

Lecture

Neurological Examination - II

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الرجاء تحويل الجوال إلى وضع
الصامت مع الشكر



VI. Motor System Examination

Classification of the Motor Neuron Lesion

I. According to the location of the lesion:

1. Upper motor neuron lesion (spastic or central paralysis). *early stages ⇒ flaccid*
2. Lower motor neuron lesion (flaccid or peripheral paralysis)

II. According to the affected limbs:

1. **Monoplegia** (Rt. UL or LL, Lt. UL or LL): paralysis of one limb.
2. **Hemiplegia** (Rt. or Lt. sided): paralysis of one side of the body.
3. **Paraplegia**: paralysis of both limbs.
4. **Triplegia**: paralysis of three limbs (*paralysed plane*) (one upper and two lower limbs).
5. **Quadriplegia (tetraplegia)**: paralysis of four limbs.

Bilateral hemiplegia ⇒ Different onset (time of start) for each half of body.

Sub Same onset

Differential between the UMNL & LMNL

L.M.N. LESION	U.M.N. LESION	
From AHCs until muscles	From area 4 until AHCs	1. Location of lesion
<u>Ipsilateral</u> at the <u>level</u> of lesion <i>If above the decussation</i>	<u>Below</u> the level of lesion: Contralateral (above decussation) and ipsilateral (below decussation) <i>If below the decussation</i>	2. Location of <u>paralysis</u>
Flaccid or peripheral	Spastic or central	3. Paralysis

I. MUSCLES

Wasting occurs <u>early</u> (hypotrophy) <i>early signs muscle atrophy</i>	Wasting occurs very <u>late</u> due to disuse <i>upper</i>	1. State of the muscles
Hypotonia (flaccidity)	<u>Hypertonia</u> (spasticity)	2. Muscle tone
May be present in the irritative lesions of <u>AHCs</u> <i>or in the brain stem</i>	Absent <i>UMN causes inhibition</i>	3. Muscle fasciculation (spontaneous contraction of muscles group).

II. REFLEXES

Hyporeflexia or <u>areflexia</u>	<u>Hyperreflexia</u>	1. Deep reflexes
Absent	May be present <i>Characteristic for UMN</i>	2. <u>Clonus</u> (Rhythmical series of contraction in response to sudden stretch of muscle tendon). <i>Severe hyporeflexia</i>
Absent <i>until 8 months old</i>	+ve (dorsiflexion of big toe + fanning of other toes)	3. Pathological reflexes (Babinski reflex)
Lost if lesion involve the segmental supply of the reflex	Lost if the lesion is <u>above</u> segmental supply of the reflex	4. Superficial reflexes

Photos added

Types of Gait Disturbances

1. **Ataxic gait;** Drunkens Gait
2. **Steppage Gait:** in drop foot; High steppage gait.
3. **Spastic gait**
4. **Hemiplegic gait ‘circumduction gait’:** in CVA
5. **Shuffling gait ‘Parkinson’s gait’:** in Parkinson’s disease Affecting upper & lower limbs
6. **Waddling gait ‘myopathic gait’:** in myopathy, common gait in late pregnancy
7. **Senile gait:** in elderly due to osteoarthritis (ankle joint—)
8. **Hysterical gait:** in conversion disorder
→ Psychogenic



Motor System Examination

1. Inspection:

- a. State of the muscles.
- b. Muscle fasciculation.
- c. Involuntary movements.
- d. Skeletal deformities.
- e. Trophic changes.

2. Palpation:

- a. Muscle **tone** examination.
- b. Muscle **power** examination.

3. Reflexes:

- a. Deep reflexes.
- b. Superficial reflexes.
- c. Plantar reflexes.

