

# **PRACTICAL (1)**

# **REFLEXES**

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# THE REFLEX ACTION

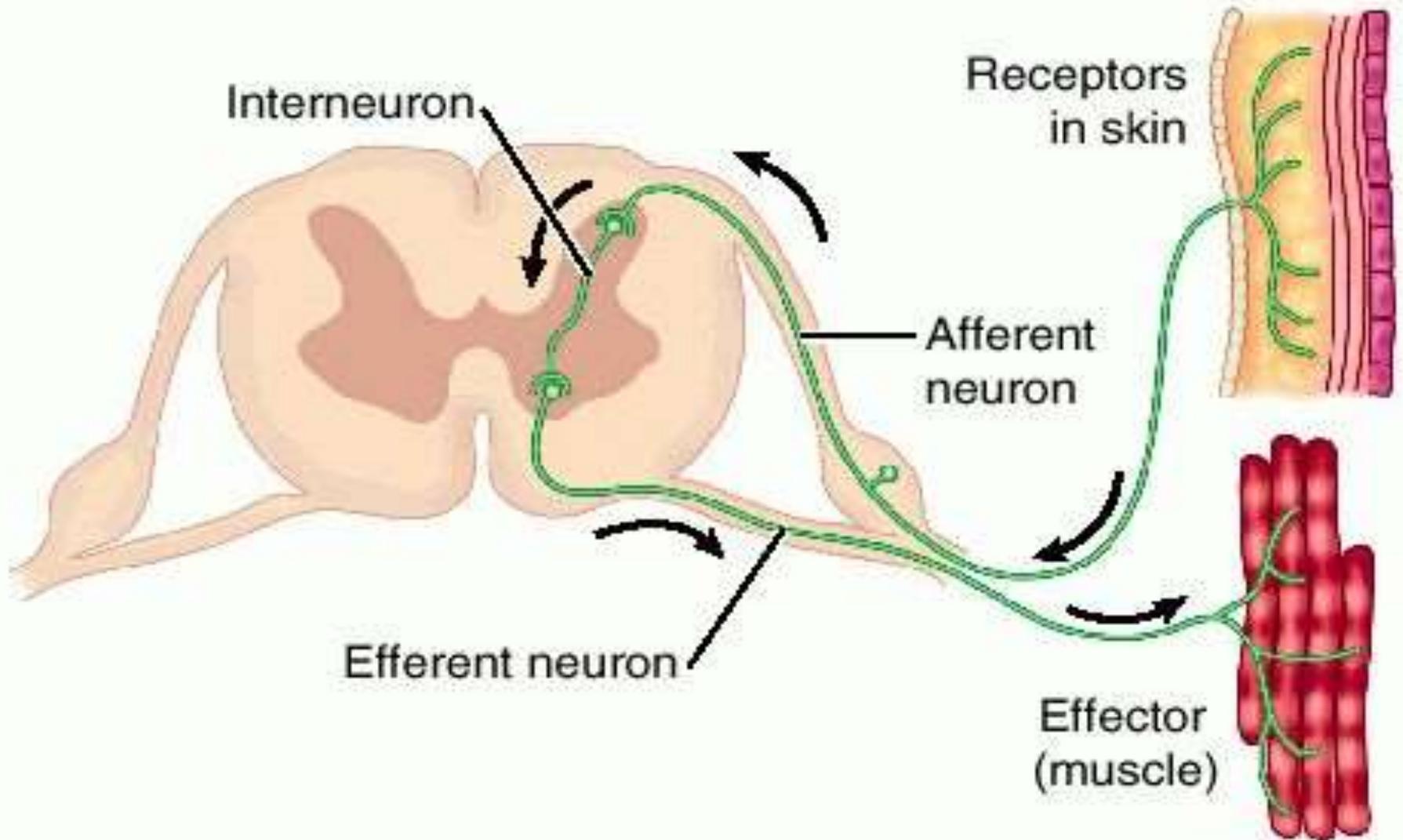
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The reflex action is the physiological (functional) unit of the nervous system.

The nervous pathway of the reflex action is called the *reflex arc* which consists of:

- ✗ -receptors
- ✗ -afferent neuron
- ✗ -center
- ✗ -efferent neuron
- ✗ -effector organ & response

# REFLEX ARC



# TYPES OF REFLEXES

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- ✘ -According to the number of synapses the *reflex arcs* are classified into:

## 1- Monosynaptic reflex arc:

- ✘ The afferent neuron synapses with the efferent neuron without interneuron in between. e.g. **stretch reflex.**

## 2- Polysynaptic reflex arc:

- ✘ In which interneurons are present between the afferent and efferent neurons.

# **CLASSIFICATION OF HUMAN REFLEXES**

## ***I- PERIPHERAL REFLEXES:***

have ***centers outside C.N.S.***                      ***e.g.***

***(G.I.T)***

a- Local enteric reflex.

b- Local axon reflex

(antidromic response)

occurs in primary hyperalgesia.

## ***II- CENTRAL REFLEXES:***

these reflexes have a ***center inside C.N.S.***

**A-Conditioned reflexes:** they need:

- previous education or training,
- intact cerebral cortex

**B- Inborn or unconditioned reflexes:**

which need no education and all of us have them since birth e.g. micturition reflex.

