Anterolateral spinothalmic tract of spinal cord (Ascending tract 2)

By

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ASCENDING TRACTS

Lat. spinothalamic

Ant. spinothalamic

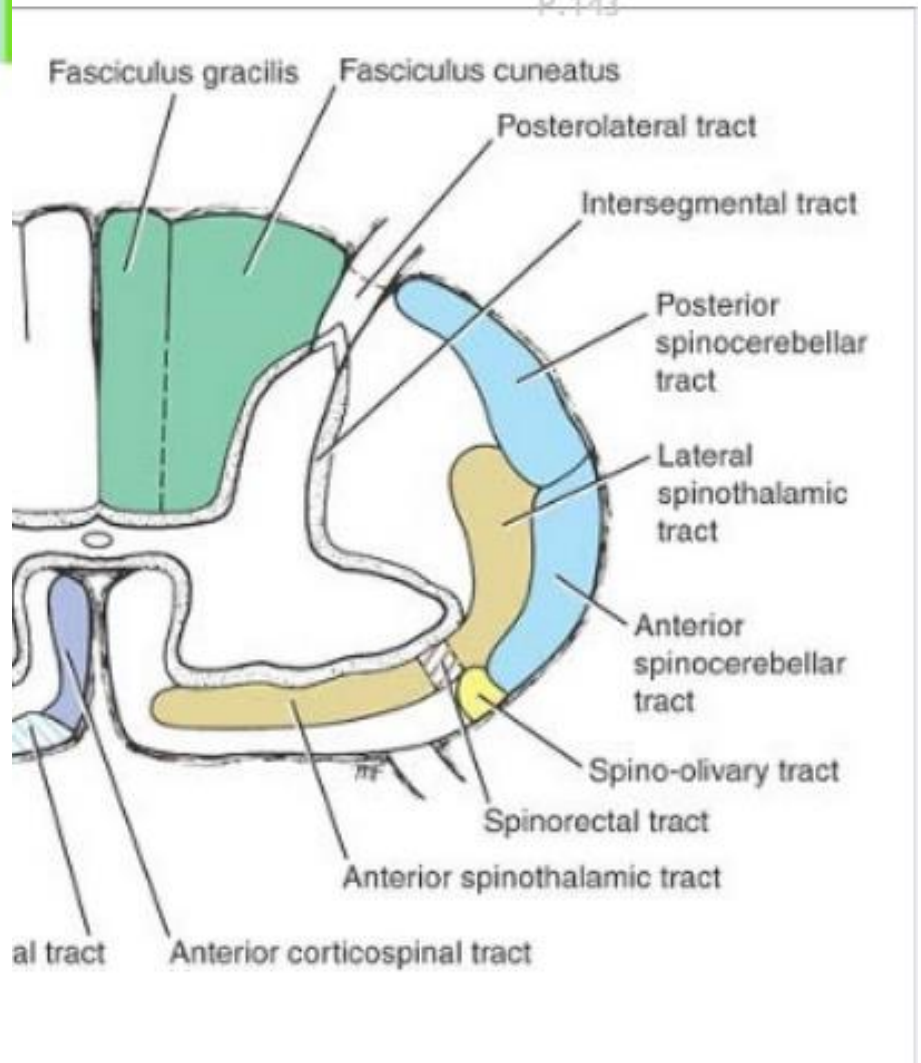
Fasciculi gracilis & cuneatus

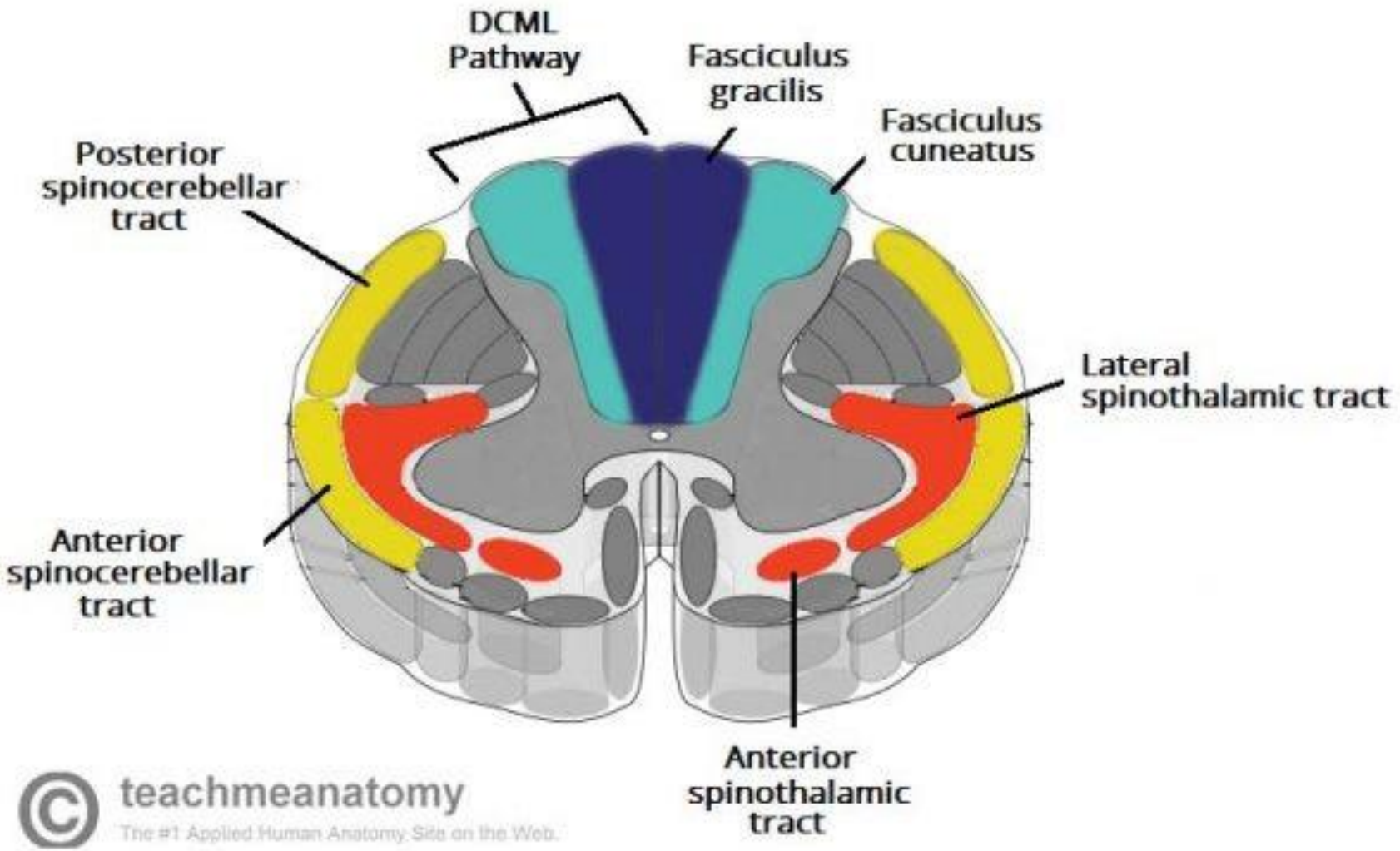
Ant. & Post. Spinocerebellar

Spinotectal

spinoreticular

Spino-olivary




DCML
Pathway
Fasciculus
gracilis
Fasciculus
cuneatus
Posterior
spinocerebellar
tract
Lateral
spinothalamic tract
Anterior
spinocerebellar
tract
Anterior
spinothalamic
tract
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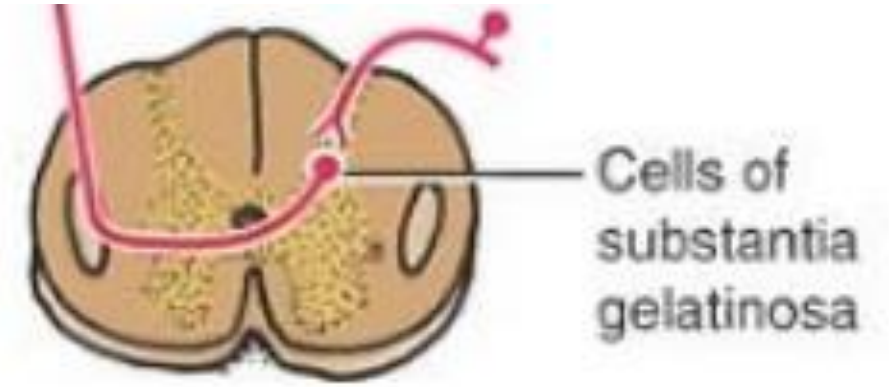
Pain and Temperature Pathways

Lateral Spinothalamic Tract

- Pain and thermal receptors in the skin and other tissues are free nerve endings.
- The pain impulses are transmitted to the spinal cord in fast conducting delta A-type fibers
- And slow-conducting C-type fibers.
- The fast-conducting fibers alert the individual to initial sharp pain,
- And the slow-conducting fibers are responsible for prolonged burning, aching pain.
- The sensations of heat and cold also travel by delta A and C fibers.