1. Inspection

a. State of the muscles:

- **Normal.**
- **Muscles hypotrophy:** affected limb or limbs, side (uni- or bilateral), symmetrical or asymmetrical, distal or proximal
- **Muscle hypertrophy:** increase muscle fibers in true hypertrophy and decrease in pseudohypertrophy (muscular dystrophy → Duchenne type).



fat deposition instead

b. Muscle fasciculation: spontaneous contraction of the muscle group. Organic or functional (normal fasciculation)

Causes of muscle fasciculation:

- Functional* ➤ **Physiological:** anxiety, fatigue, coffee, smoking. *stress*
- Organic* ➤ **Pathological:** Irritation of AHCs (motor neuron disease → amyotrophic lateral sclerosis, poliomyelitis, syringomyelia). *ALS*

related to the subthalamus
lowis bodies in subthalamus ➤ *Stroke here causes hemiballism*

c. Involuntary movements (hyperkinesias): chorea, ticks, athetosis, hemiballism, tremors (static or kinetic, rhythmic or dysrhythmic, what increase & decrease them).

d. Skeletal deformities: pes cavus, talipes equinus and kyphoscoliosis, Charcot's neuropathic joint (painless deformed joint).

→ *High Steppage gait x pes cavus*
(Bilateral neuropathy) (Skeletal deformity) } *This combination = Charcot's disease*

e. Trophic changes: ulcers, brittle nail, loss of hair.

Kyphoscoliosis



Pes Cavus

*Painless deformed
joint, skeletal*



Talipes Equinus

Skeletal



2. Palpation

→ Passively, no control from the patient

a. Muscle Tone Examination: Muscle tone is examined by assessing the patient response to passive movement

(passive flexion & extension of all joints):

- Normal muscle tone
- Muscle hypotonia.
- Muscle hypertonia: spasticity or plasticity (rigidity).

Stimulus to compare the muscle tone on the Rt & Lt sides

Plasticity
Cog wheel characteristic for Parkinson

Spasticity

UMN
pyramidal

Extrapyramidal

i.e. Parkinson's
named as a disease
Akathetic Rigid Syndrome

Differential between Muscle Spasticity and Rigidity

Muscle Rigidity	Muscle Spasticity	
<u>Extrapyramidal</u> system	Pyramidal lesion <u>UMN</u>	Site of lesion
- <u>Proximal</u> > Distal - <u>Flexors</u> of U.Ls & L.Ls. <i>in birth</i>  <u>Shuffling Gait</u>	- <u>Distal</u> > proximal - <u>Flexors</u> of <u>UL</u> & <u>extensors</u> of <u>LL</u>.	Distribution
Cogwheel <i>all Jcs</i>	Clasp – knife	Character
<u>Hyporeflexia</u>	<u>Hyperreflexia</u>	Deep reflexes

b. Muscle Power Examination

MRC (Medical Research Council) Scale for Grading Muscle Strength

Muscle Response	Score
No Movement (Complete paralysis)	0
Muscle <u>contract</u> "Flicker" but the joint <u>does not move</u>	1
Joint movement when effect of <u>gravity</u> eliminated	2
Joint moves <u>against gravity</u> , but <u>not against resistance</u>	3
Joint moves <u>against gravity</u> and <u>some resistance</u> (but weak than normal)	4
Full strength (Normal)	5

1. **Test for the strength of the deltoid muscles:**

This test for **deltoid muscle** (innervated by the C5 nerve root via **axillary nerve**)

→ Shoulder elevation

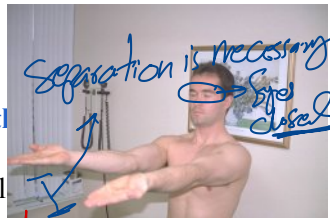


2. Next, ask the patient to extend and raise both arms in front of them (**Barry's test**):

Ask the patient to keep their arms in place while they close their eyes and count to 10.

Performed in UL & LL to determine muscle poss.

