Spinal cord

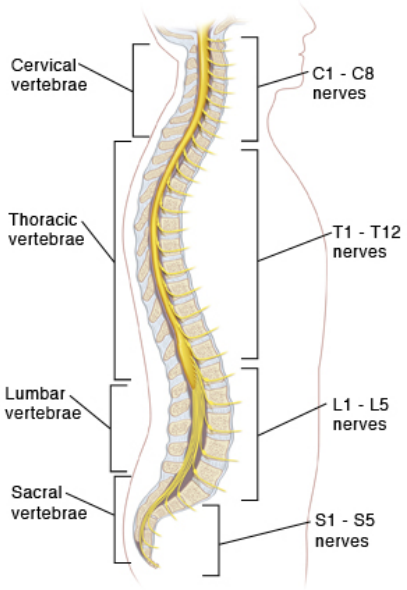
Part of the CNS extend from foramen magnum to the level of L1-L2 (it is shorter than the vertebral column) it is covered by spinal meninges. It is cylindrical in shape. It's lower end become tapered and called ***conus medullaris*** (at level of L1-L2).

We have extension of the pia mater below L1-L2 called ***filum terminale***

Along the length of the spinal cord we have 2 enlargements of : ***cervical enlargement*** (upper) >> it will give rise to the nerves that supply upper limb. and ***lumbar enlargements*** (lower) >> to supply lower limb.

We have 31 pairs of spinal nerves

- 8 in the neck > Cervical (C1-C8)
- 12 in the chest > Thoracic\Dorsal (T1-T12)
- 5 in The lower back > lumbar (L1-L5)
- 5 in the pelvis > sacral (S1-S5)
- 1 in the > coccygeal

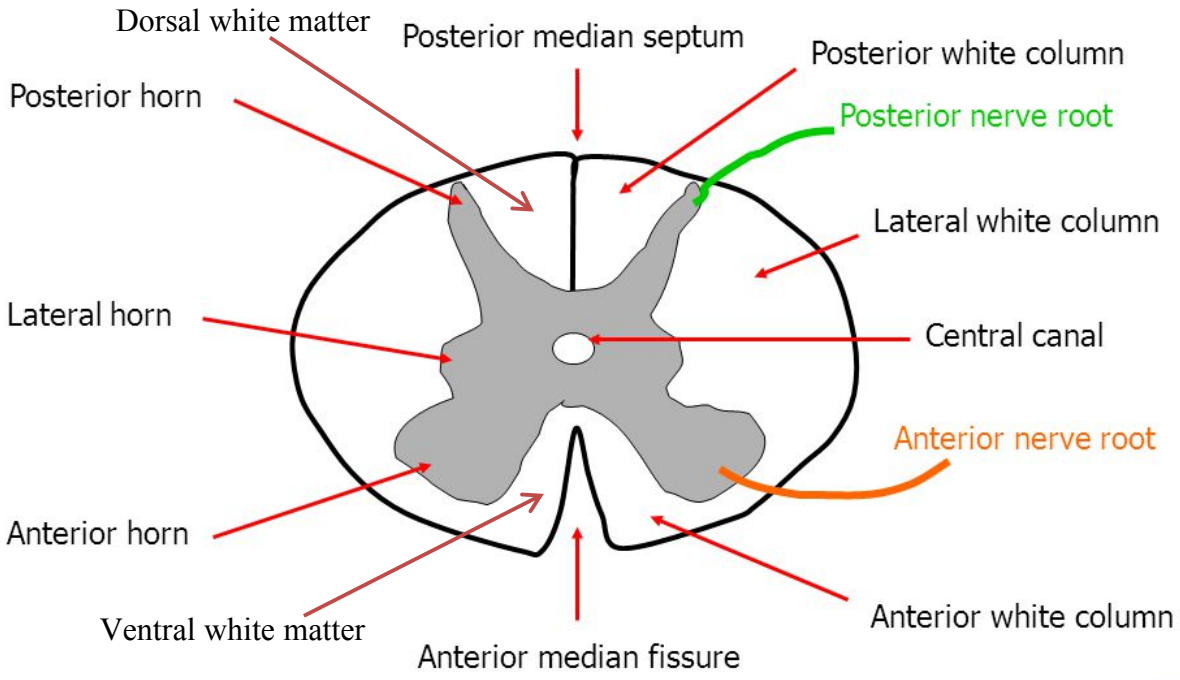


The lower spinal nerves they extend down in the spinal canal looks like tail of the horse and called ***cauda equina*** (extension of spinal nerves below the level of L1-L2).