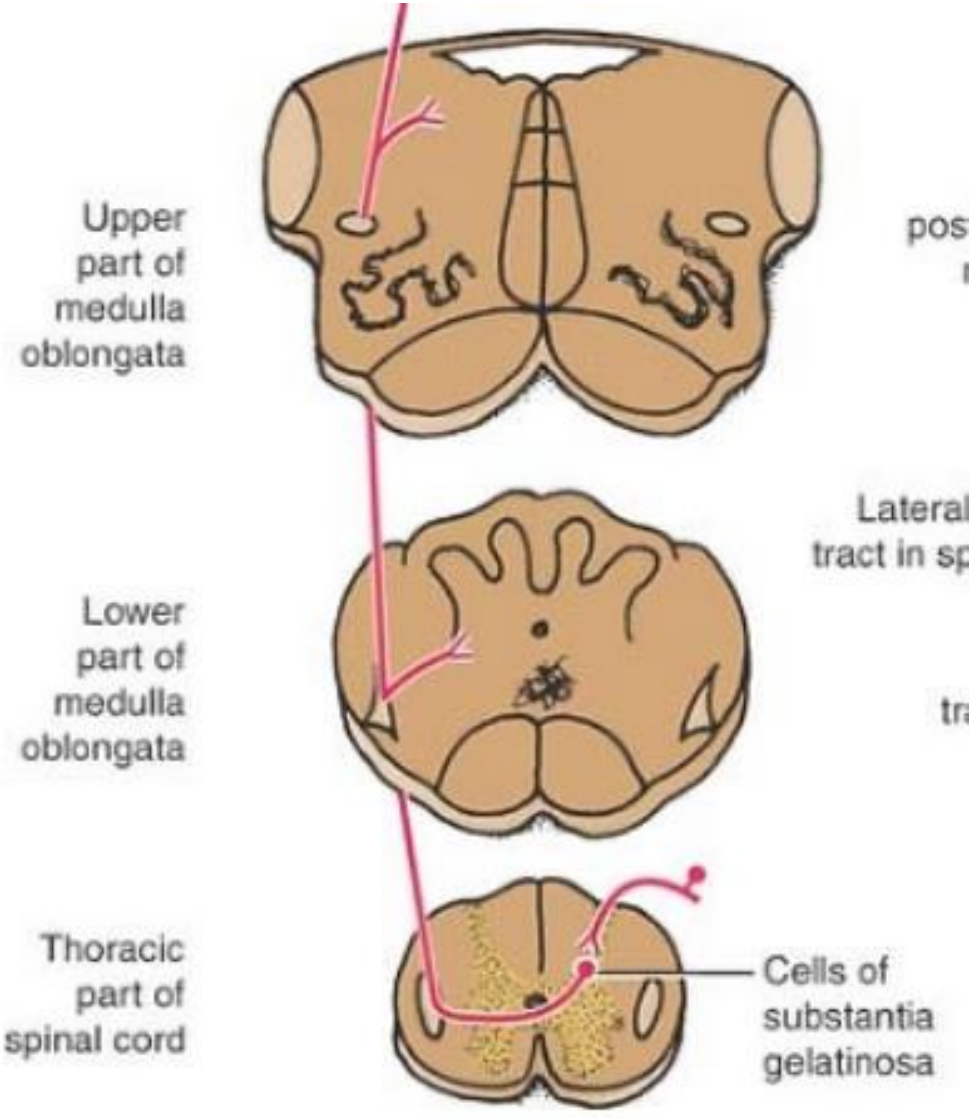
Pain and Temperature Pathway lateral spinothalamic tract

- The axons entering the spinal cord from the posterior root ganglion proceed to the tip of the posterior gray column
- Divide into ascending and descending branches .
- These branches travel for a distance of one or two segments of the spinal cord
- And form the posterolateral tract of Lissauer .
- These fibers of the first-order neuron terminate by synapsing with cells in the posterior gray column,
- Including cells in the substantia gelatinosa. Substance P, a peptide, is thought to be the neurotransmitter at these synapses.



lateral spinothalamic tract

- Axons of the second-order neurons
- Now cross obliquely to the opposite side in the anterior gray and white commissures within one spinal segment of the cord
- Ascending in the contralateral white column
- As the lateral spinothalamic tract .

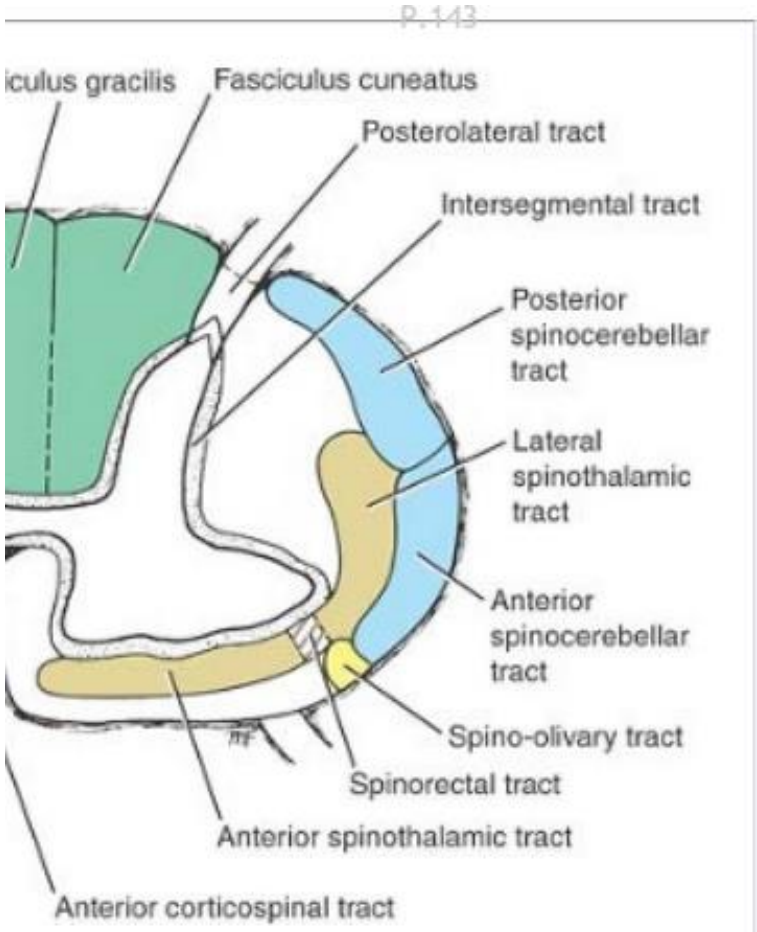


lateral spinothalamic tract

- Lies medial to the anterior spinocerebellar tract.
- As this tract ascends through the spinal cord
- New fibers are added to the anteromedial aspect of the tract.

❖ At Upper cervical segments of the Cord

- Sacral fibers are lateral
- Cervical segments are medial.

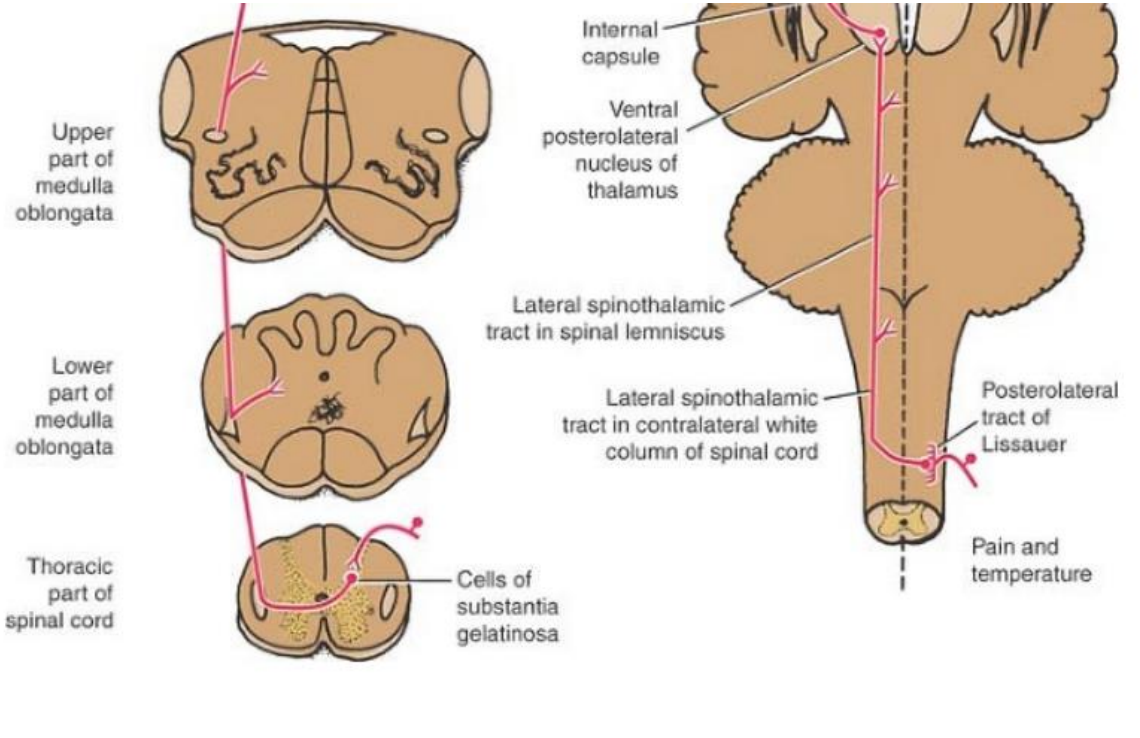


lateral Spinothalamic Tract

- As this tract ascends through the medulla oblongata.