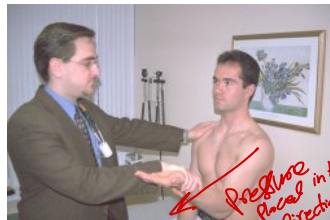
Barry's Test



Separated

3. **Test for the elbow flexion:**

This test for the **biceps muscle** (by the C5-C6 nerve roots via **musculocutaneous nerve**)



4. Test for the elbow extension:

This test for the **triceps muscle** (by the C7 nerve roots via **radial nerve**)



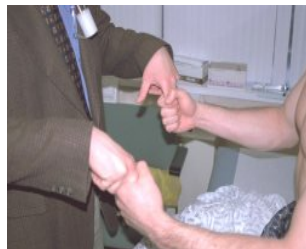
5. Test for the strength of wrist extension:

This test for the **Extensor carpi radialis longus muscles** (by the C6 nerve roots via **radial nerve**)



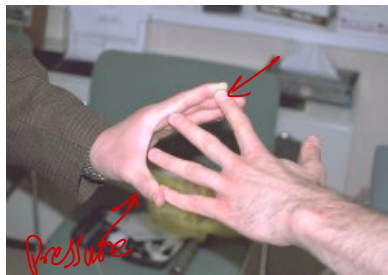
6. Test for the strength of wrist flexion:

This test for the **flexor pollicis longus and flexor digitorum profundus muscles** (by the C8 nerve root via **median nerve**)



7. Test for the fingers abduction or "fanning":

This tests for the **intrinsic hand muscles**. Finger abduction or "fanning" is innervated by the T1 nerve root via **ulnar nerve**.



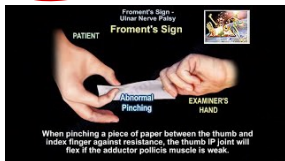
8. Test for the strength of the thumb:

This test for the **flexor pollicis longus muscle**, innervated by the C8-T1 nerve roots via **median nerve**.

by examiner's hand / paper



Check this one as an Alternative



9. Test for the flexion of the hip:

This test for the **iliopsoas muscle**

(innervated by the L1-L2 nerve roots via **femoral nerve**)



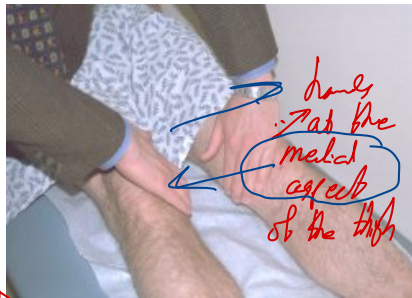
10. Test for the extension of the hip:

This test for the **gluteus maximus muscle** (innervated by the L5-S1 nerve roots via **inferior gluteal nerve**)



11. Test for the adduction of the hip:

This test for adductors *of the* **medial thigh muscle**: adductor longus, adductor brevis, adductor magnus, pectineus, and gracilis muscles, (by the L2-L4 nerve roots via **obturator nerve**)



12. Test for the abduction of the hip:

This test for **gluteus medius and gluteus minimus muscles** (by the L4-S1 nerve roots via **superior gluteal nerve**)



13. Test for extension of the knee:

This test for the **quadriceps muscle** (innervated by the L3-L4 nerve roots via **femoral nerve**)



14. Test for flexion of the knee:

This test for the **hamstrings muscle** (innervated by the S1 nerve roots via **sciatic nerve**)



15. Test for dorsiflexion of the ankle:

This test for the **anterior tibialis muscles** (innervated by the L4-L5 nerve roots via **deep peroneal nerve**)



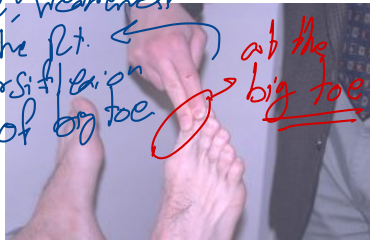
16. Test for flexion of the ankle:

This test for the **gastrocnemius and soleus muscles** in the posterior compartment of the lower leg (innervated by the S1-S2 nerve roots via **tibial nerve**)



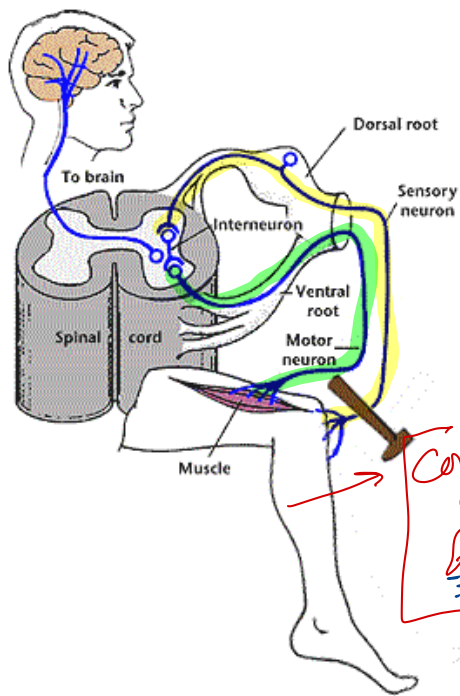
17. Test for dorsiflexion of the big toe:

