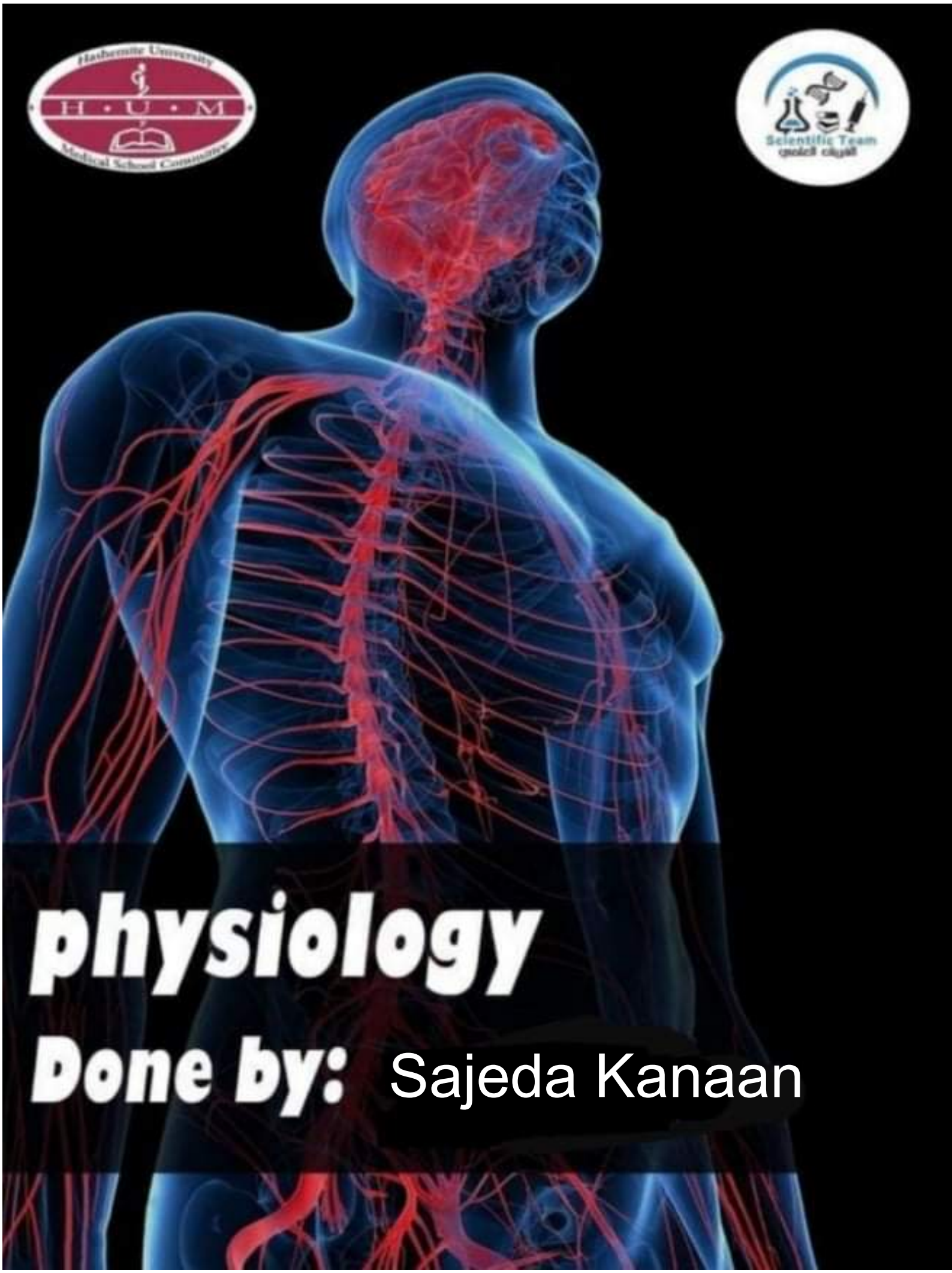

physiology
Done by: Sajeda Kanaan

بسم الله الرحمن الرحيم

Physiology lecture 13 and 14 sheet

UMNL Vs LMNL

?What are the clinically differences between them

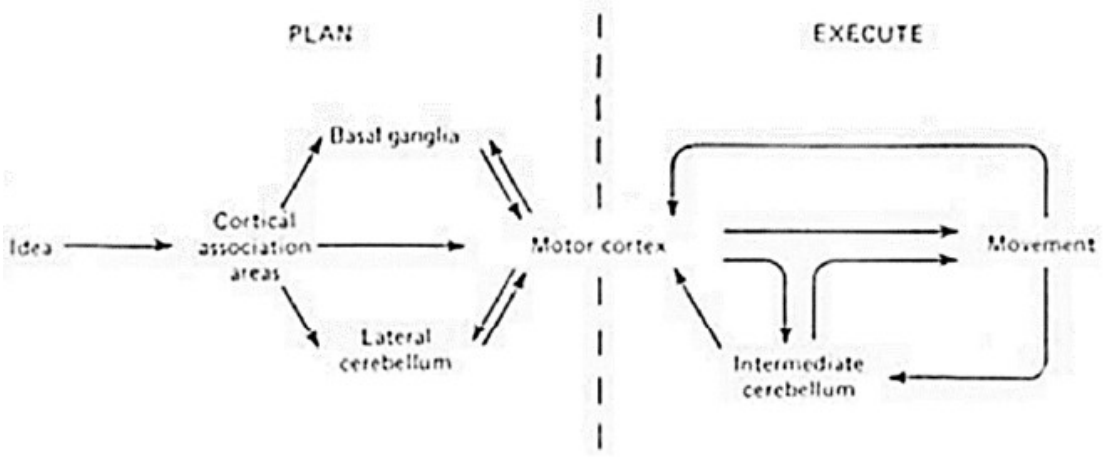


Figure 71 : Planning and execution of voluntary movements.

الصورة اللي بتحب الدكتورة تكررها دايما و اللي بتحكي عن