# INBORN REFLEXES

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according to *the site of their centers*:

1- ***Spinal reflexes:***

their centers lie in the spinal cord.

2- ***Brain stem reflexes;***

centers lie in the brain stem.

As vomiting, deglutition, cough reflexes, which have their centers in the medulla.

3- ***Hypothalamic reflexes:***

centers lie in the hypothalamus.

# TYPES OF SPINAL REFLEXES

## ***a-superficial reflexes***

receptors lie in the skin .

## ***b- Deep reflexes***

receptors lie in the deep structures as  
muscles, ligaments

## ***c- Visceral reflexes***

receptors lie in the viscera e.g. micturition,  
defecation

# (A) SUPERFICIAL REFLEXES

## *1- Abdominal reflexes*

✦ **Center:** ( T7 – T 12 )

**Procedure:** light stroking or touching the skin of the abdomen from the periphery inwards.

**Normal:** contraction of underlying abdominal muscle and deviation of umbilicus towards the stimulated side.



## ***2- Cremastic reflex***

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**Center** : L1

**Procedure** : gentle stroking of a medial side of the thigh

**Normal**: contraction of cremasteric muscle  
and retraction of the testicle of same side

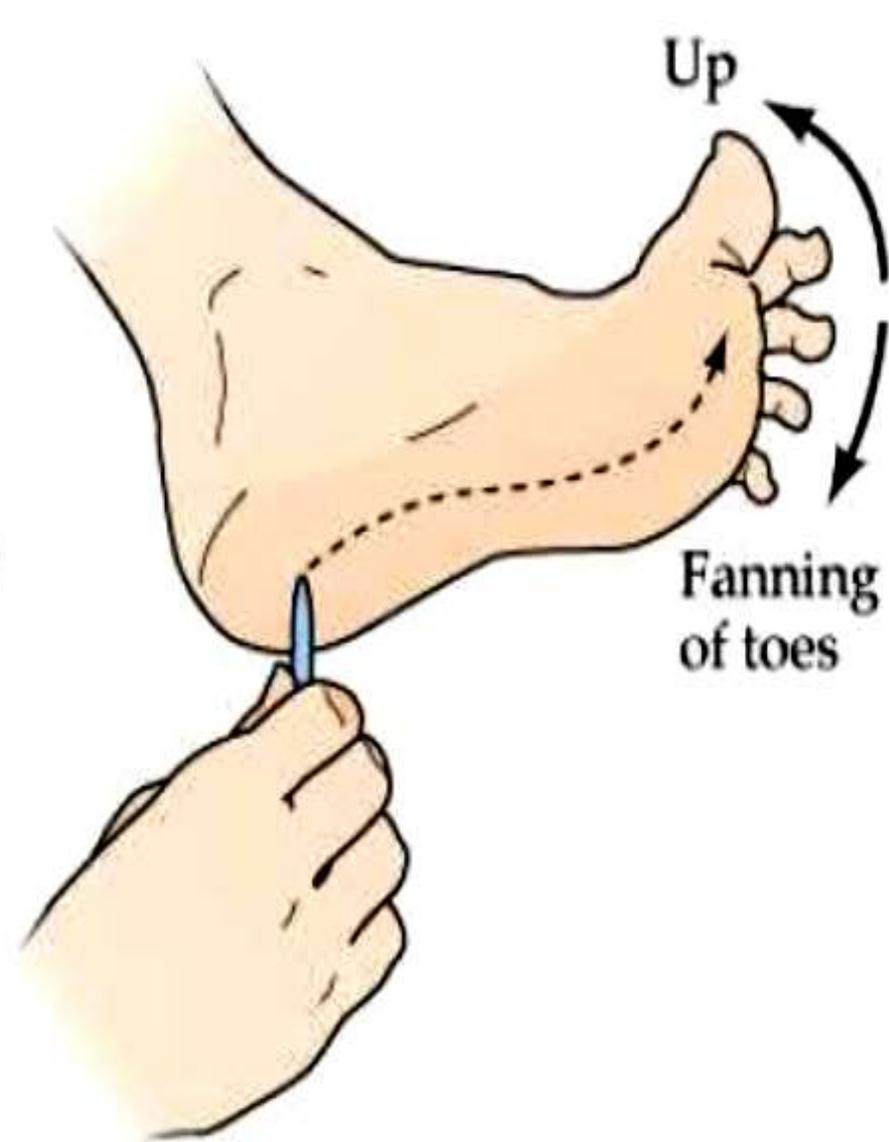
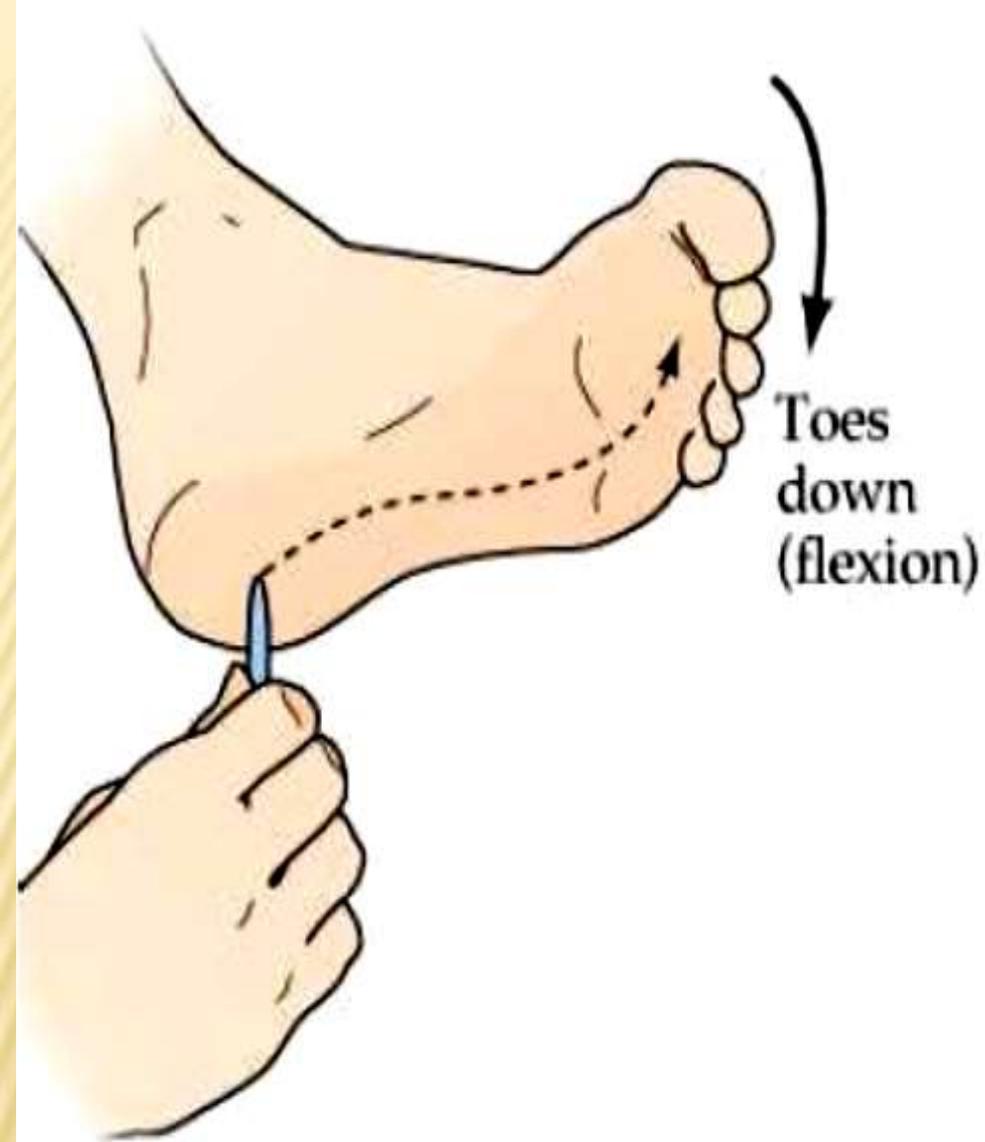
## ***3- Planter reflex***

