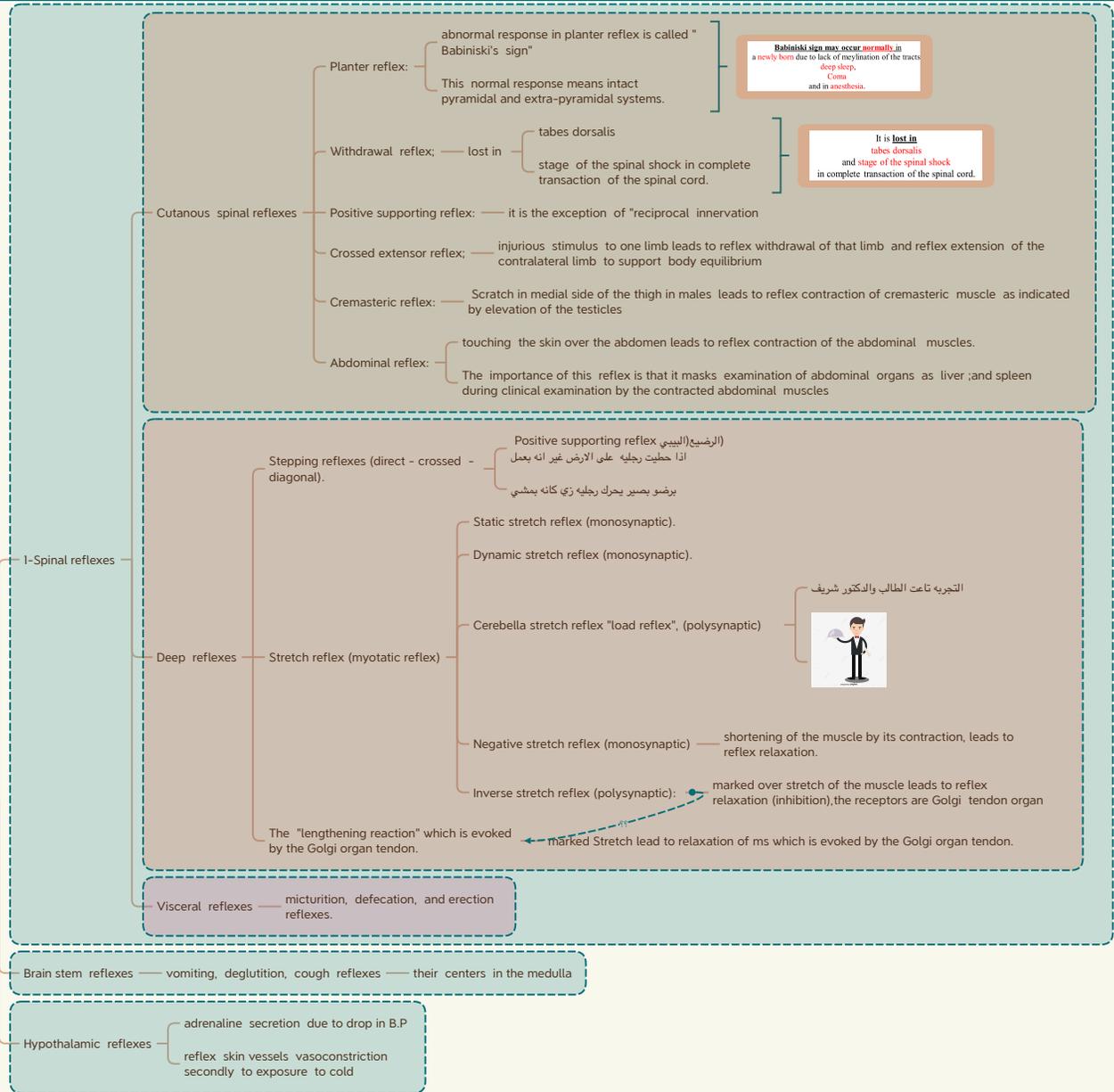


Peripheral reflexes:

- Local enteric reflex
- Ganglionic reflex gastro-colic reflex,
- Local axon reflex: (anti-dromic response)

Central reflexes:

Inborn or unconditioned reflexes:



Conditioned reflexes:

- previous education or training, intact cerebral cortex (consciousness) and Stimulus must be present.
- As when we think in delicious food — reflex salivation occur to us.
- speech
- education
- our experience