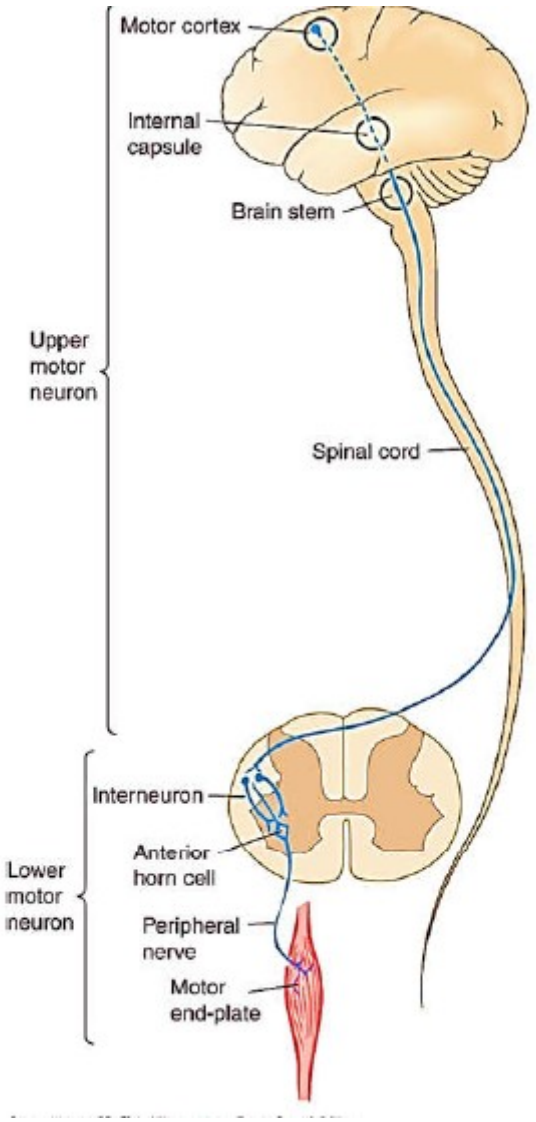
Levels of voluntary movement

Idea initiation → planning → execution

Execution done by skeletal muscles, what is the final common pathway (who is the one give the order to the skeletal muscle so it can execute the movement)? Either from spinal nerve or cranial nerve