**Center** : S1

**Procedure**: stroke the outer edge of the sole of the foot from heel up ward by a blunt object (key) then curve inward across the transverse arch.

**Normal**: planter flexion of big toe and adduction and planter flexion of other toes

normal response means intact **pyramidal and extrapyramidal** systems.

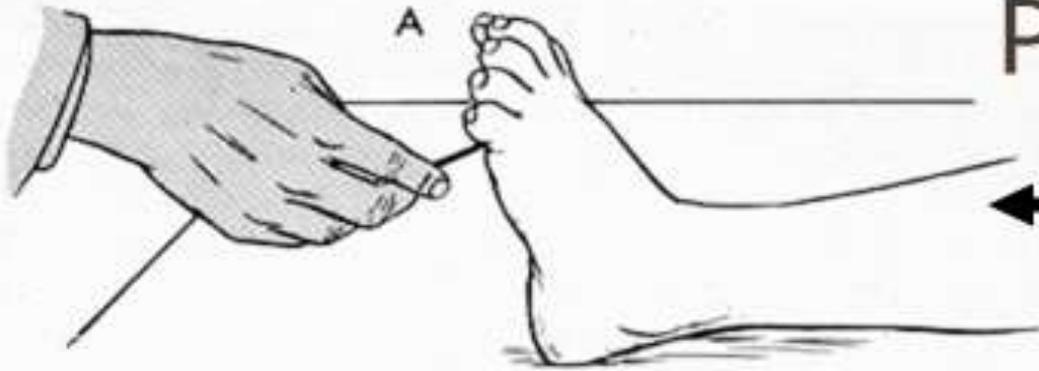


Normal plantar response

(Babinski sign)

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- ✘ Abnormal response in planter reflex is called "Babiniski's sign" dorsiflexion of the big toe (indicates pyramidal lesion) with fanning in other toes (indicates extra pyramidal lesion).
  - ✘ Babiniski sign may occur **normally** in a newly born due to lack of myelination of the tracts, deep sleep, Coma and during anesthesia.