This test the **extensor hallucis longus muscle** (innervated by the L5 nerve root via **deep peroneal nerve**)



IF +ve ^{sign} weakness of the pt. ←
dorsiflexion of big toe
at the big toe

3. Reflexes



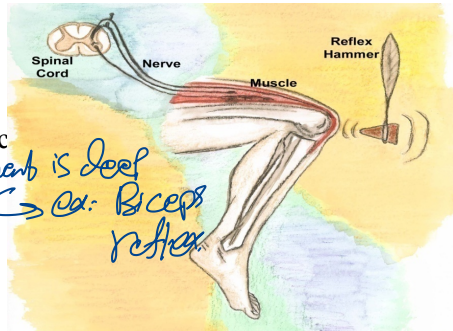
Response of patellar tendon

Contraction of
Quadriceps
Ext. of knee

Reflexes

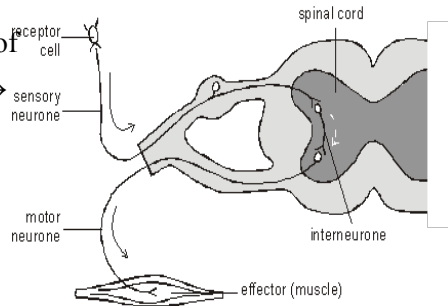
Reflexes: are involuntary action performed in response to impulses (a sensory stimulus):

- A. Deep reflexes (Muscle stretch reflexes).
- B. Superficial reflexes.



Muscle stretch reflex arc:

Stretch reflex induced by tapping the tendon of the muscle → sensory fibers of the peripheral nerve → posterior root → posterior horn of the spinal cord → anterior horn cells of the spinal cord of the same side → anterior root → motor fibers of the peripheral nerve → muscle contraction.



a. Deep Reflexes

1. In the face:

Jaw jerk: (Trigeminal N → Mandibular nerve → pons)

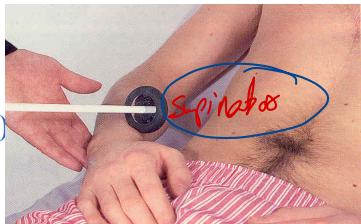
2. In the upper limb:

Biceps jerk (C5-C6): Musculocutaneous N. Tap on your finger placed on biceps tendon with elbow flexed. Mild flexion occur.

Supinator or brachioradial jerk (C5-C6): Radial N. Tap 5-10 cm above styloid process of radius with elbow flexed. Mild flexion occur.

Triceps jerk (C7-C8): Radial N.

Tap on triceps tendon with elbow flexed at 90°. Slight extension occur.