for a muscle innervated by spinal nerve, the cell body is-1 going to be in the AHC

for a muscle innervated by cranial nerve, the cell body-2 will be in the cranial nerve nuclei



LMNL= lesion occurs at level of execution, so the problem is going to be in the AHC or its axon or the muscle itself. Example of LMNL is Poliomyelitis

UMNL = lesion at any supra spinal nerve. It can occur at the spinal cord; however, the level has to be higher than .axon that comes out of it

Descending tracts manipulate AHC either by stimulation :or inhibition can be classified into two ways

pyramisal and extrapyramidal-1

medial and lateral motor system-2

Just to emphasize: neurons in our bodies are arranged in a specific way and so on the AHC

AHC which are toward the medial side give axons that control the muscles close to midline like axial muscles

AHC which are toward the lateral side give axons that control the muscles away from .midline like Hand muscles

In addition, each one of these AHC (medial or lateral) has its own motor control .(separated from the other)

Motor system	medial	lateral
…Controls	Contraction of axial muscles and maintain position	Fine movements
Tracts involved	Vestibule-spinal and reticule-spinal tracts	Lateral-cortico-spinal and rubro-spinal tracts

بالنسبة للجدول اللي تحت, علقت عليه الدكتورة شوي أشياء :

Extra cortical origin can be the red nucleus, Basal Ganglia,- reticular formation. Etc… seen in extra pyramidal

-Knowing the termination for each is very important

pyramidal terminate in alpha neuron, so it affects the-extrafusal muscle fibres. While extra pyramidal can terminate in alpha or gamma motor neuron, so it can

affect extrafusal muscle fibers (alpha) or intrafusal .muscle fibers (gamma)

Associated movement هي حركات بتعملها و ما بتكون ماخد بالك منها زي حركة ايديك وانت بتمشي

Posture adjustment means what changes in your posture must done so you can perform fine movement (seen in extra pyramidal) مثلا لما تزبط وضعية جلوسك حتى تقدر تكتب

Muscle tone, some will facilitate it, others will inhibit. For

	PYRAMIDAL SYSTEM	EXTRAPYRAMIDAL SYSTEM
Origin	Cortical only	Cortical (much wider) and extracortical
Tract	Mononeuronal	Multineuronal
Pathway	Direct activation pathway	Indirect activation pathway
Crossing	About 90%	About 50 %
Termination	Cranial nerve nuclei and alpha neurons in the spinal cord	Alpha and gamma neurons in the spinal cord only (not at the cranial nuclei)
Location	Medullary pyramids, and in lateral column of spinal cord mainly	Outside the medullary pyramids, and in lateral and ventral columns of spinal cord
Time of function	Only after the first year of life	During and after the first year of life
Function	Initiates fine skilled voluntary movements and increases the muscle tone	Initiates gross and associated movements, decreases the muscle tone and controls autonomic functions

.Now we are going to compare between UMNL and LMNL

In case of UMNL, the clinical picture (C.P) mentioned below is the most common. that we will see it in the most

common UMNL injury (internal capsule injury). That means there are some contraindications to these (C.P) in other UMNL. Example, UMNL commonly will cause hypertonia, but there are some UMNL will cause hypotonia

Upper and Lower motor Neuron lesion

1. Cause
2. Paralysis
3. Muscle tone
4. Tendon reflexes
5. Superficial reflexes.
6. Muscle wasting

UMNL

Cause:

Cerebrovasular accidents (strokes) **due to :**

1- hemorrhage or

2- thrombosis

in the posterior limb of the internal capsule.