Lies near the lateral surface of medulla oblongata

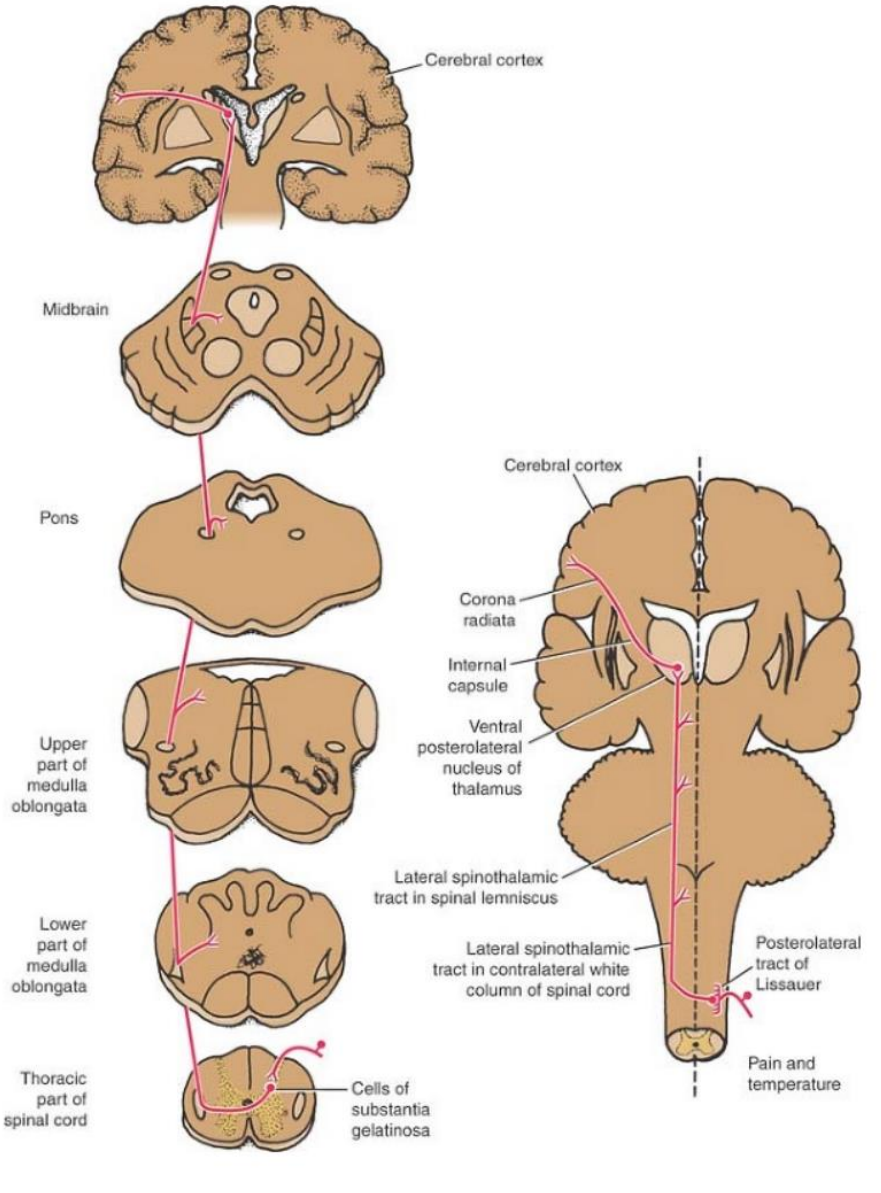
- B/W the inferior olivary nucleus
- And the nucleus of the spinal tract of the trigeminal nerve.
- Togather with the anterior spinothalamic tract and spinotectal tract together they form the spinal lemniscus



Lateral Spinothalamic Tract

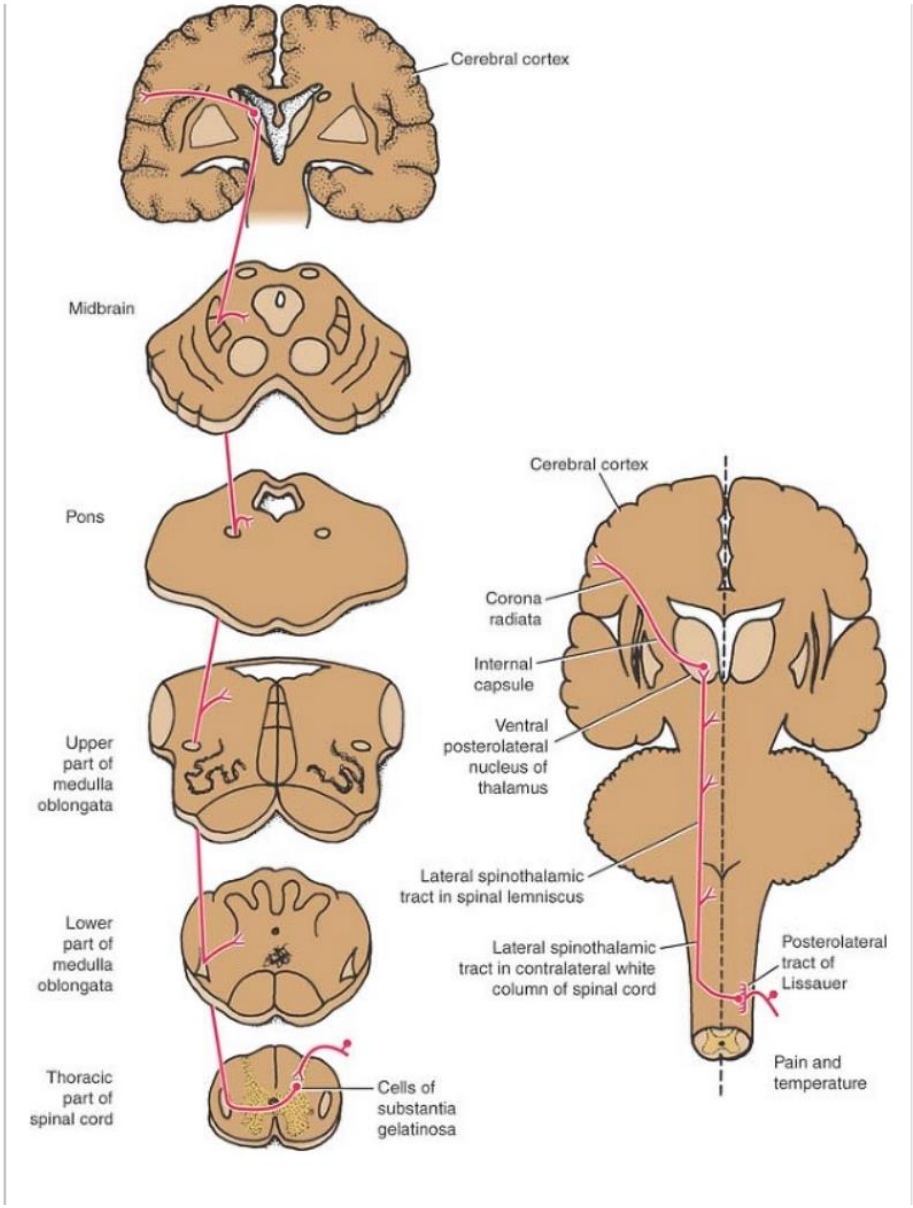
Spinal lemniscus

- Continues to ascend through the posterior part of the pons .
- In the midbrain, it lies in the tegmentum lateral to the medial lemniscus.
- This tract end by synapsing with the third-order neuron in the ventral posterolateral nucleus of the thalamus .
- It is believed that here crude pain and temperature sensations are appreciated and emotional reactions are initiated.



Lateral Spinothalamic Tract

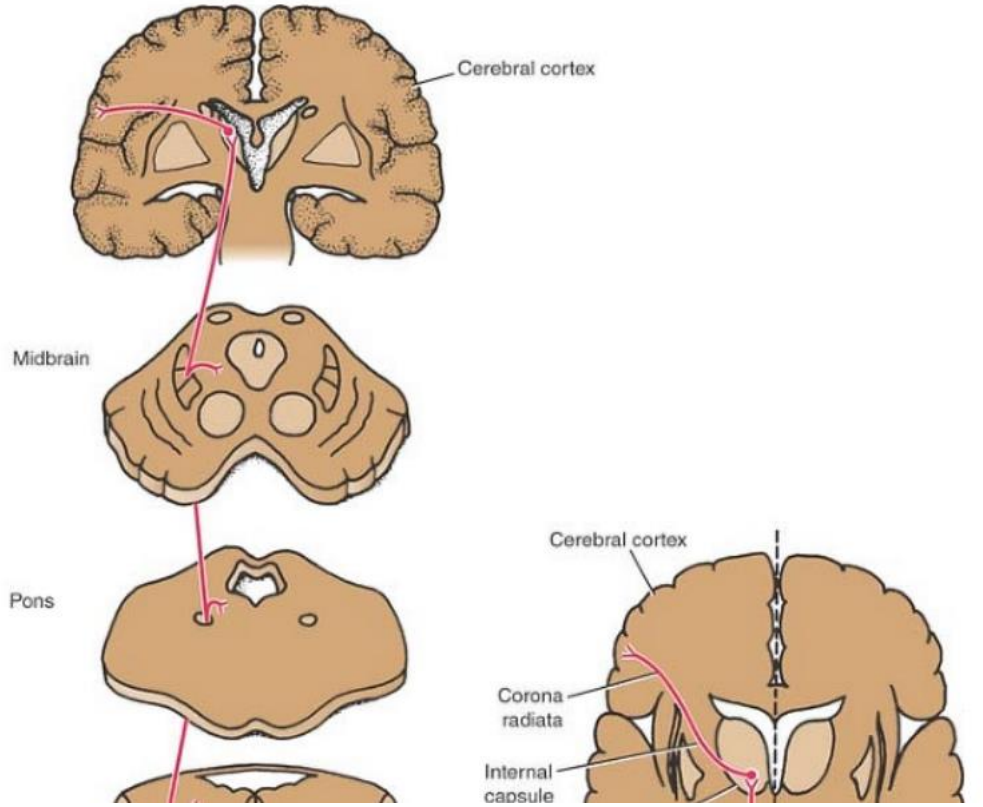
- Axons of the third-order neurons in the ventral posterolateral nucleus of the thalamus
- Now pass through the posterior limb of the internal capsule
- And the corona radiata to reach the somesthetic area in the postcentral gyrus of the cerebral cortex.