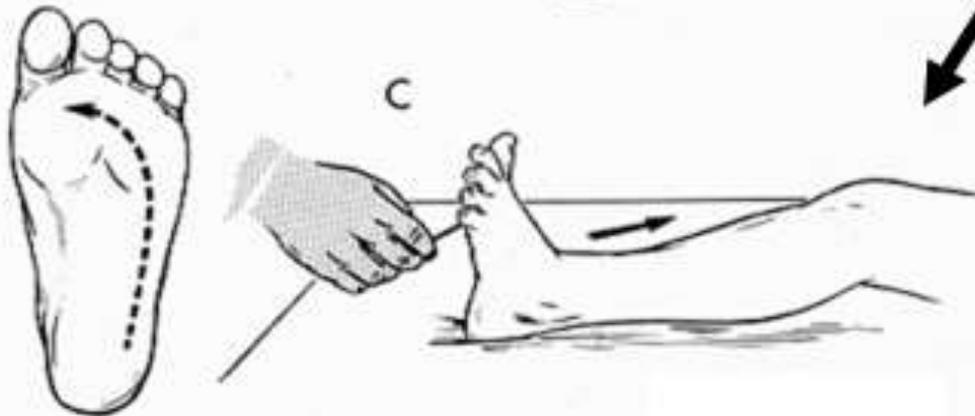
# Plantar Reflex



Normal



Abnormal  
(Babinski's)