- There is damage of both pyramidal and extrapyramidal fibres.

LMNL

Cause:

Is due to :

1- lesion of the lower motor neurons as in poliomyelitis.

2- damage of motor nerves e.g. diabetes mellitus, and alcoholism.

Characters

UMNL	LMNL
1. Paralysis:	**1. Paralysis:**
Occurs on the opposite side of the body i.e. contra lateral hemiplegia.	Occurs in the muscles supplied by the affected segment only e.g. muscles of the limb only, on the same side of the lesion.
It is widespread affecting lower half of the face, upper limb and lower limb.	Recovery may occur.
Recovery is poor	

:In UMNL

Lesion occur in opposite side cuz there are crossing of- neurons at some point in the tracts

wide spread cuz there are a lot of neurons pass in the- lesion location and all of them will be affected

Prognosis is poor cuz the CNS neurons do not regenerate, but in LMNL, peripheral neurons may be able to .regenerate according to the lesion nature and location

UMNL	LMNL
2. Hypertonia The paralyzed muscles show increased tone of the spastic type. **(Clasp Knife Type).** Hypertonia is due to ???	**2. Hypotonia or atonia:** • The paralyzed muscles show decrease or loss of tone, referred to as flaccid paralysis. • Hypotonia is due to interruption of the stretch reflex.

-Muscle tone is the same as static form of muscle reflex

Tendon jerk is the same as the dynamic form of muscle-reflex

Remember that there were 2 neuron types that increase-the stretch reflex which are alpha and gamma

HYPERTONIA

facilitation of stretch reflex can have done by stimulate-either alpha alone or gamma alone. So, in fact we have two types of hypertonia in case of UMNL

spasticity 2-regidity-1

-Spasticity hypertonia seen in internal capsule lesion

Clasp knife هو الموس عنا او المطوة بالمصري

???Hypertonia is due to

When gamma is overstimulated → that will lead to contraction of peripheral contractile parts of intrafusal muscle fibers → stretch of central receptive area (stretch reflex circuit)→stretch reflex get stronger → increase muscle tone = hypertonia

شو دخل الموس؟؟ الشباب اكيد جربوه و البنات اللي عندهم اخوان شباب كمان المفروض انهم بعرفوه ع الأقل

لما تفتح الموس أولها بكون صعب فتحه و فيه مقاومة و بعدين فجاه بفتح بسهولة يعني

Resistance then sudden release, and that’s exactly what you will see in the examination of this pt

In LMNL, we have said that it is a result of an interruption of reflex arc (AHC or its axon or the muscle). So it is obviously that the muscle tone will decrease (hypotonia) or disappear (Atonia)

	Gamma rigidity	Alpha rigidity
Cause	Increased gamma discharge	Increased alpha discharge
Muscles affected	Antigravity muscles	All muscles
Resistance to movement	Uni-directional	Bi-directional
Type of rigidity	Clasp-knife	Lead-pipe or cogwheel
Effect of velocity	Increases with velocity	Not velocity-dependent
Tendon jerks	Exaggerated and clonus may also be present	Not necessarily exaggerated
Common diseases	Upper motor neuron lesion and decerebrate rigidity	Parkinsonism

Gamma rigidity is seen in vascular accident in internal capsule. Example, if the lesion affects the elbow, resistance will be seen in flexors of elbow (antigravity muscle) not in the extensors. That is the meaning of .unidirectional

Alpha rigidity (remember effect is on the extrafusal muscle fiber). Eg, resistance in both flexors and extensors .of elbow

Lead pipe كانك بتثني مسورة من الرصاص, المقاومة للحركة مستمرة طول الفحص

Cogwheel المسننات, يعني بنشوف resistance + tremors

Seen in Parkinson disease

Clasp Knife spasticity

.Resistance followed by sudden release

Why resistance? Cuz internal capsule lesion will cause destruction that leads to this
∑ facilitation of AHC > ∑ inhibition
Why suddenly released?
Cuz the doctor during the examination will exert more strength on the already hypertonic muscle (which means more stimulation of stretch reflex) → so increase the contraction → increase muscle tension to level where inverse stretch reflex turn on.

