- Project to <b>accessory olivary nuclei</b> and cerebellum. - Contribute to movement coordination associated primarily with <b>balance</b> .				
<i>Spinotectal Tracts</i>	-Project to <b>superior colliculi</b> of midbrain. -Involved in reflexive <b>turning of the head and eyes toward a point of cutaneous stimulation</b> .				
<i>Spino reticular Tracts</i>	-Involved in <b>arousing consciousness</b> in the reticular activating system through cutaneous stimulation.				

# ★General Notes★

## \* Dorsal column tracts

- The dorsal column contains the axons of the neurons that have entered the cord through the dorsal roots of spinal nerves.
- Fibers of **Fasciculus Gracilis** enter via the **sacral, lumbar and lower thoracic** levels; (**lower limbs**).
- Fibers of **Fasciculus Cuneatus** enter via the **upper thoracic and cervical** levels; (**upper limbs**).

## \* Dorsal column tracts Pathway:

- 1- The first-order neurone or primary afferent neurone) enters the spinal cord through the dorsal root of a spinal nerve and its cell body lies in the **dorsal root ganglion**.
- 2- The main fiber remains on the **ipsilateral** side of the cord and terminates in synaptic contact with the second neurone either in the spinal grey matter or in the medulla oblongata of the brain stem.
- 3- **The second order neuron** has its cell body in the cord or medulla oblongata → axon crosses over (decussates) in the medulla as **internal arcuate fibers (sensory decussation)** → then it

ascends to the opposite side of brain stem as **medial lemniscus** to the thalamus, where it terminates upon the third neuron and run in the **internal capsule** to the somatosensory cortex of the parietal lobe of the cerebral hemisphere.

\*Lateral spinothalamic tract:-

-After leaving the parent cell bodies(2<sup>nd</sup> order neuron ) spinothalamic axons **decussate** to the opposite side of the cord by passing through the **ventral white commissure** .

—→ **Lesion:- Syringomyelia** (widening of the central canal) leads to Loss of **pain & temperature** below the level of the lesion.

\*ventral spinothalamic tract:-

—→ **Lesion :-** Loss of **crude touch** sensation below the level of the lesion.

\* Spinocerebellar tract:-

-Fibres of spinocerebellar tracts form dorsal and ventral tracts that are located at the **dorsolateral** & **ventrolateral** surfaces of the cord, respectively.

-Both tracts carry information derived from **muscle spindles**, **Golgi tendon organs** and **tactile receptors**.



\* Dorsal ( Direct ) Spinocerebellar tract:-

-The axons ascend **ipsilaterally** to enter the cerebellum through the **inferior cerebellar peduncle**.

\*Ventral ( Indirect ) Spinocerebellar tract:-

-spinocerebellar tract **decussate**, ascend on the **contralateral** side of the cord and enter the cerebellum via the **Superior cerebellar peduncle**.

-Some axons then recross within the cerebellar white matter.

★ Good Luck ★