Lateral Spinothalamic Tract

The information is transmitted to other regions of the cerebral cortex to be used by motor areas and the parietal association area.

The role of the cerebral cortex is interpreting the quality of the sensory information at the level of consciousness.



Other Terminations of the Lateral Spinothalamic Tract

- Fast pain impulses travel directly up to the ventral posterolateral nucleus of the thalamus and are then relayed to the cerebral cortex.
- Slow pain fibers terminate in the reticular formation
- which then activates the entire nervous system.
- It is in the lower areas of the brain that the individual becomes aware of the chronic, nauseous, suffering type of pain.

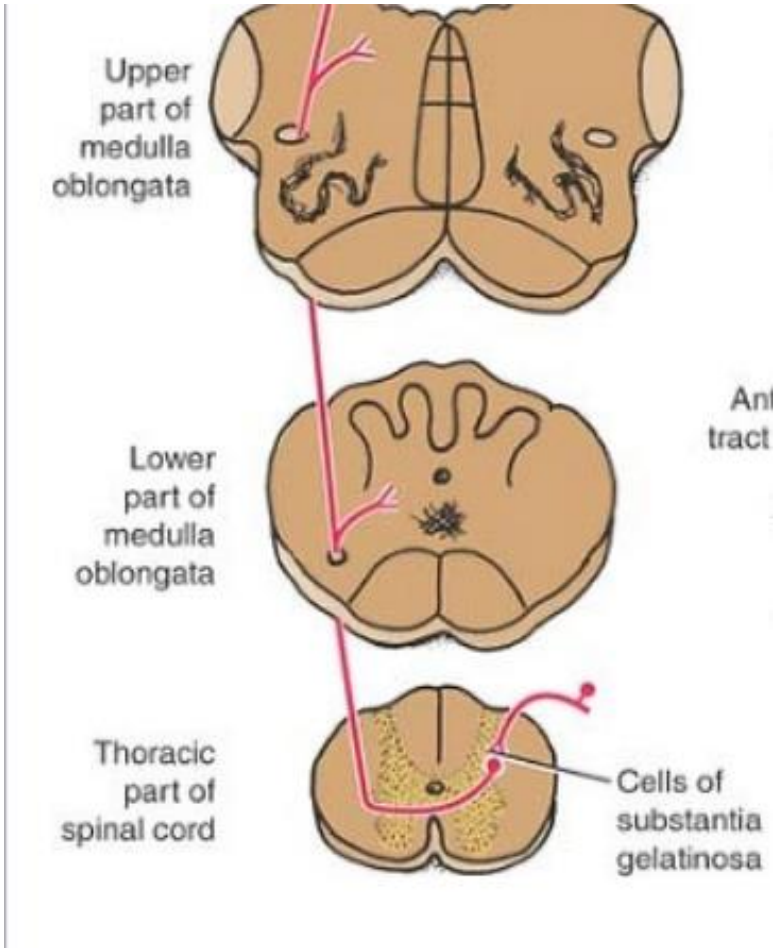
Light (Crude) Touch and Pressure Pathways

Anterior Spinothalamic Tract

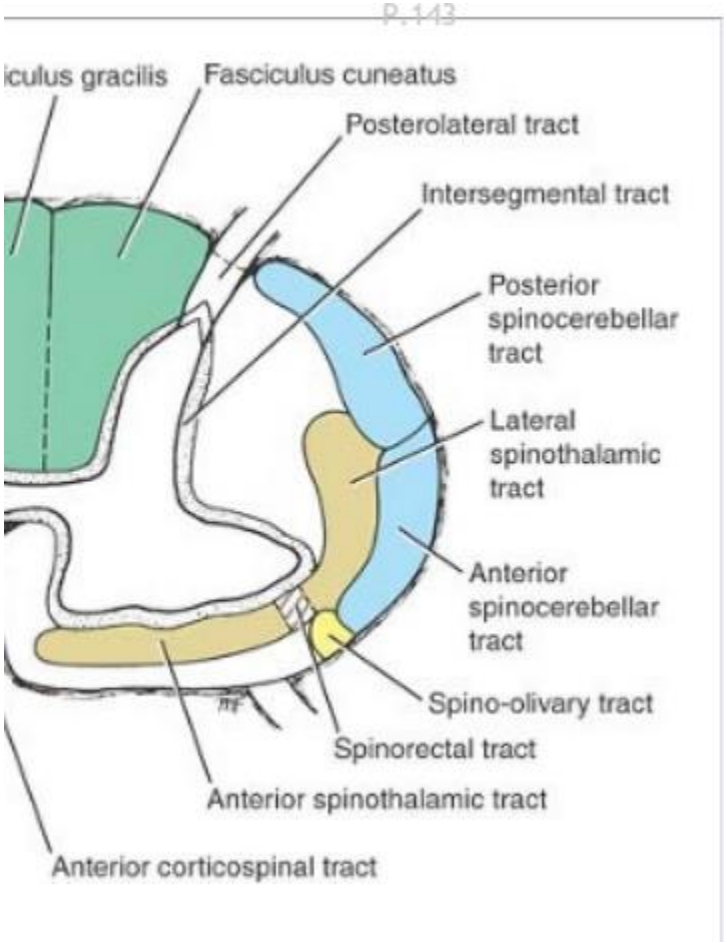
- The axons enter the spinal cord from the posterior root ganglion
- And proceed to the tip of the posterior gray column
- where they divide into ascending and descending branches .

These branches travel for a distance of one or two segments of the spinal cord

- Contributing to the posterolateral tract of Lissauer.
- It is believed that these fibers of the first-order neuron terminate by synapsing with cells in the substantia gelatinosa group in the posterior gray column .