Extensor
Cubitus
→ Carpal
→ Extension

Contr. of biceps
Relax. of triceps

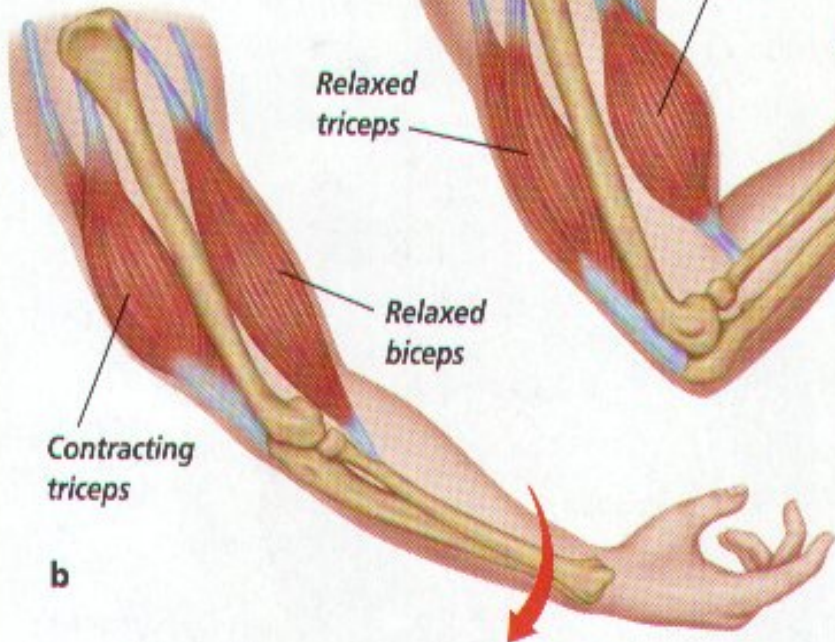
Contractor of triceps
Relaxation of biceps

a

*Relaxed
triceps*

*Relaxed
biceps*

*Contracting
biceps*



b

It's important to distract the patient → here, he is distracted by crossing his hands. *need to distract the patient to avoid noise*

b. In lower limb

Knee jerk (L2-L4): femoral N.

Tap on quadriceps tendon (below the patella) with flexed knee supported by your hand: contraction quadriceps with knee extension occur.



Ankle (Achilles) jerk (S1): Sciatic N. (Tibial nerve).

Tap on Achilles tendon, the knee is flexed at 90° and the ankle is dorsiflexed. Contraction of calf muscles occur with plantar flexion of ankle.

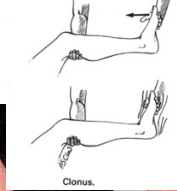


↓ Sure? do reflexes set

The Five Most Commonly Tested Muscle Stretch Reflexes

Muscle	Nerve	Spinal Cord Segment	Muscle Stretch Reflex
• Gastrocnemius	• Tibial	S1 – S2	Ankle “Achilles” Jerk
• Quadriceps	• Femoral	L2 - L4	Knee “Patellar” Jerk
• Biceps	• Musculocutaneous	C5 – C6	Biceps Jerk
• Brachioradialis	• Radial	C5 – C6	Forearm “Brachioradialis or Supinator” jerk
• Triceps	• Radial	C7 – C8	Triceps

Clonus



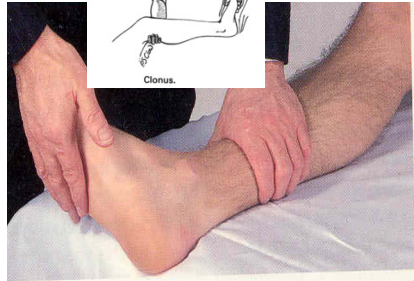
Definition: Rhythmic series of contraction in response to sudden stretch of muscle tendon.

Types of clonus:

1. Ankle clonus.
2. Patellar clonus.

Causes:

1. Organic clonus: occur in UMNL.
2. Hysterical clonus.



Ankle clonus



Patellar clonus



B. Superfacial Reflexes

1. Corneal and conjunctival reflexes:

touch eye from lateral side leads to
blinking of both eyes

Afferent: Trigeminal (ophthalmic) ^{Sensory} nerve
→ Pons

Efferent: ^{motor} Facial nerve → Pons

2. Palatal reflex: stimulation of soft palate leads to its elevation

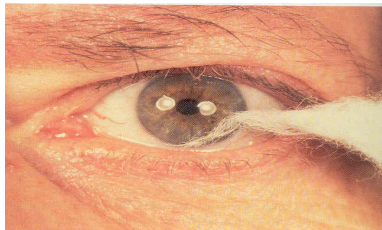
Afferent: Trigeminal nerve → Pons

Efferent: Vagus nerve → medulla.