# DEEP REFLEXES

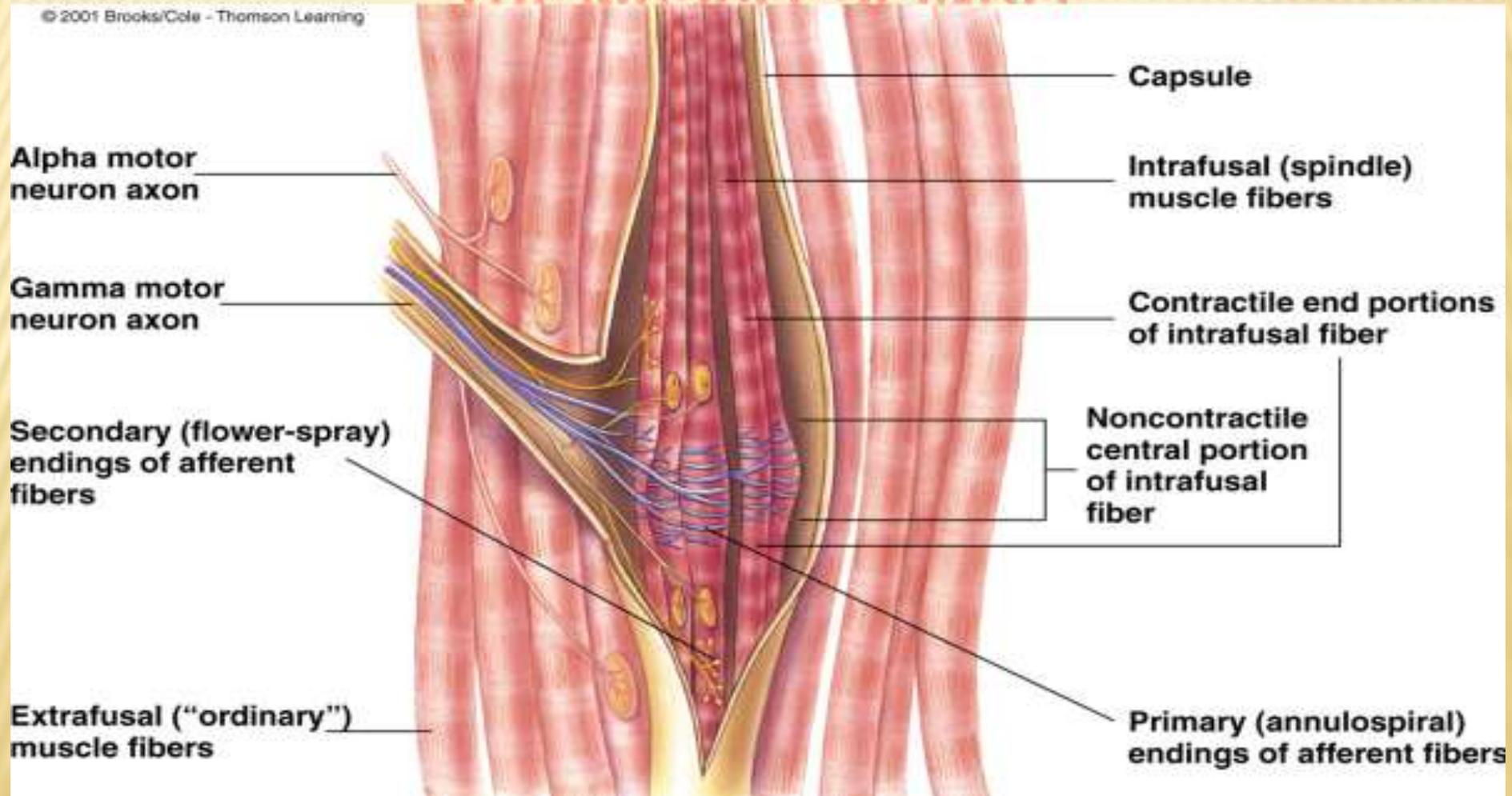
## STRETCH REFLEX

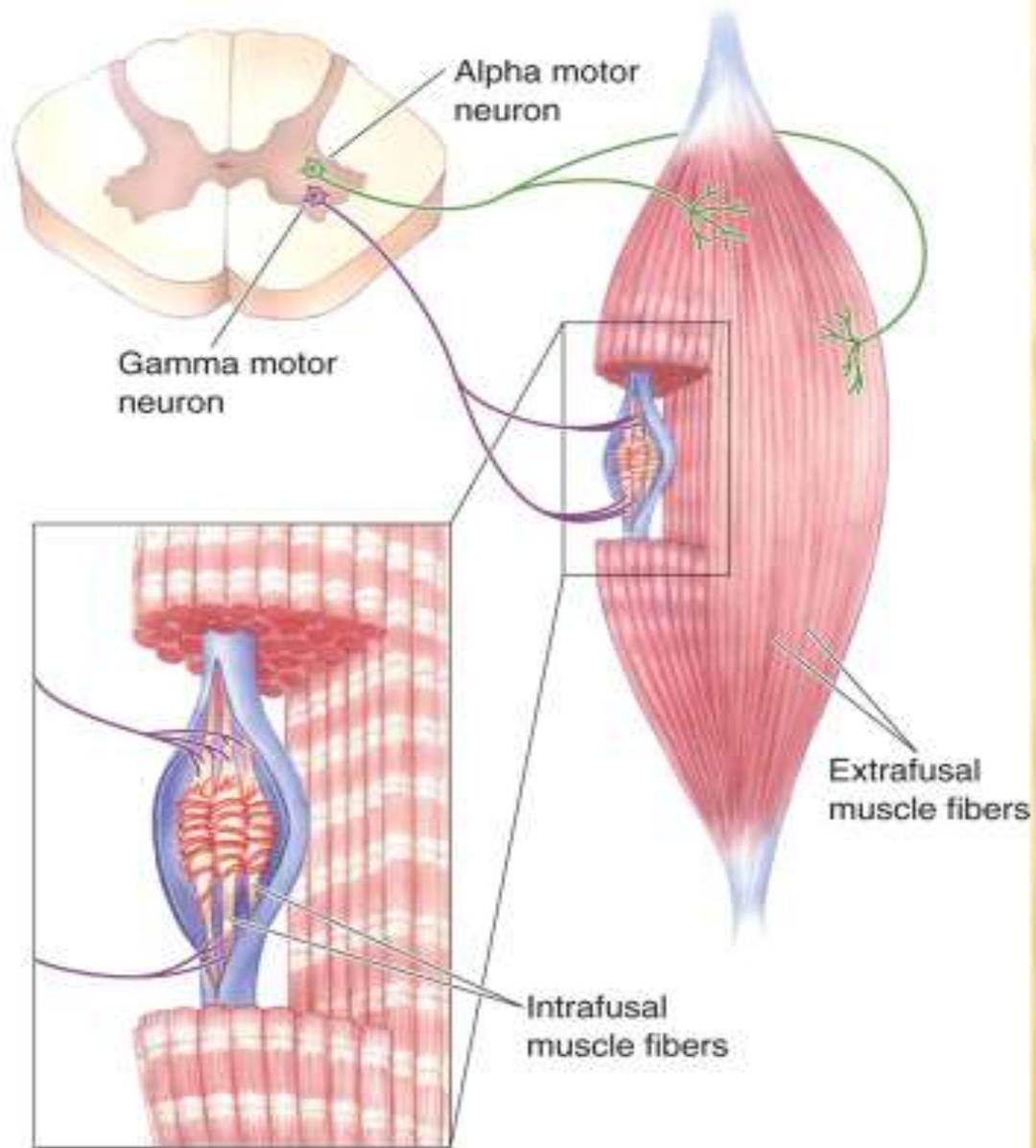
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- ✘ The stretch reflex means stretch of a muscle leads to reflex contraction.
- ✘ In the skeletal muscle it is central deep spinal unconditioned monosynaptic reflex .
- ✘ the stretch reflex **has two phases**
  - 1 - The static phase, the muscle tone .
  - 2 - The dynamic phase, the tendon jerk.

# THE RECEPTOR OF THE STRETCH REFLEX: "THE MUSCLE SPINDLE"

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# MODE OF STIMULATION OF MUSCLE SPINDLE

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- ✘ 1-Application of a sudden stretch on the extrafusal muscle fibers like during tapping on muscle's tendons (tendon jerk), stimulate the nuclear bags in the spindle and evokes the dynamic response.
- ✘ 2-Pulling effect of gravity, exerts a sort of stretch specially in the antigravity muscles stimulating the static phase of the stretch reflex.
- ✘ 3-Contraction of the periphery of the intrafusal fibers due to efferent discharge from gamma  $\gamma$  fibers that innervate both the nuclear bag and the nuclear chain

- ✘ 4) Contraction of the antagonist of the muscle leads to stretch and stimulation of muscle spindle.

N.B: Maximal stimulation of muscle spindle: when muscle is passively stretched (like during tapping its tendon).