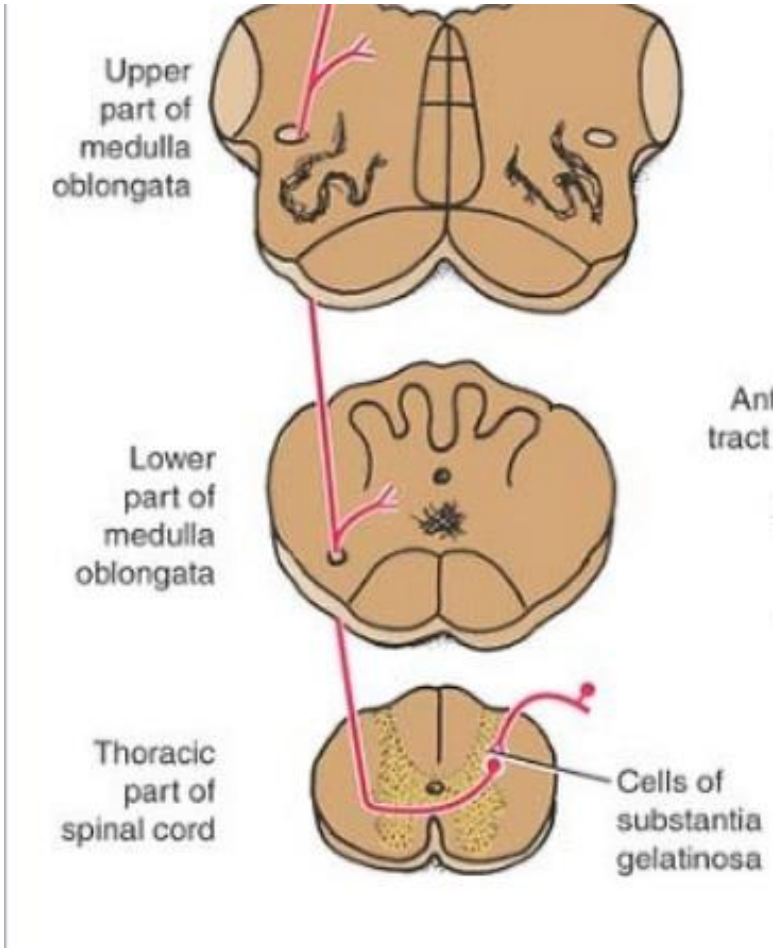


Anterior Spinothalamic Tract



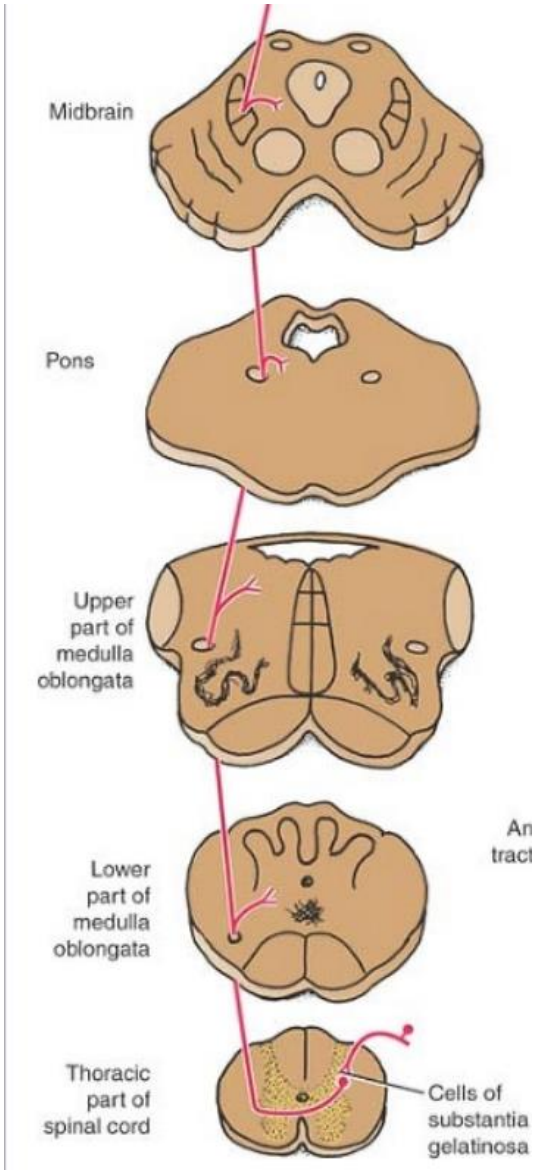
Anterior Spinothalamic Tract

- The axons of the second-order neuron now cross very obliquely to the opposite side in the anterior gray and white commissures within several spinal segments
- And ascend in the opposite anterolateral white column .
- As the anterior spinothalamic tract ascends through the spinal cord



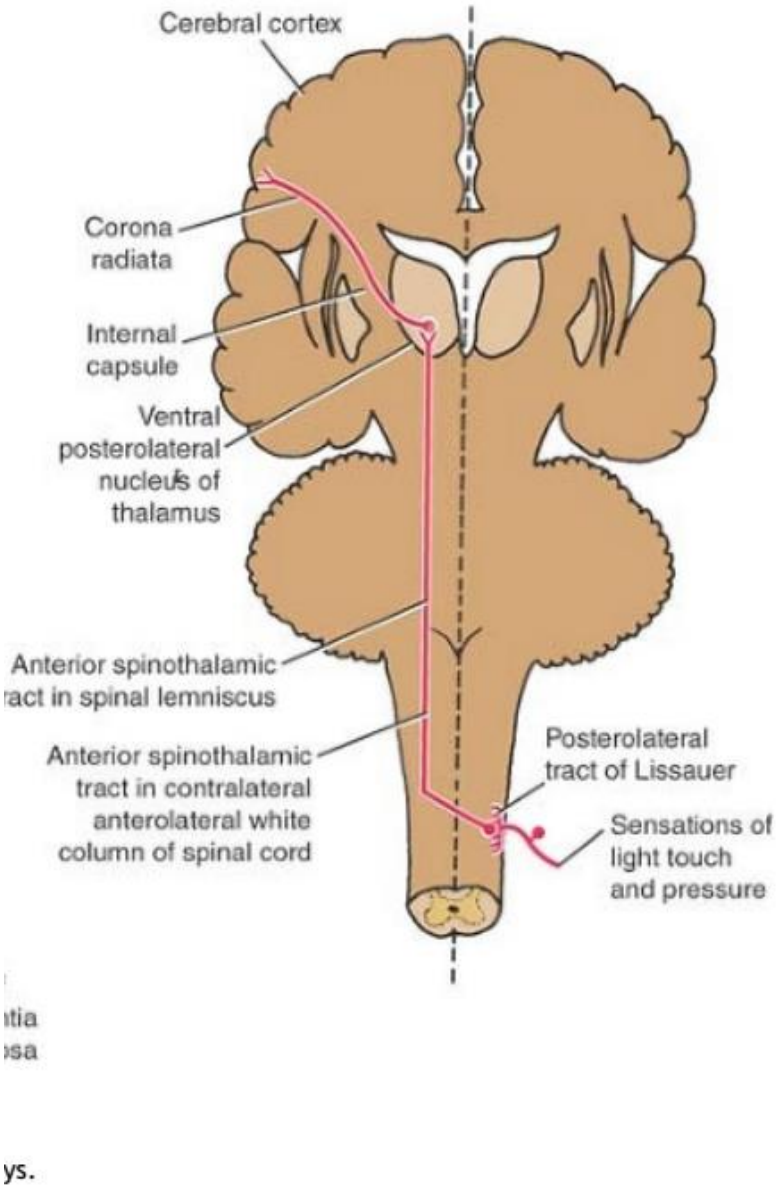
Anterior Spinothalamic Tract

- New fibers are Added to the medial aspect of the tract.
- Thus, in the upper cervical segments of the cord, the sacral fibers are mostly lateral
- And the cervical segments are mostly medial.



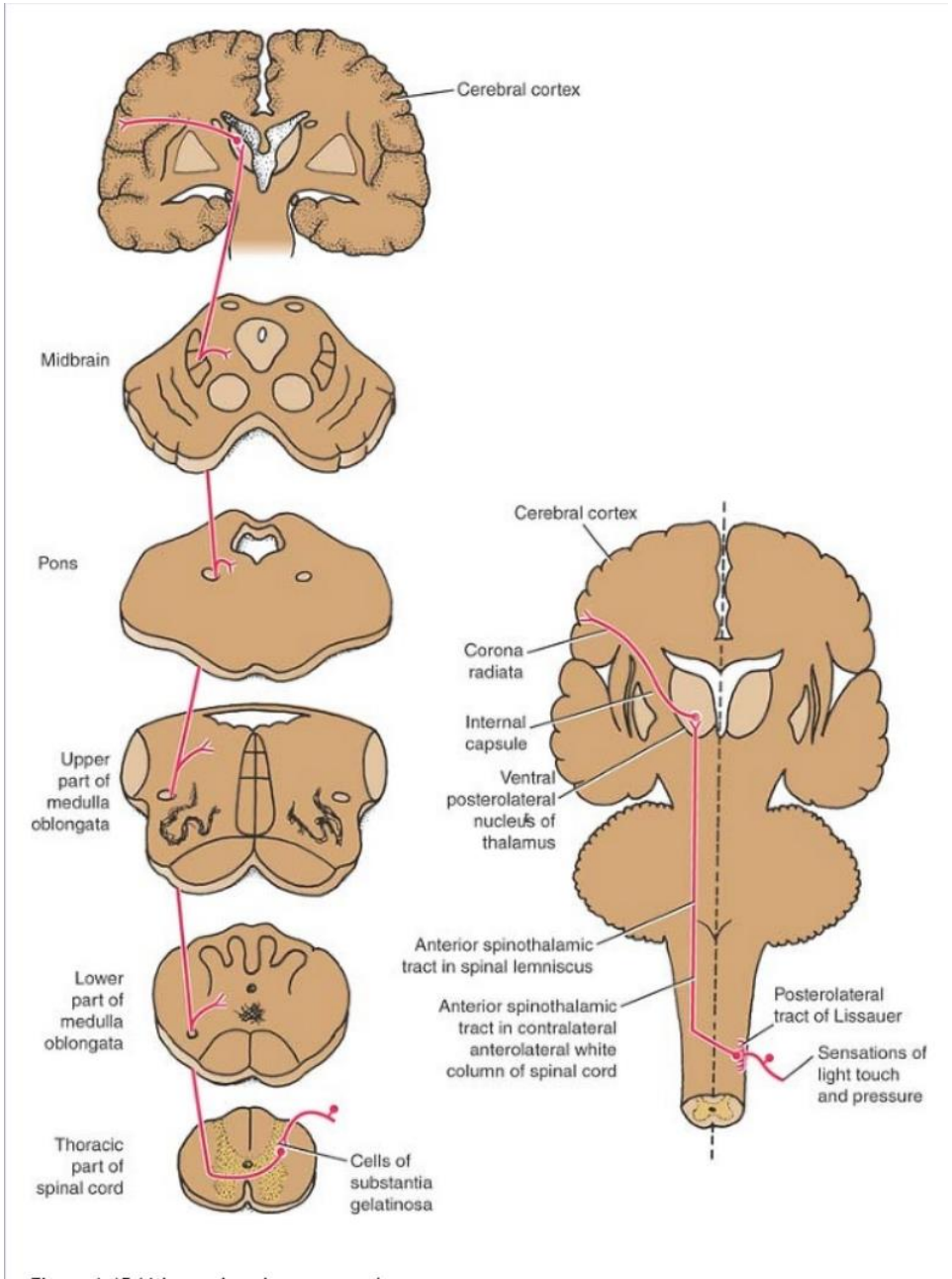
Anterior spinothalamic tract

- As it ascends through the medulla oblongata
- It accompanies the lateral spinothalamic tract
- And the spinotectal tract, all of which form the spinal lemniscus .