Stretch reflex and skeletal muscle tone

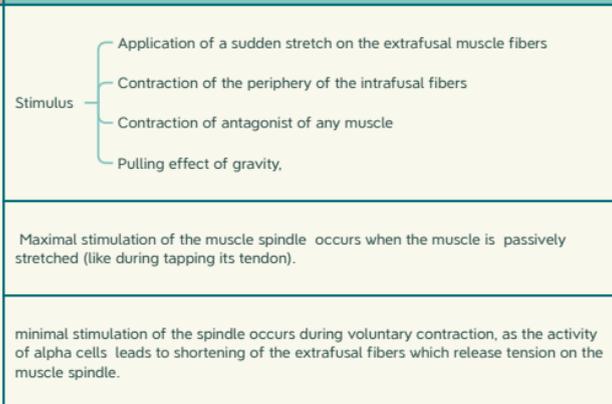
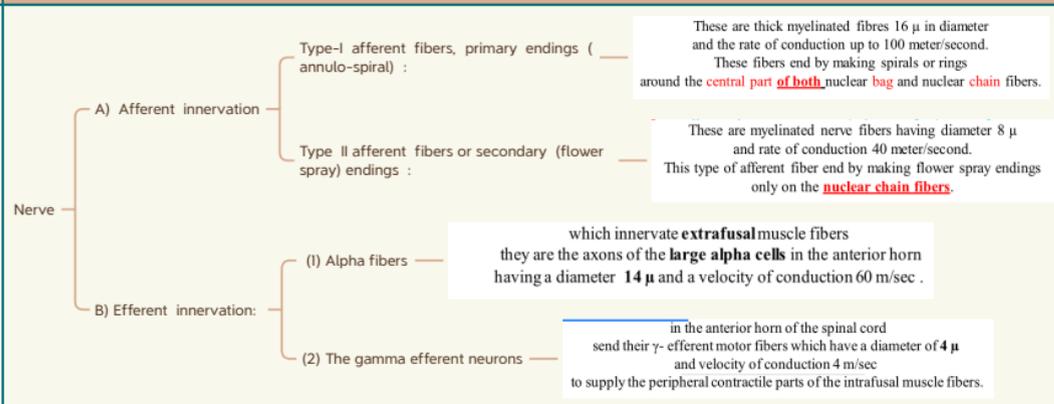
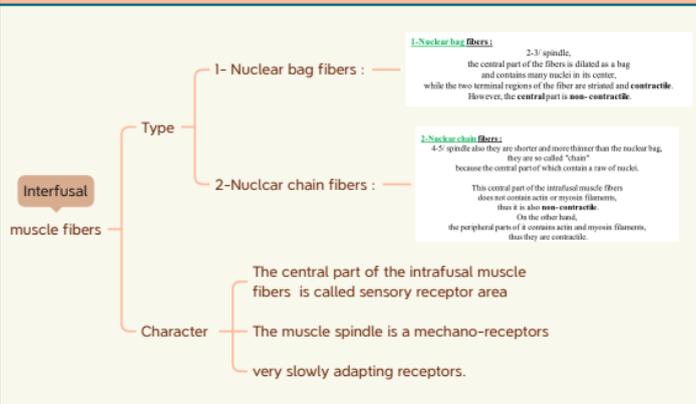
-Stimulation of the **γ - efferent** motor fibers will lead to **contraction** of the **peripheral contractile** parts of the intrafusal muscle fibers and **stretching** of their **central non contractile part**,
 resulting in **stimulation** of the **primary** or **annulo-spiral endings** or **dynamic receptors** and **secondary endings** or **flower spray** or **static receptors**.

receptor (muscle spindle.)

Innervation of the muscle spindle;

Mode of stimulation of the muscle spindle :-

مُلصَق 1



stretch reflex;

Type

مناقش 1

- Static stretch reflex (monosynaptic).
- Dynamic stretch reflex (monosynaptic).
- Negative stretch reflex (monosynaptic):
- 4- Cerebella stretch reflex "load reflex", (polysynaptic):
- 5- Inverse stretch reflex (polysynaptic):

phases

Static phase	Dynamic phase
1-Receptors are nuclear chain .	1-Receptors are nuclear bag .
2-Discharge in both primary and secondary afferent .	2-Discharge only in the primary afferent .
3-Its receptors are stimulated with maintained stretch .	3-Its receptors are stimulated with sudden stretch .
4- Activity in muscle fibers are alternating .	4-The whole muscle fibers are stimulated at the same time .
5- Physiologically it is represented by the muscle tone .	5-Physiologically it is represented by the tendon jerk .
6- The proper stimulus is the continuous stretch by effect of gravity.	6- The proper stimulus is the sudden tap on the tendon of the muscle.