If the spinal canal become narrow because of slipped disc (***Spinal canal stenosis)*** << the functions of the structures which are supplied by these nerves will be affected and that is known as ***cauda equina syndrome*** (compression of the spinal nerves).

BY :
M.Safwan Sultan

Structure of a spinal cord segment



the H shaped gray matter have R&L arms which are connected by ***gray commissures***.

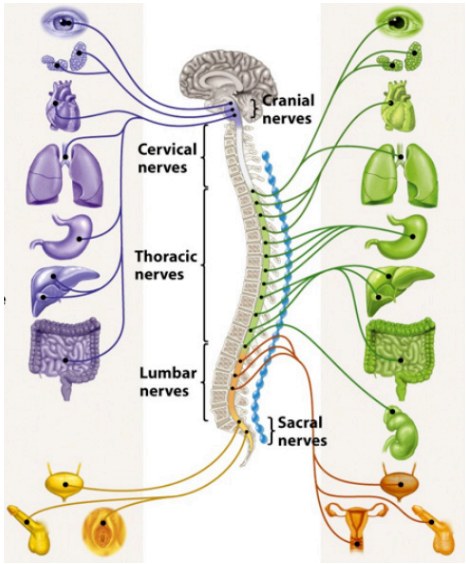
The central canal receives the CSF from the 4th ventricles.

Each arm of the gray matter have ***dorsal\posterior horn*** and ***ventral\anterior horn***. The cells which are found on the dorsal horn they are sensory neurons while the cells at ventral horn are motor neurons. So damage to the dorsal horn sensation will be affected and damage to the ventral horn motor part will be affected. ***Poliomyelitis*** is viral disease which affect the ventral horn.

In some parts of spinal cord (thoracic, lumbar &sacral) we might have extra horn called ***lateral horn*** which have neurons for autonomic nervous system.

The sympathatic nervous system originates from the thoracic and lumbar part of the spinal cord While the parasympathatic originates from the brain and the sacral part of the spinal cord.

The sympathatic is called ***thoracolumbar outflow*** and the parasympathaticis called ***craniosacral outflow***.



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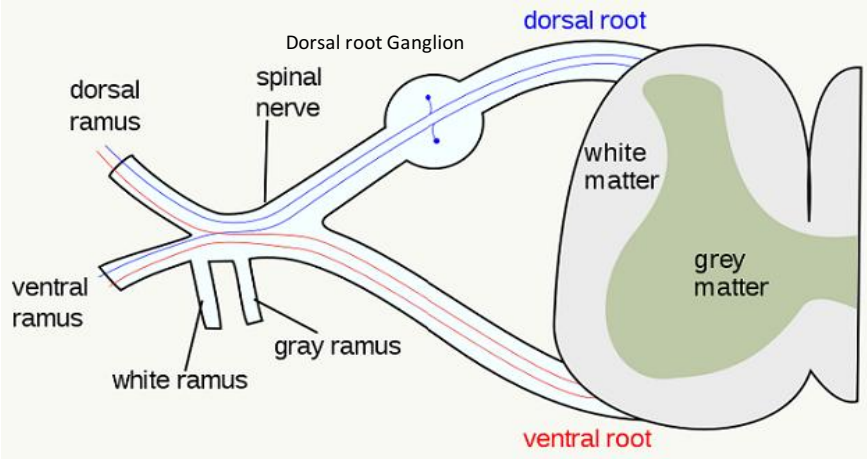
M.Safwan Sultan

The following cranial nerves have parasympathetic fibers.

- Vagas >> to heart, intestine. Lungs
- Golssopharyngeal >> to parotid gland
- Occulomotor >> constrictor of the pupil & cissioal accomodation
- Facial >> submental & sumnandibular

If we draw imaginary midline the white matter ill be divided by the gray matter into:

1. ***Posterior or dorsal white matter*** (between the midline and the dorsal horn)
2. ***Lateral white column*** (between the dorsal and ventral horns)
3. ***Anterior or ventral white matter*** (between the midline and the ventral horn)



dorsal root: pure sensory, dorsal ramus mixed

Gray matter have 4 nuclei in posterior\dorsal horn:

- ***Substantia gelatinosa*** (pain, temp & touch)
- ***Nucleus properius*** (properioception, vibration & 2 point discrimination)
- ***Nucleus dorsalis*** (properioception)
- ***Visceral afferent nucleus*** present in T1-L3 segments. (associated with receiving visceral afferent information)

Two-point discrimination is the ability to discern that two nearby objects touching the skin are truly two distinct points, not one. We use this test to access the nervous system.