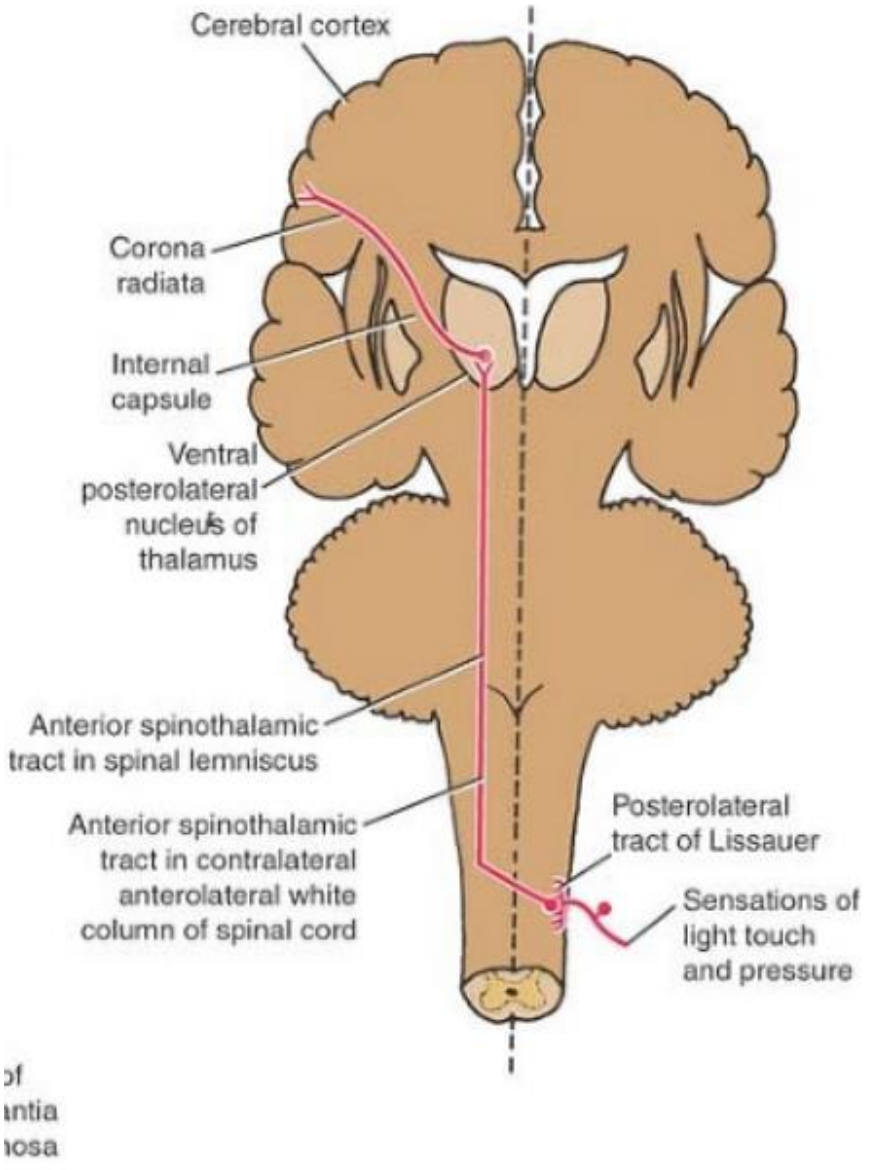
Anterior spinothalamic tract

- The spinal lemniscus continues to ascend through the posterior part of the pons
- And the tegmentum of the midbrain
- And the fibers of the anterior spinothalamic tract
  terminate by synapsing with the third-order neuron in the ventral posterolateral nucleus of the thalamus .
- Crude awareness of touch and pressure is believed to be appreciated here.



Anterior spinothalamic tract

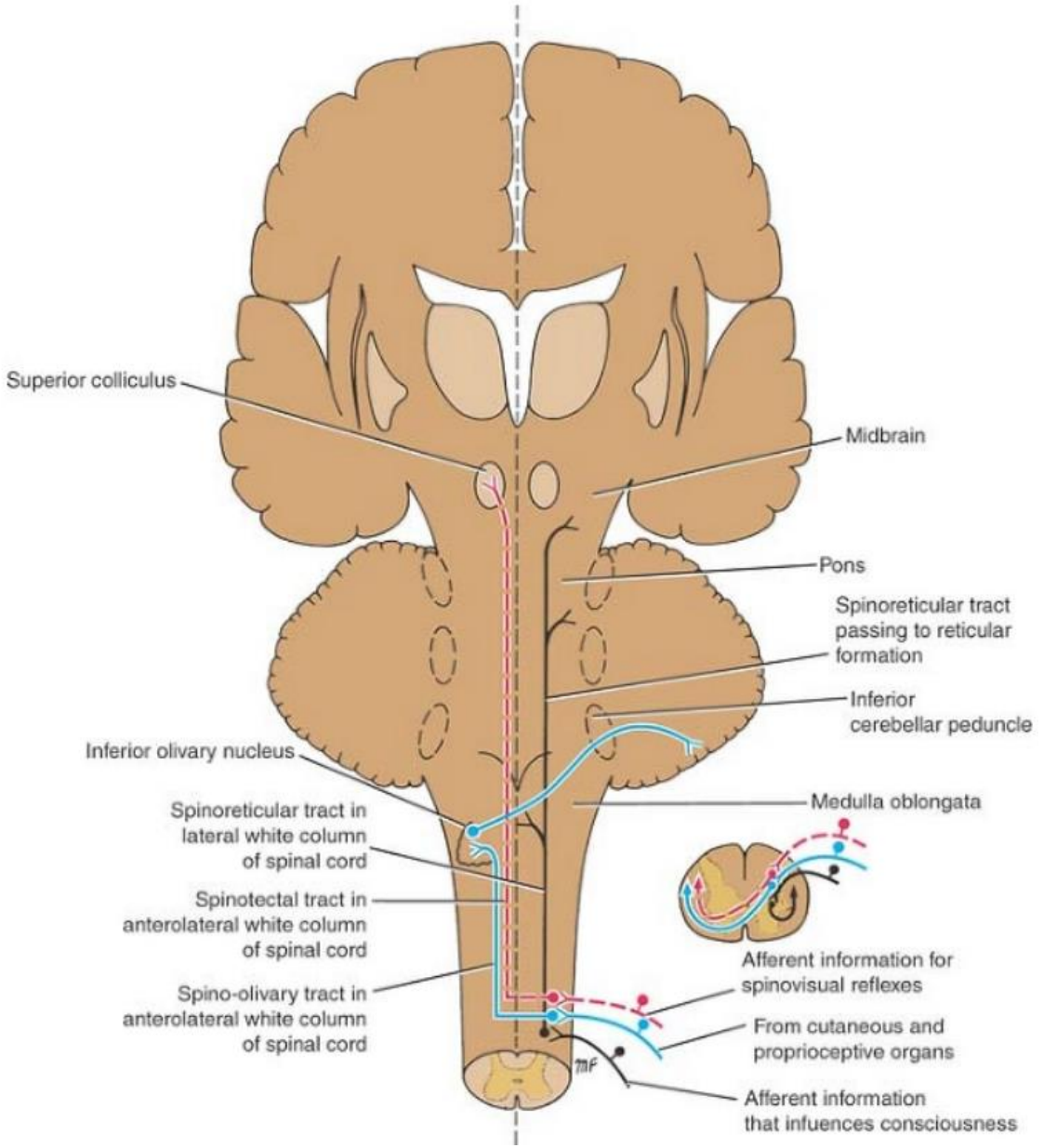
- Axons of the third-order neurons in the ventral posterolateral nucleus of the thalamus pass through the posterior limb of the internal capsule
- Corona radiata to reach the somesthetic area in the postcentral gyrus of the cerebral cortex.
- The contralateral half of the body is represented inverted, with the hand and mouth situated inferiorly



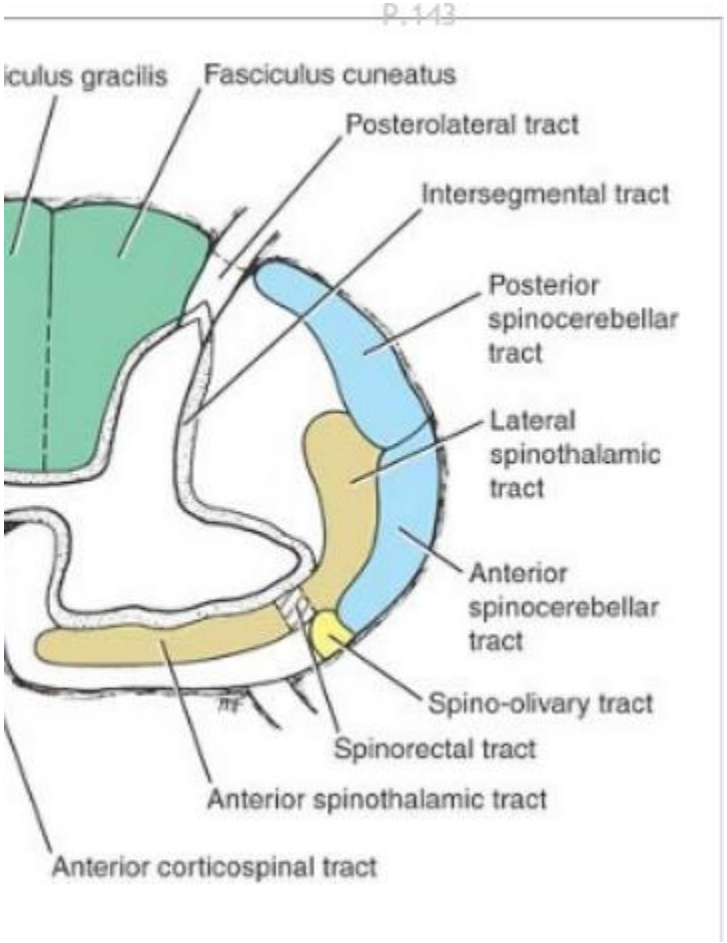
Spinotectal Tract

Axons enter the spinal cord from the posterior root ganglion and travel to the gray matter where they synapse on unknown second-order neurons .