Muscle spindle	Golgi tendon organ
1- Receptor is found in fleshy muscle fibers .	1- Receptor is found in tendons of muscles .
2-Formed of intrafusal & extrafusal m. fibers .	2- Encapsulated network of knobby nerve endings .
3- Stimulated by muscle stretch .	3- Stimulated by over stretch .
4-When stimulated it leads to muscle contraction .	4-When stimulated it leads to muscle inhibition .
5- Monosynaptic connection in the spinal cord only .	5- Polysynaptic connection in the spinal cord and may reach cerebellum .
6-Connected by two types of afferent fibers to the spinal cord (primary & secondary endings).	6- Only one afferent rapidly conducting fibers 16 μ in diameter.
7-Its stimulation elicits " stretch reflex ".	7-Its stimulation elicits the " inverse stretch reflex ".
8-Has static and dynamic components.	8- Has static and dynamic components.

controlled by many higher centers

Supra-spinal facilitatory centers	Supra-spinal inhibitory centers
1-Primary motor area "4"	1-Suppressor cortical areas "4s"
2-Facilitatory pontine reticular formation.	2-Inhibitory medullary reticular formation.
3-Neocerebellum .	3-Paleocerebellum.
4-Vestibular nucleus.	4- Red nucleus.
5- caudate nucleus of the basal ganglia.	5-lentiform nucleus.

--N.B:- The γ cells in the anterior horn which innervate the intrafusal muscle fibers are controlled by many higher centers through the **descending tracts**.
Some of these centers **increase the activity of the stretch reflex** and are called "**supraspinal facilitatory centers**".
While others **diminish** its activity and are called "**supraspinal inhibitory centers**".

The most-important characters of the stretch reflex are:-

Character

- The muscle tone is deep, spinal, monosynaptic reflex.
- The muscle tone is the static phase of the stretch reflex.
- Skeletal muscle tone consumes very little energy and never fatigued and is very slowly adapting.
- When the tone is increased in a certain muscle, it is inhibited in its antagonistic one.

Function of stretch reflex:

Function

- Keeping equilibrium and adjusting body posture.
- Help venous return through muscle tone and help lymphatic drainage.
- Muscle tone causes heat production and regulates body temperature.
- Tone of the abdominal muscle keeps viscera in position.
- Also tone of mastication muscle prevents drop of the mandible .
- Damping function (Signal averaging function):
- Servo - assist function (α - γ co- activation):

-Clinical abnormalities of the tendon jerk:

A-Tendon jerk may be "Exaggerated", hyperreflexia in:-

- 1-Upper motor neuron lesion due to damage in the internal capsule which destroys the descending tracts.
- 2-Hyperthyroidism.
- 3- Tetany (Ca^{++} deficiency).
- 4-Anxiety.
- 5- Paleocerebellum syndrome.
- 6- Eclampsia (toxicity of pregnancy).

B-Tendon jerk may be "Inhibited", hyporeflexia in :-

- 1 - Sleep
- 2 - Coma
- 3 - Shock
- 4- Anesthesia
- 5-Myxedema (hypothyroidism)

C-Completely absent,"Areflexia" in:

- 1-Advanced tabes dorsalis.
- 2- Lower motor neuron lesion.
- 3- shock Stage of complete transection of the spinal cord.

D- "Pendular" knee jerk (hypotonia): looks like the "pendulum" of the watch; this is abnormal condition of hypotonia. On tapping the tendon there will be a weak contraction of the muscle, then the limb is dropped like a dead object which causes another stretch of the tendon and a second weaker contraction occurs and the limb oscillates for few times then stops.

Pendular knee jerk occurs in :-

- 1- Neocerebellar syndrome
- 2- Thalamic syndrome
- 3- Chorea (lesion in basal ganglia)
- 4- Anterior quadrant lesion of the spinal cord
- 5- Pure motor area "4" lesion.
- 6-Pyramid lesion in medulla oblongata.

مناقش 1