3. Pharyngeal reflex: stimulation of posterior pharyngeal wall leads to local contraction and gag reflex

Afferent: Glossopharyngeal nerve →
Medulla

Efferent: Vagus nerve → Medulla

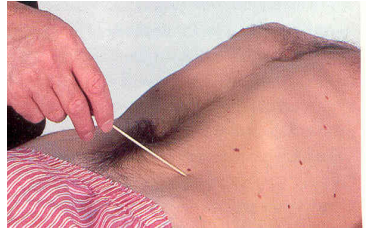


Corneal reflex

4. Abdominal reflexes (T6-T12):

Stroking skin by a pin from lateral to medial. Normal response is by shift of umbilicus towards site of stimulation:

- Upper abdominal reflex (T6-T8).
- Middle abdominal reflex (T8-T10).
- Lower abdominal reflex (T10-T12).



Middle abdominal reflex

5. Cremasteric reflex (L1):

Stroking skin of upper part of medial aspect of thigh. This result in contraction of cremasteric muscle with elevation of the testis.

6. Anal reflex (S3-S5): Stroking across the buttox result in contraction of external anal sphincter.

well contraction → sphincter contraction.

Abnormal Plantar reflexes Seen as Extension of the BigToe

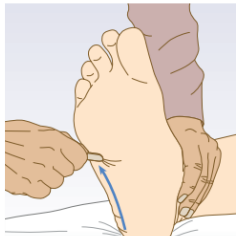
- a. **Babinski reflex** (scratch of the lateral aspect of the foot:

1. Negative Babinski reflex:

plantar flexion of toes.

2. Positive Babinski reflex :

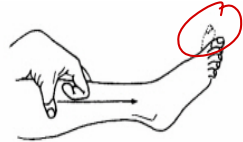
dorsiflexion of big toe and flexion of others toes.



b. Schaeffer's reflex: squeezing the Achilles tendon leads to dorsiflexion of the big toe

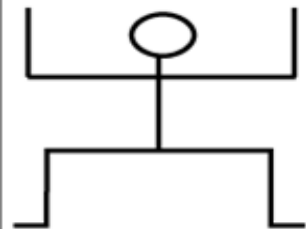
c. Oppenheim's reflex: applying pressure to the medial side of the tibia leads to dorsiflexion of the big toe

d. Gordon's reflex: squeezing the calf muscle leads to dorsiflexion of the big toe

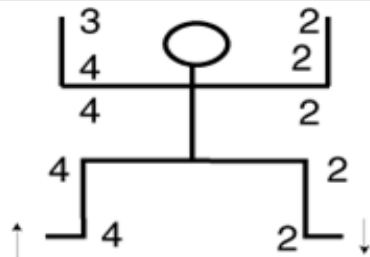


Grading of Reflexes

Response	Grade
Absent	0
Reduced (hypoactive or hyporeflexia)	1
Normal	2
Increased (hyperactive or hyperreflexia)	3
Clonus	4



Blank for
Recording Reflex



Example of Right
Hyperreflexia

VII. Examination of the Coordination System

Lesion of the Cerebellum

1. **Ataxia:** discoordination. *Drunken Gait*

2. **Muscle hypotonia.** *Cerebellar damage, MS → mild spasticity due to this C. damage. ~~not isolated~~*

3. **Intention tremor:** a tremor which increases as the limb approaches its target (tremor during and maximal at the end of movement). Absent at rest.

4. **Dysmetria:** (error in termination of movement).

5. **Dysdiadochokinesia:** a failure to perform a rapid alternating movement.

6. **Dysarthria:** a type of slurred speech. *Characteristic for Cerebellar damage*

7. **Nystagmus.**

8. **Rebound phenomenon:** ask the patient to flex elbow against resistance. Sudden release may cause the hand strike the face due delay in triceps contraction.

*Q. الـ 2.5
Contracted*

Examination of the Coordination in the Upper Limb

- Finger to Doc's finger to nose -*
- Complex*
- **Finger to nose test (dysmetria or intention tremor).**
 - **Finger to nose to finger test.**
 - **Finger to finger test.**
 - **Finger to doctor's finger test.**
 - **Rebound phenomenon:** ask the patient to flex elbow against resistance. Sudden release may cause the hand to strike the face due to delay in triceps contraction.
 - **Adiadokokinesia.**



Examination of the Coordination in the Lower Limb

- **Heel to knee to shin test (ataxia)**
- **Walking along straight line (ataxia).**
- **Rombergism:** first with the eyes open, then with the eyes closed. Disbalance with eye open or closed (cerebellar ataxia), with eye closed only (sensitive ataxia).