- The axons of the second-order neurons cross the median plane
- Ascend as the spinotectal tract in the anterolateral white column lying close to the lateral spinothalamic tract.

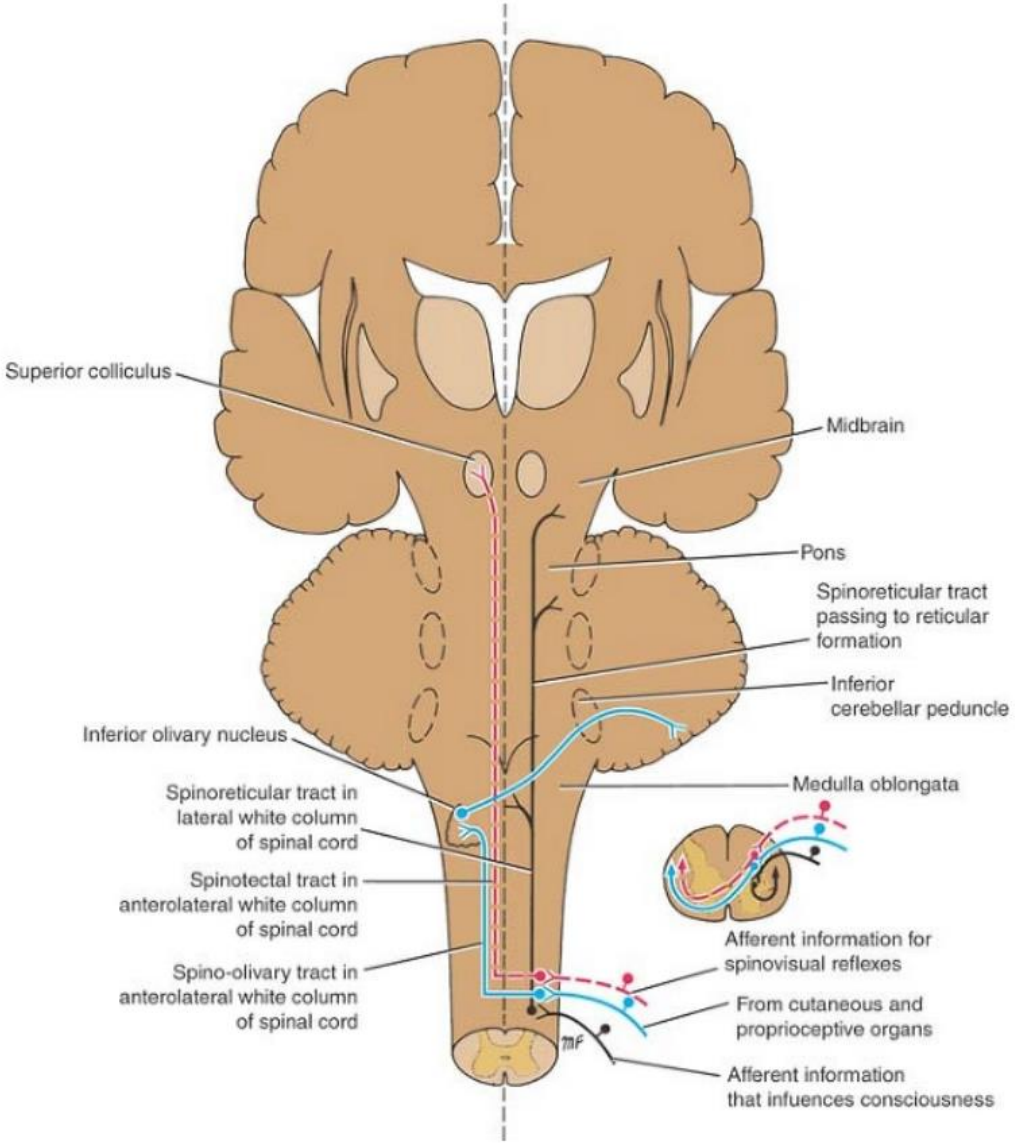


Other Ascending Pathways



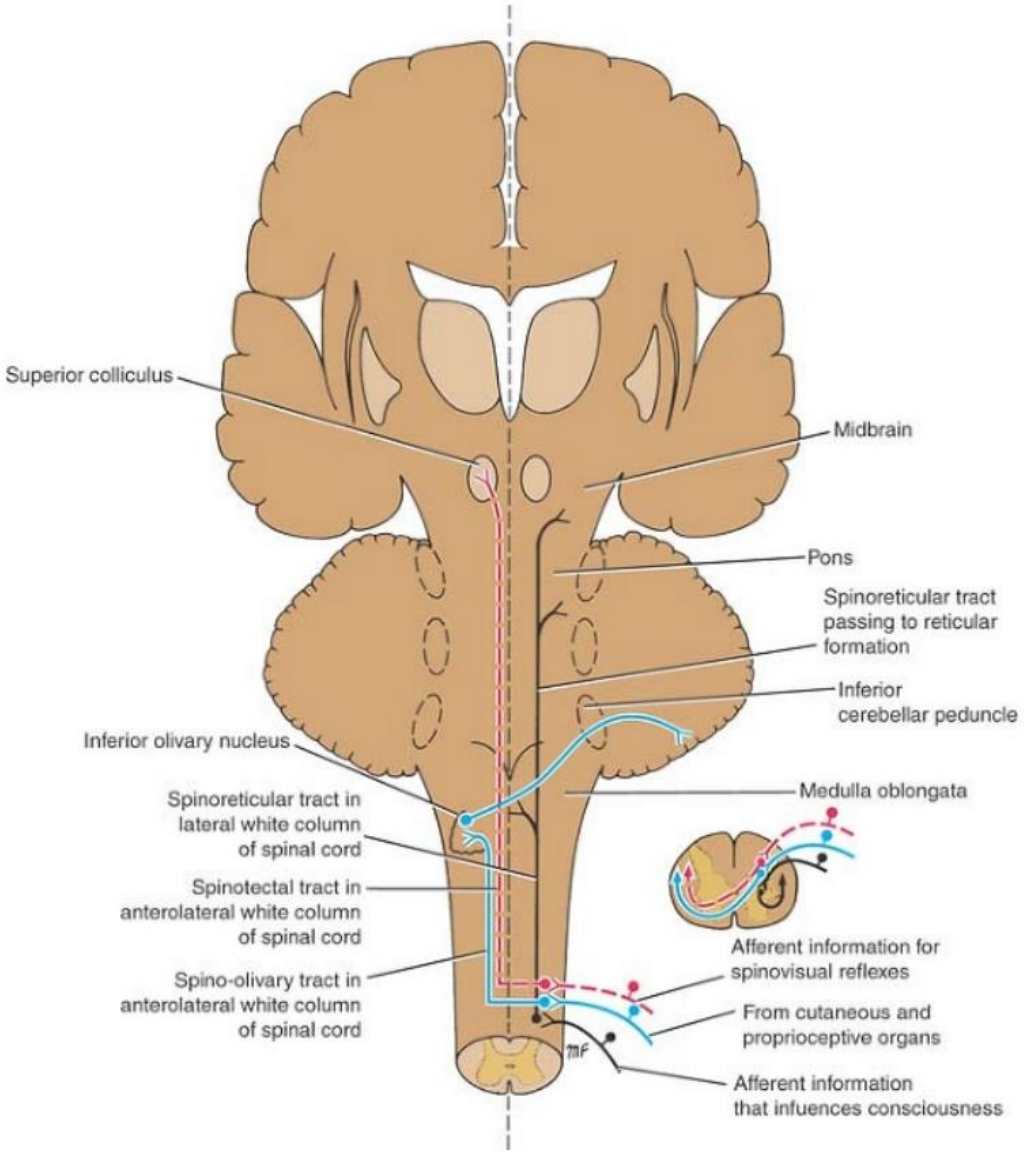
Spinotectal Tract

- After passing through the medulla oblongata and pons
- Terminate by synapsing with neurons in the superior colliculus of the midbrain.
- This pathway provides afferent information for spinovisual reflexes
- And brings about movements of the eyes and head toward the source of the stimulation.



Spinoreticular Tract

- Axons enter the spinal cord from the posterior root ganglion and terminate on unknown second-order neurons in the gray matter.
- Axons from these second-order neurons ascend the spinal cord as the spinoreticular tract in the lateral white column mixed with the lateral spinothalamic tract.

