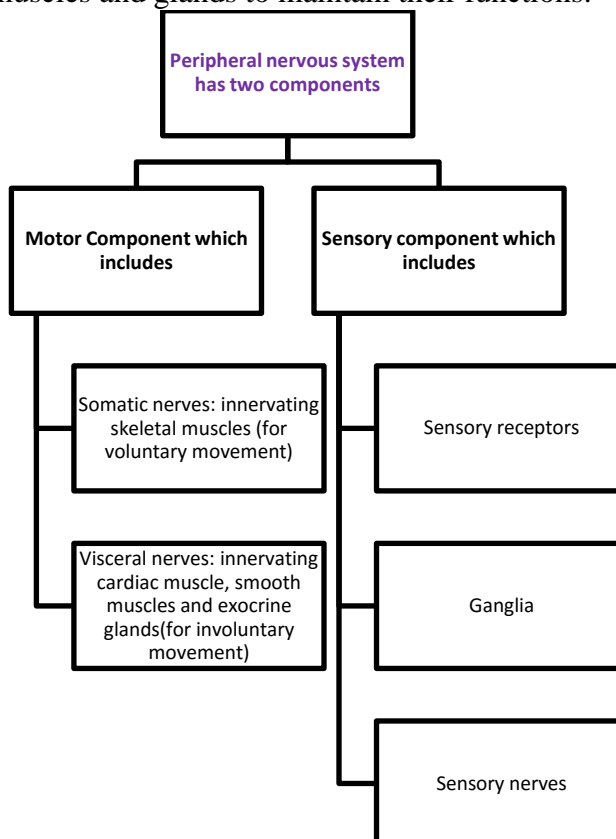




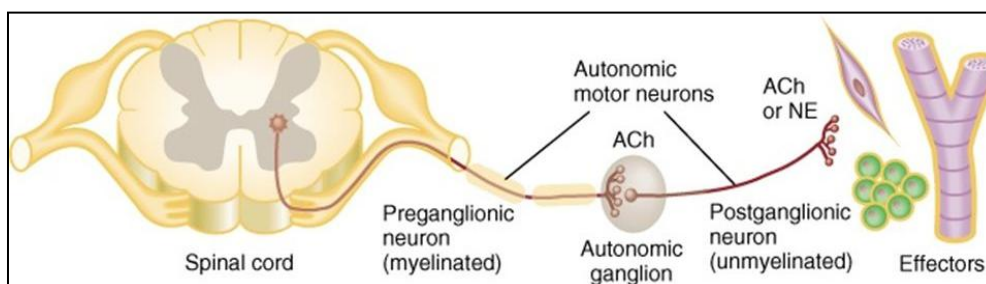
- The nervous system is composed of two divisions:

- **Central nervous system:** which is represented by
  - ✓ Brain (cerebrum)
  - ✓ Brainstem (containing the following three parts: midbrain, pons and medulla).
  - ✓ Cerebellum (المخيخ)
  - ✓ Spinal cord.
- **Peripheral nervous system:** which is represented by peripheral nerves -which are emerging from the central nervous system- with different skeletal muscles, smooth muscles, cardiac muscles and glands to maintain their functions.



- The Autonomic Nervous System (ANS) has the following:

- **Afferent neurons:** which brings information –via sensory receptors- to the central nervous system.
- **Connector neurons.**
- **Efferent neurons:** which are taking signals from central nervous system to different muscles and glands to mediate a proper response/effect. Efferent neurons are divided into:
  - ✓ Pre-ganglionic neurons: their cell bodies are found in the lateral grey horn of the spinal cord and in the motor nuclei of certain cranial nerves. The axons of these neurons are collected to form ganglia outside the Central nervous system (CNS).
  - ✓ Post-ganglionic neurons.