- ✘ Minimal stimulation of muscle spindle: during voluntary contraction.
- ✘ -N.B: gamma cells in the anterior horn are stimulated by many higher centers in the brain stem and the cerebral cortex to enhance muscle contraction from CNS so the stretch reflex is the only reflex which its stimulation can be started from the CNS.

The  $\gamma$  cells in the anterior horn are controlled by many higher centers through the descending tracts of two types:

### Supra-spinal facilitatory centers

- 1-Primary motor area "4"
- 2-Facilitatory pontine reticular formation.
- 3-Neocerebellum .
- 4-Vestibular nucleus.
- 5- caudate nucleus of basal ganglia.

### Supra-spinal inhibitory centers

- 1-Suppressor cortical areas "4s"
- 2-Inhibitory medullary reticular formation.
- 3-Paleocerebellum.
- 4- Red nucleus.
- 5-lentiform nucleus.

# SKELETAL MUSCLE TONE

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- ✘ nearly all skeletal muscles specially the antigravity muscles are in state of stretch due to the pulling effect of the gravity.
- ✘ This state of maintained stretch initiate in our muscles a state of maintained rhythmic mild contraction "skeletal muscle tone" or (static phase of stretch reflex )

# TENDON JERK

sudden tap on a tendon of any muscle  
(Dynamic phase of stretch reflex)



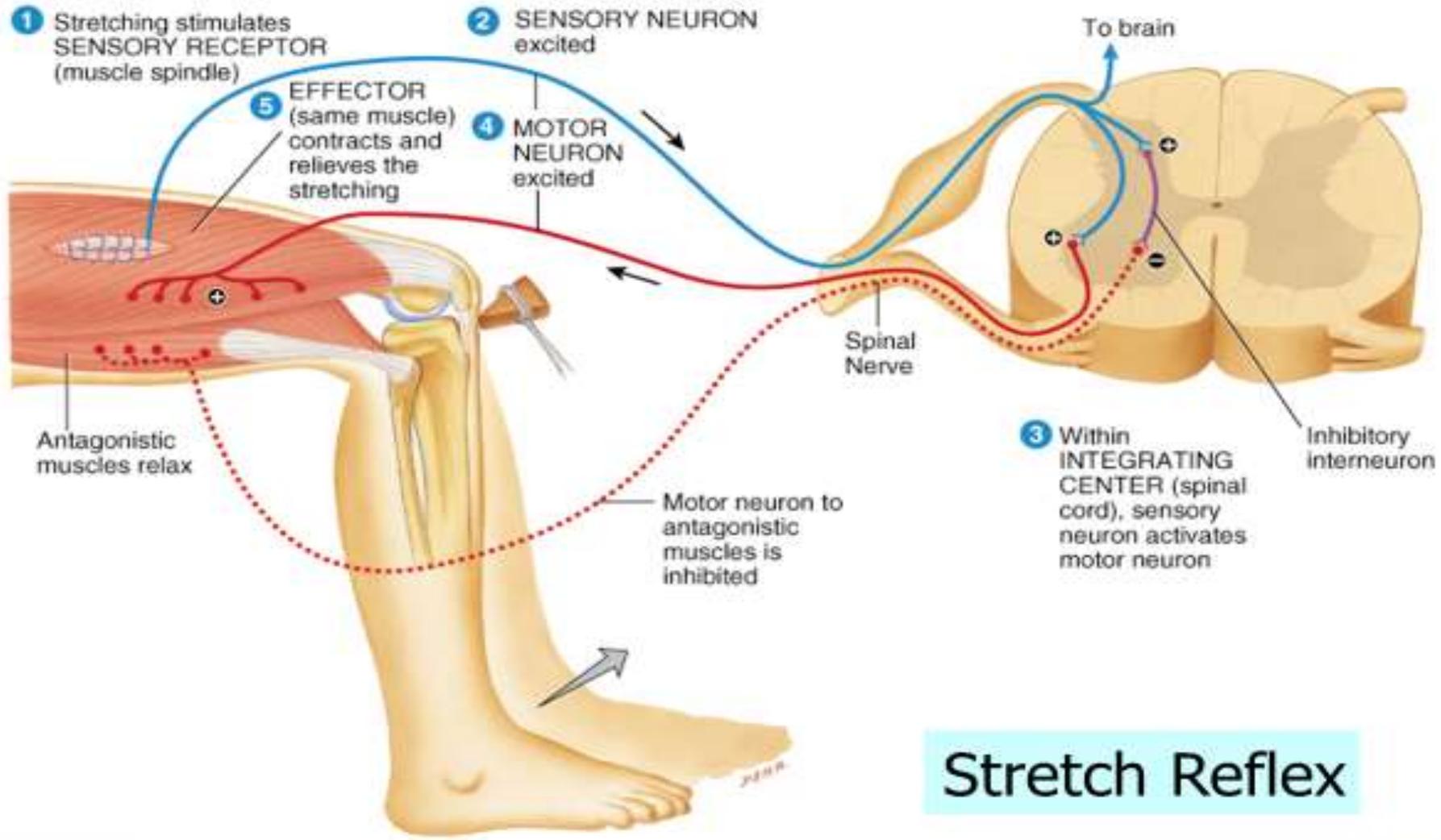
sudden stretch which stimulate deep  
receptors "the muscle spindle"



sudden visible reflex contraction

"tendon jerk".