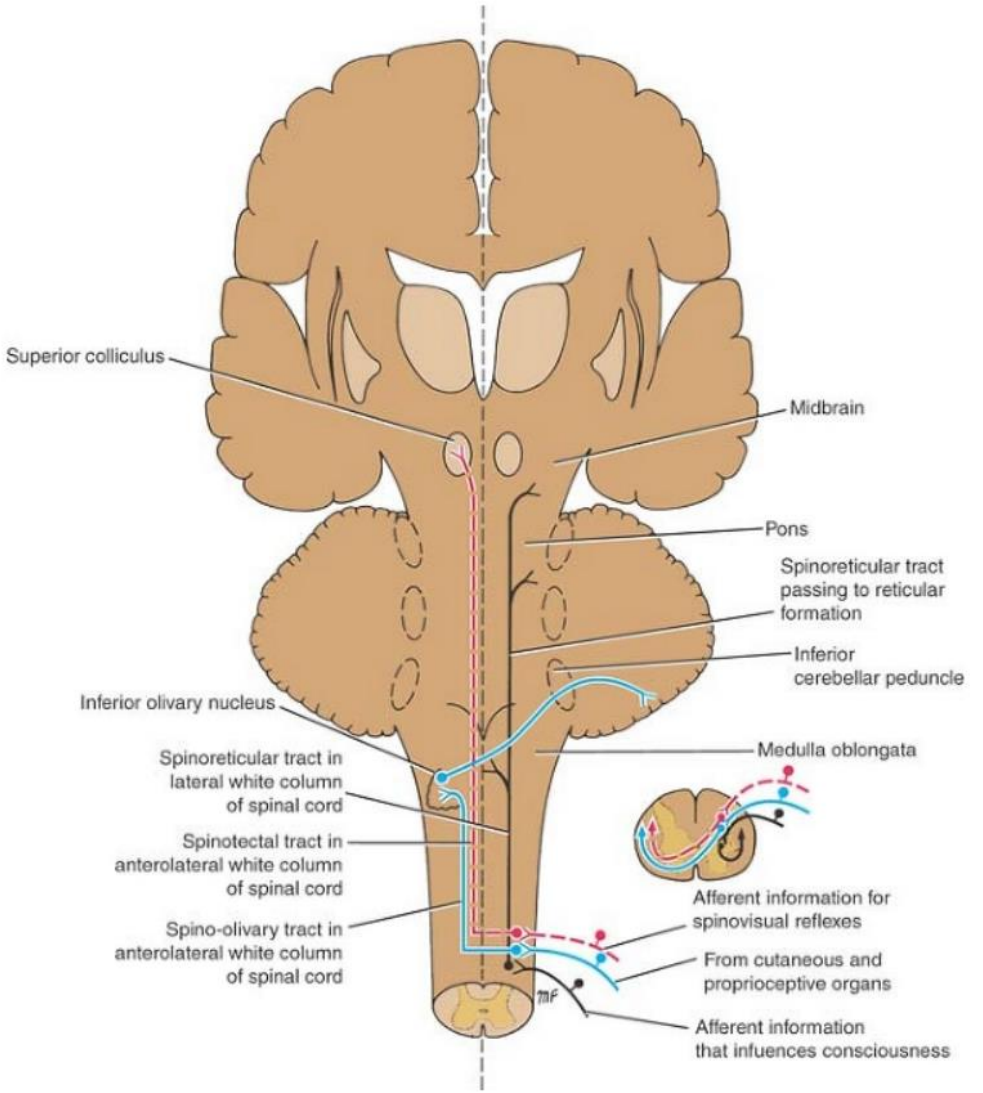


Spinoreticular Tract

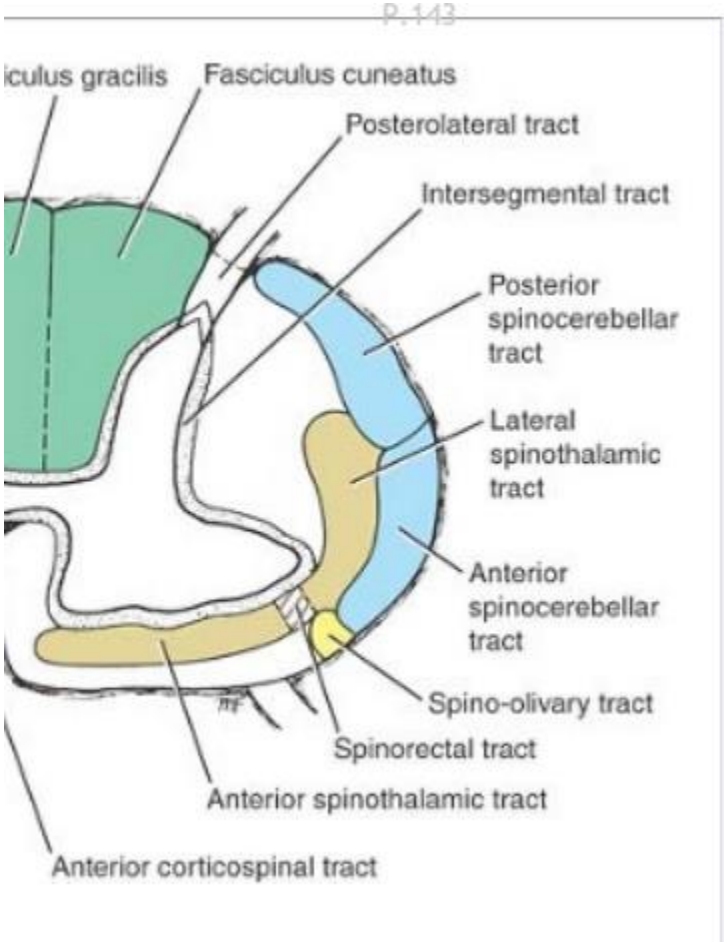
Fibers are uncrossed and terminate by synapsing with neurons of the reticular formation in the medulla oblongata, pons, and midbrain .

The spinoreticular tract provides an afferent pathway for the reticular formation

which plays an important role in influencing levels of consciousness.



Spino-Olivary Tract



Spino-olivary Tract

Axons enter the spinal cord from the posterior root ganglion and terminate on unknown second-order neurons in the posterior gray column

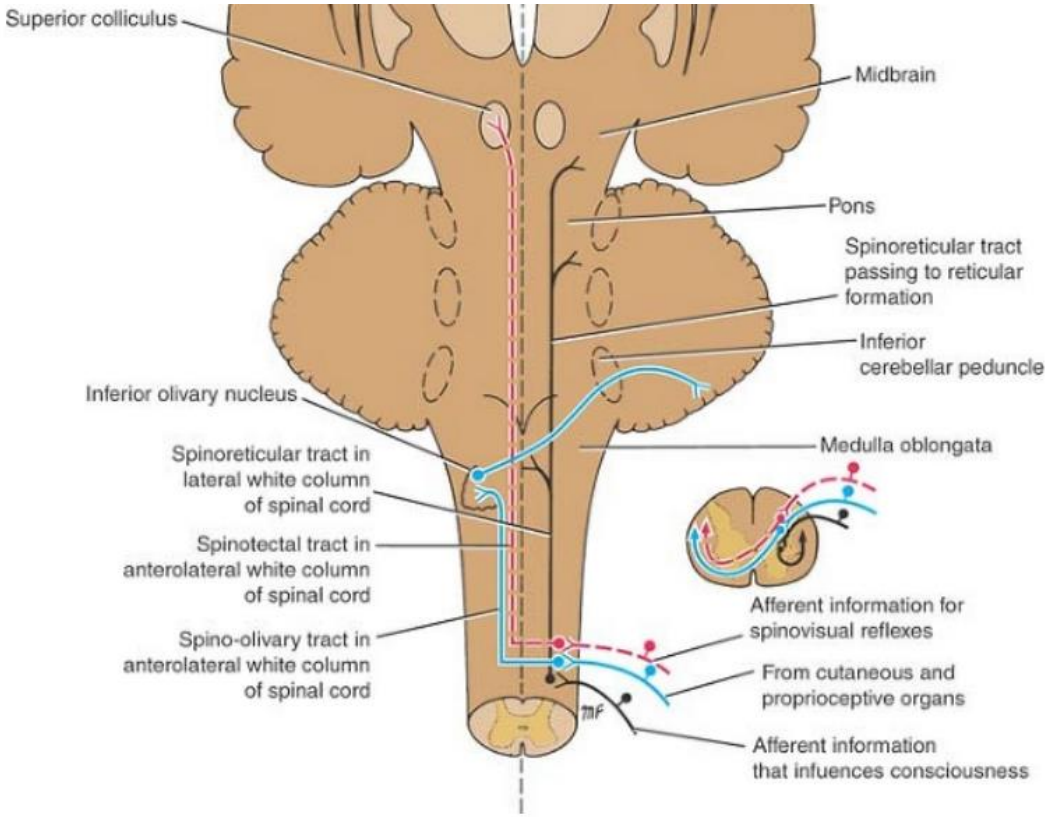
Second-order neurons cross the midline

And ascend as the spino-olivary tract in the white matter at the junction of the anterior and lateral columns.

The axons end by synapsing on third-order neurons in the inferior olivary nuclei in the medulla oblongata.

The axons of the third-order neurons cross the midline and enter the cerebellum through the inferior cerebellar peduncle.

The spino-olivary tract conveys information to the cerebellum from cutaneous and proprioceptive organs.



thank you!