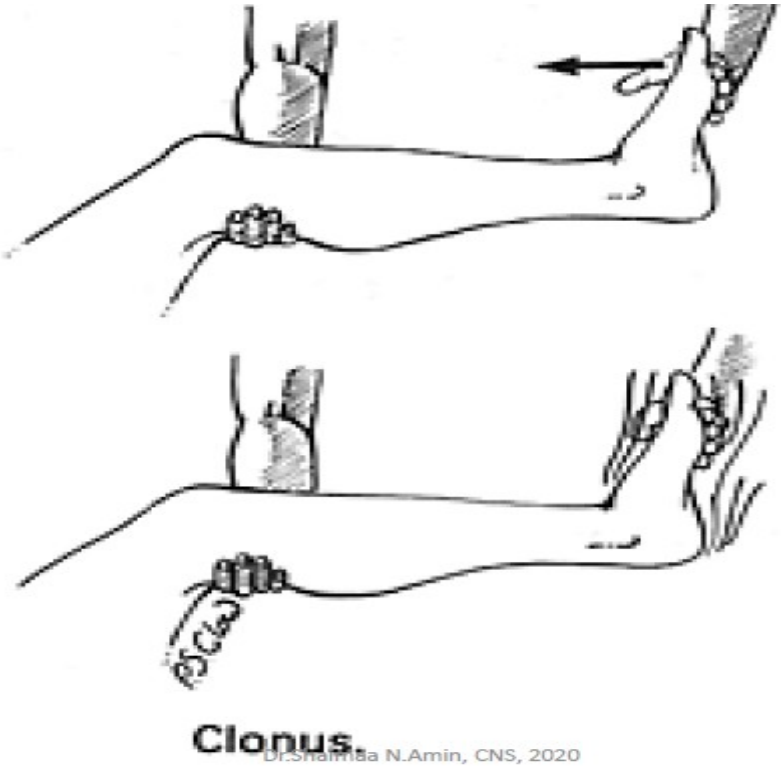
Now let us move to tendon reflex. It has the same concept as hypertonia …

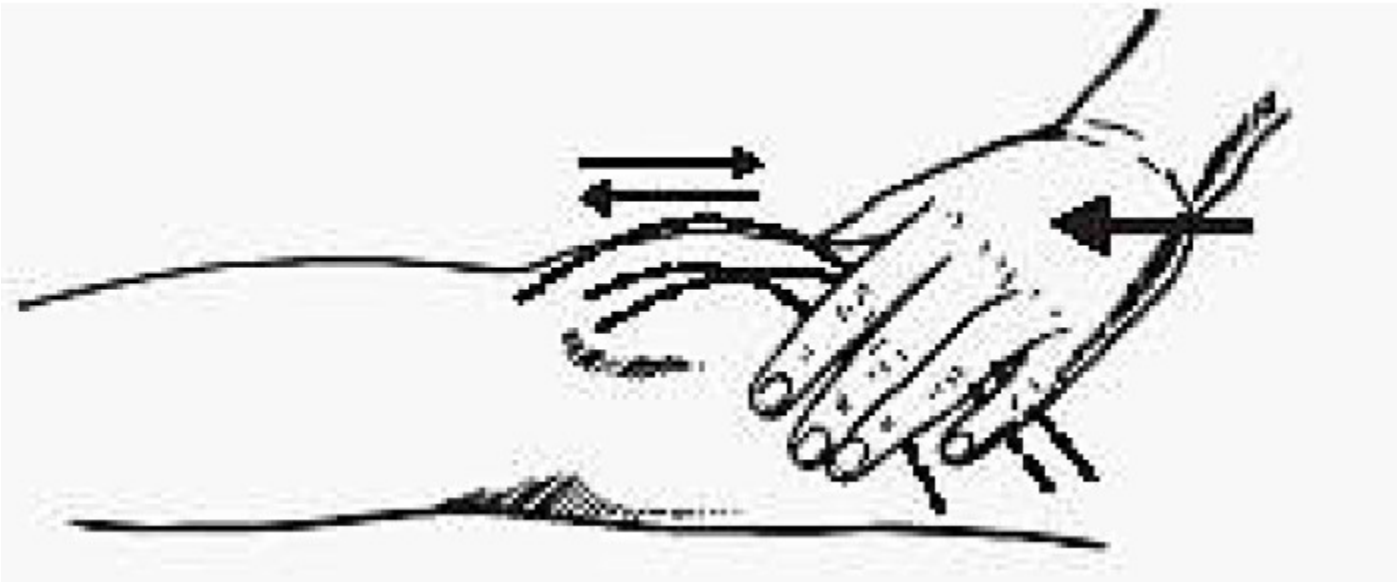
UMNL	LMNL
3. Exaggerated Tendon Reflexes.- • Deep reflexes are exaggerated on the affected side .g. exaggerated knee jerk and ankle jerk, and are due to the release of the stretch reflex from cerebral inhibition. • **Clonus** is present (see before).	**3. Absent Deep Reflexes.** This occurs in the muscles supplied by the affected segments or motor nerves. **Have you done Jendrassik maneuver before reporting areflexia??**