# Stretch Reflex

## ✘ Types of tendon jerk

### ✘ I- In the upper limb:

#### ✘ 1) *Biceps reflex* Center : (C 5,6)

#### ✘ Procedure :-

✘ Tap the biceps tendon indirectly i.e the tap is done on the index finger placed over the tendon .The forearm is semi flexed till the elbow is at 120°.

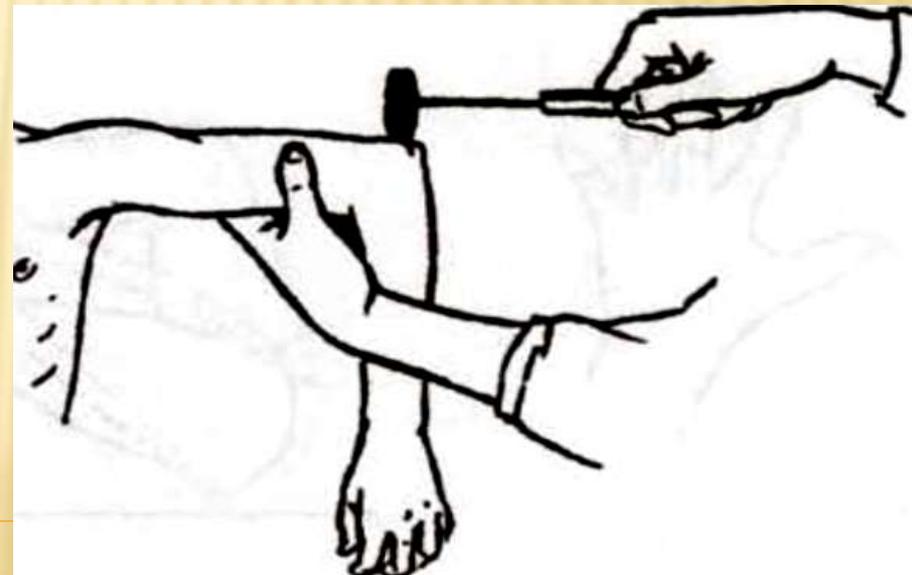
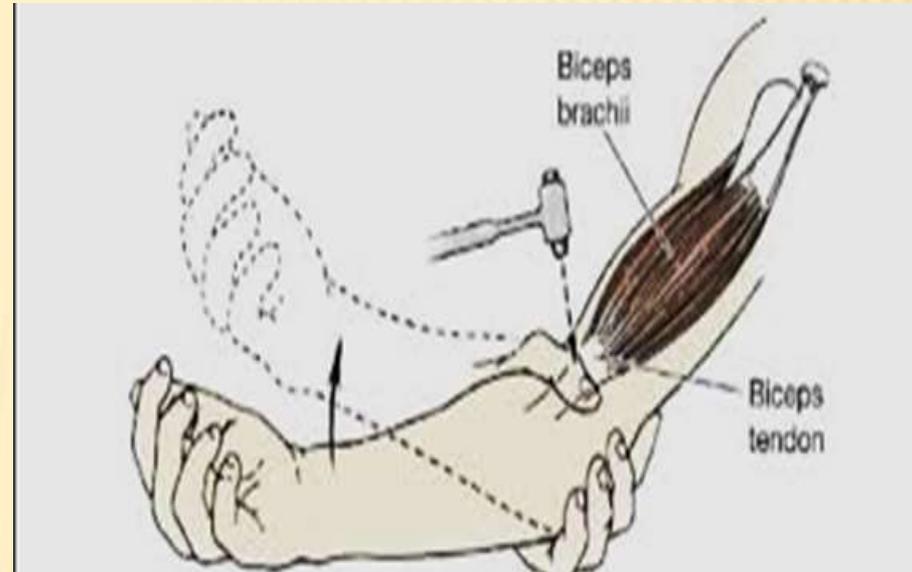
✘ **Normal** : mild contraction of biceps with slight flexion of elbow

#### ✘ 2) *Triceps reflex* Center (C 6,7)

#### ✘ Procedure :-

✘ Tapping the triceps directly while the elbow is flexed at 90°.

✘ **Normal** :- Mild contraction of triceps and extension of elbow .