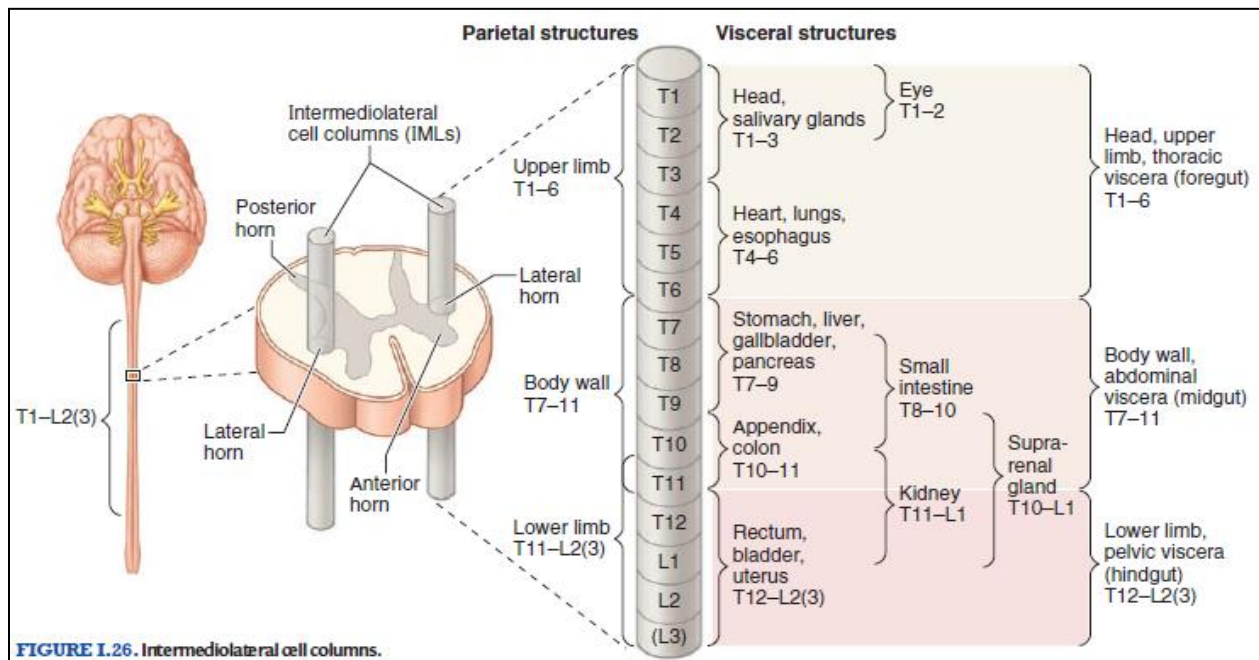




- Autonomic Nervous System (ANS) is divided into two parts:

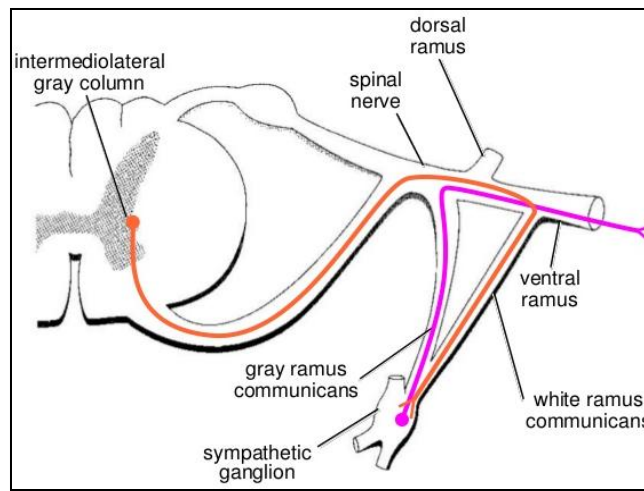
• **Sympathetic Nervous System (SNS):**

- ✓ **Characteristics:** it is larger than parasympathetic nervous system with more effects and it is widely distributed in the body.
- ✓ **Function:** preparing the body for emergency situations or what is known as “fight-or-flight” response.
- ✓ **Sympathetic nervous system is composed of the following:**
  - ❖ **Efferent outflow:**
    - Efferent nerves are emerging from the lateral grey horn of the spinal cord at the following segments: T1-L2 or L3
    - The preganglionic myelinated axons of these nerves leave the spinal cord in anterior nerve root (myelin sheath around axons of these nerves functions as an insulator which prevents wasting of signals in the form of heat and it also increases conduction velocity of signals).
    - These preganglionic myelinated axons will pass through white rami to enter para-vertebral ganglia of sympathetic trunk (why?) → to synapse with and excite neuron in the ganglia.
    - Then, postganglionic non-myelinated axons will leave the ganglia and pass to thoracic spinal nerves through grey rami.
    - Efferent nerve fibers will: join cervical spinal nerves, join lumbar and sacral regions, or pass without synapsing as (greater splanchnic, lesser splanchnic and least splanchnic nerves).
    - The ratio of preganglionic to postganglionic nerve fibers is 1:10