-Increase the facilitation of stretch reflex = hyper reflexia
-Clonus = rhythmic regular contraction and relaxation of the muscle on **sustained stretch**

Areflixia and jendrassik maneuver
قبل ما تشخص المريض انه ما عنده ريفلكس لازم تعمل هاد الفحص
رح نشرحو بعد شوي بس نحكي اول عن ال
Clonus
Picture below is for ankle clonus
Doctor will make the pt perform dorsal flexion. by pushing on the pt leg with his hand (**sustained stretch**) that will increase the stretch more than its needed → that will lead to activate the inverse stretch reflex (cause muscle relaxing) but the doctor is continuously push and maintained the **sustained stretch** which will lead to contraction again then relaxation and so on the cycle will

be repeated again and again as long the sustained stretch still exerted by the doctor hand=clonus if the pt is sick.





Patellar clonus

هون الطبيب رح يمسك الباتيلا زي مافي الصورة و يرفعها لاعلى وبعدها يشدها مرة وحدة لتحت فاذا كان المريض عنده مشكلة رح تضل تتحرك اعلى و اسفل طول ما الطبيب شاددها

Figure 1-33
The Jendrassik maneuver.

This is the jendrassik manoeuvre

Why it is important to do it before confirming the pt Areflixia / atonic?? because

1-pt might be stressed (pt voluntarily inhibit the reflex(psychologically), so reflex does not appear

2-the reflex is very weak, so the doctors can not realise it. (it is a case of hyporeflixia not Areflixia)

شو الحل عشان نتاكد من الحالة؟؟

1-distract the pt (no voluntary inhibition of the reflex) by asking him to do something else like holding hands as in the picture above

2-increase overall gamma discharge by the contraction of any muscle in the body

(contraction of any skeletal muscle in the body will cause generalized discharge to gamma neuron including the muscle under examination)

For lower limb examination تطلب من المريض يشبك ايديه و يشدهم زي مافي الصورة و هيك بتكون شتت انتباهه و خلصت من الاحتمال الأول و بنفس الوقت زودت ال

Gamma discharge

لكل العضلات وخاصة اللي بدك تفحصها و هيك خلصت من المشكلة الثاني Areflixia و لو ما صار عندي ريفلكس بعد كل هاد يعني المريض عنده

In case of upper limb examination, ask the pt to press with strength on his teeth لانه مابزبط افحص الكوع مثلا و المريض شادد ايديه فببعد عن مكان الفحص زي مثلا بخليه يصر ع اسنانه