## *II- in the lower limb*

### *1) knee jerk*                      **Center (L2,3,4)**

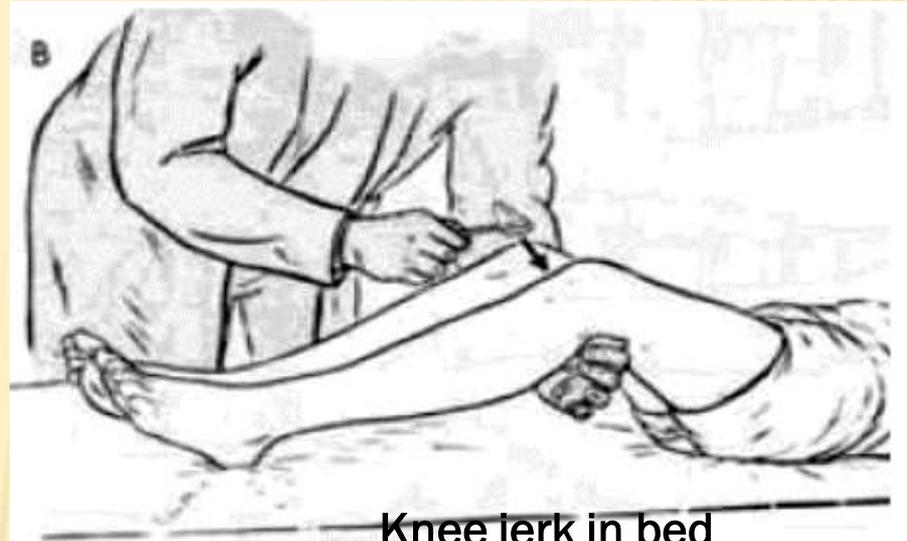
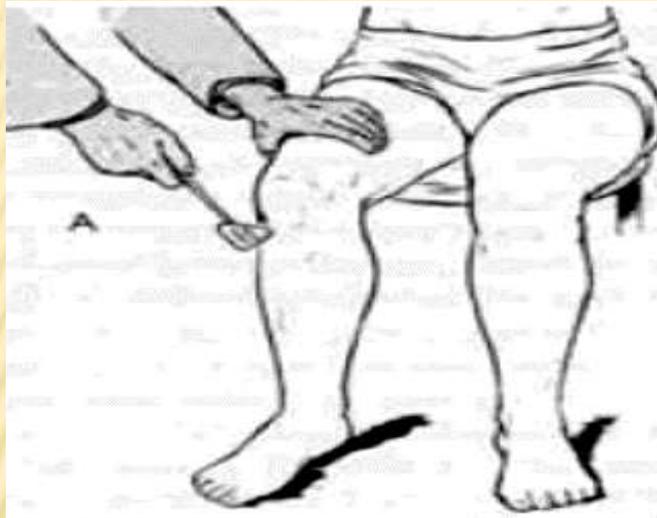
**Procedure :-** Tapping the patellar (quadriceps) tendon while the hip and knee joints are flexed.

**Normal :-** Contraction of quadriceps and **extension** of knee .

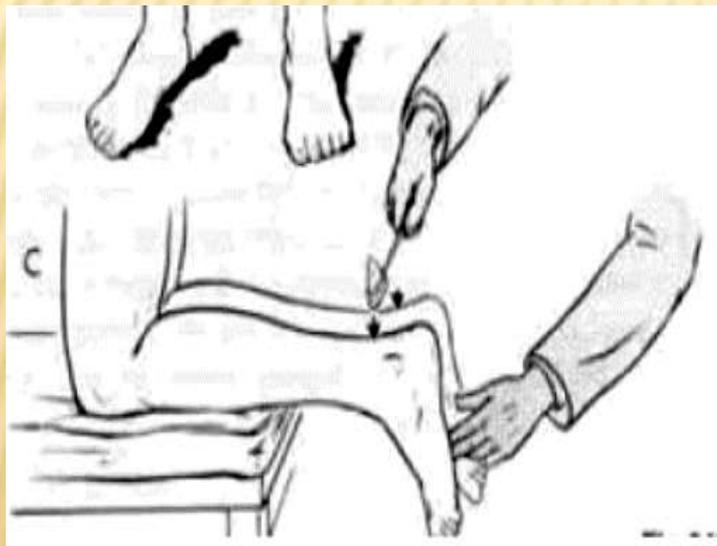
### *2- Ankle jerk*                      **Center ( S1 , 2 )**

**Procedure:** Tap on tendo Achilis while the hip is abducted and externally rotated , the knee is flexed at 90 degree and Ankle is dorsi-flexed .

**Normal:** mild contraction of the calf muscles with **planter** Flexion of the ankle .



Knee jerk in bed



Ankle jerk in bed

# CLINICAL ABNORMALITIES OF THE TENDON JERK

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## ***A- EXAGGERATED (HYPERREFLEXIA)***

- × 1-Upper motor neuron lesion.
- × 2- Hyperthyroidism.
- × 3- Tetany (Ca<sup>++</sup> deficiency).
- × 4- Paleocerebellum syndrome.
- × 5- Anxiety.
- × 6- Eclampsia (toxicity of pregnancy).

# ***B-INHIBITED (HYPOREFLEXIA)***

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

# **C- COMPLETELY ABSENT, "AREFLEXIA"**

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- × 1- Lower motor neuron lesion.
- × 2- Shock stage of complete transection of the spinal cord.
- × 3- Advanced tabes dorsalis.

## ***D-"PENDULAR" KNEE JERK (HYPOTONIA):***

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like the "pendulum" of the watch, occurs in 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.

**Causes:** 1 - Neocerebellar syndrome .

2- Chorea (lesion in basal ganglia) .

3- Anterior quadrant lesion of the spinal cord.

4- Pure motor area "4" lesion.

# E-CLONUS

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- ✘ It is an abnormal response of tendon jerk that occurs in U.M.N.L. It is either ankle or patellar clonus
- ✘ Ankle clonus: If a ***sudden sustained stretch*** is applied on tendocalcanius by dorsiflexion of the foot, there will be ***regular rhythmic oscillation of contractions and relaxations***

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**Thank You**