❖ **Afferent nerve fibers:**

- They are myelinated fibers which travel from the viscera (internal organs) through the sympathetic ganglia (without synapsing).
- They pass through white rami and reach cell bodies in the posterior root ganglia of the corresponding spinal nerve.

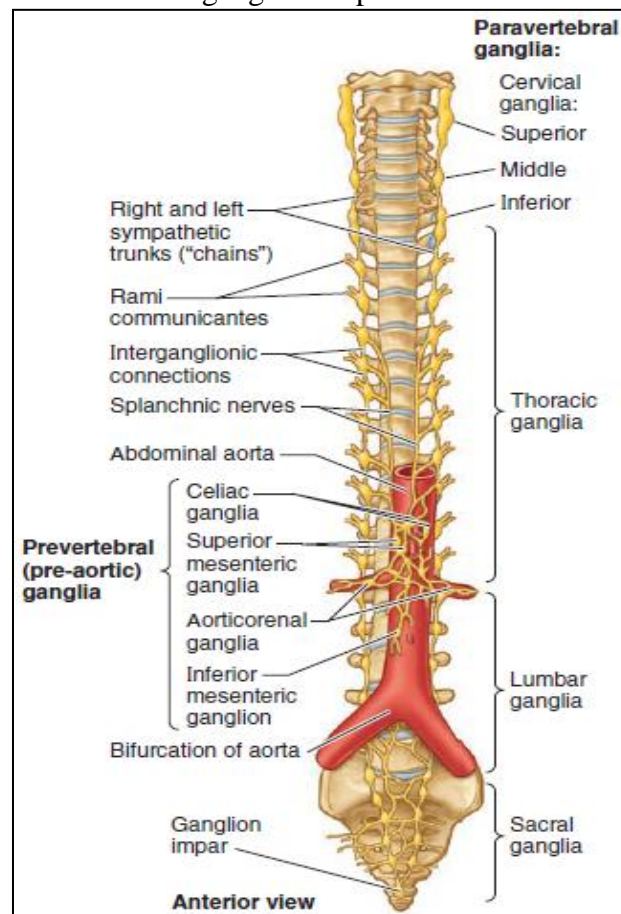


❖ *Two ganglionated sympathetic trunks (paravertebral ganglia):*

- They extend the whole length of the vertebral column.
- How are these ganglia divided:

<b>Neck</b>	3
<b>Thorax</b>	11-12
<b>Lumbar</b>	4-5
<b>Pelvis</b>	4-5

- Below the pelvis, the two trunks end by joining each other to form ganglion impar.



• **Parasympathetic Nervous System (PNS):**

✓ Efferent nerve fibers:

- ❖ Cell bodies are found in the brain stem (represented by the cranial nerves: III, VII, IX and X) and lateral grey horn of sacral segments of the spinal cord (S2-S4).
- ❖ The efferent fibers leave in the anterior roots of spinal nerves and form pelvic splanchnic nerve.



- ❖ They synapse in peripheral ganglia located close to the viscera (pelvic splanchnic nerve synapses in hypogastric plexus).
- ❖ Postganglionic nerve fibers are non-myelinated and short.
- ❖ The ratio of preganglionic to postganglionic nerve fibers is 1:3
- ✓ Afferent nerve fibers:
  - ❖ These are myelinated nerve fibers which travel from viscera to cell bodies in sensory ganglia of cranial nerves or posterior root ganglia of sacral spinal nerves.
  - ❖ They are similar to afferent of somatic nerves and to general afferent segment of the entire nervous system.
- ✓ Cranial parasympathetic ganglia:
  - ❖ Ciliary, pterygopalatine, submandibular and otic ganglia.
  - ❖ In certain locations, ganglionic cells are placed in plexuses as in cardiac, pulmonary, myenteric and Meissner's.