BY :
M.Safwan Sultan

Nerve fibers grouped into tract:

- Assending tracts (going toward the brain) >> sensory
- Decsendin tracts (coming down from the brain) >> motor

Ascending Tracts of the Spinal Cord

Funiculus or column	Tracts	Origin	Termination	Function
Anterior	Anterior Spinothalamic	Posterior horn on one side of the cord but crosses to opposite side	Thalamus, then cerebral cortex	Conducts sensory impulses for touch & pressure
Posterior	Fasciculuc gracillis & Fasciculuc cuneatus	Peripheral afferent neurons; ascends on ipsilateral side of the spinal cordbut crosses over in the medulla	Nucleus grcillis & nucleus cuneatus of the medulla; eventually to thalamus, then cerebral cortex	Conducts sensory impulses from skin, muscles, tendons & joints, which are interpreted as sensations of fine touch, precise pressure & body movements.
Lateral	Lateral Spinothalamic	Posterior horn on one side of the cord but crosses to opposite side	Thalamus, then cerebral cortex	Conducts pain & temprature impulses that are interpreted within the cerebral cortex
	Anterior spinocerebellar	Posterior horn; some fibers cross, others do not	Cerebellum	Conducts sensory impulses from both sides of the body to cerebellum; necessary for coordinated muscle contraction
	Posterior spinocerebellar	Posterior horn; does not cross over	Cerebellum	Conducts sensory impulses from both sides of the body to cerebellum; necessary for coordinated muscle contraction

Descending Tracts of the Spinal Cord

Category	Tract	Origin
Pyramidal (Corticospinal)	Lateral corticospinal	Cerebral cortex
	Anterior corticospinal	Cerebral cortex
Extrapyramidal	Rubrospinal	Red nucleus (MB)
	Tectospinal	Superior colliculus (MB)
	Vestibulspinal	Vestibular nuclei (MO)
	Reticulospinal	Reticular formation (MO & Pons)

BY :
M.Safwan Sultan

Note: Extrapyramidal originate from any part below the cortex.

Damage to the corticospinal tract or dysfunction will result in weakness of the muscles and can be of two types

1. ***Upper motor neuron lesion*** (the problem in the origin)
2. ***Lower motor neuron lesion*** (the problem through the course of the nerve fiber)

How to differentiate between lower and Upper motor neuron lesion?

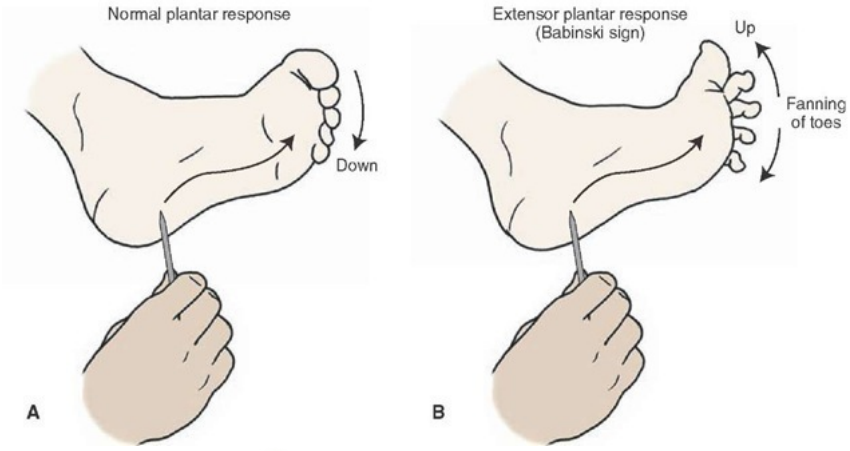
paralysis In the upper motor neuron usually start distal while in Lower motor neuron can be anywhere.

Atrophy is minimum in case of upper motor neuron while in Lower motor neuron it is very clearly and start early (in the upper motor neuron it is because of disuse not because of nerve cut).

Spasticity (increase tone of the muscle) in present in the upper motor neuron and absent in the lower motor neuron.

tendon reflexes In case of Upper motor neuron it is exaggerated while in case of Lower motor neuron lesion it is absent or sluggish.

Babinski's sign: if we use sharp object and put it on the sole of feet the toes will spread and dorsiflex and it is present\positive in Upper motor neuron



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