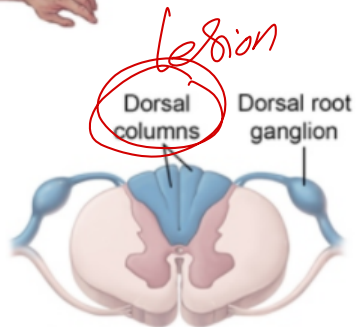
Romberg sign



Eyes open



Eyes closed



**Impaired proprioception
(Sensory ataxia)**

VIII. Examination of the Sensory System

Rules:

1. Eyes should be closed.
2. Compare both sides of the body (leg to leg, arm to arm) to detect hemihypoesthesia.
2. Descending search to detect level of lesion.
3. Compare different dermatomes (for radicular sensory loss).

Symptoms of the Sensory System Lesions

1. Pain:

- a. **Peripheral:** (trigeminal neuralgia, radicular pain)
- b. **Central:** thalamic pain.
- c. **Phantom pain:** due to amputation of limbs
- d. **Allodynia:** pain provoked by a non-painful stimulus
- e. **Causalgia:** severe sympathetic pain

2. Numbness and paresthesia.

3. Anesthesia: complete loss of all forms of sensation:

- a. **Thermoanesthesia:** complete loss of temperature sense.
- b. **Analgesia:** complete loss of pain sense
- c. **Tactile anesthesia.**
- d. **Pallesthesia:** loss of vibratory sense.

4. Hypoesthesia: partial loss of all forms of sensation.

5. Hyperesthesia: increased sensitivity to various stimuli.

6. Hyperpathia, hyperalgesia: exaggerated response to a painful stimulus (severe painful).

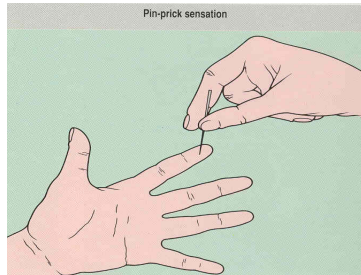
8. Sensory ataxia.

8. Afferent (sensory) paralysis.

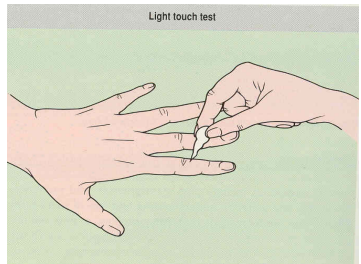
9. Astereognosis.

a. Superfacial Sensation

1. **Pain sense** → using pin prick.



2. **Touch sense** → using a piece of cotton.



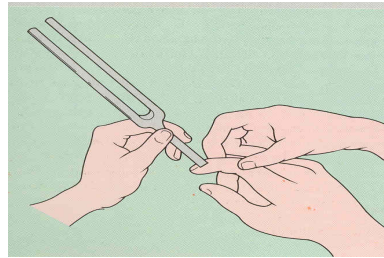
3. **Temperature sense** → using hot & cold test tubes.

b. Deep Sensation

proprioception

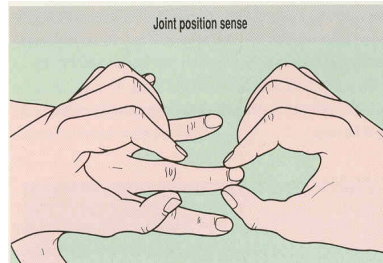
1. Vibration sense.
2. Joint sense.
3. Muscle sense.
4. Nerve sense.
5. Rombergism (Romberg's) test.

1. **Vibration Sense:** vibrating fork placed over bony prominence, if decreased or lost, indicates posterior column affection



2. **Joint Sense:** "sense of position & movement".

Hold the big toe from each side (or the index finger in U.L.) and dorsiflexion or plantar flexion. Ask the patient (with closed eyes). Normal if the patient feels it moving & if so in which direction.

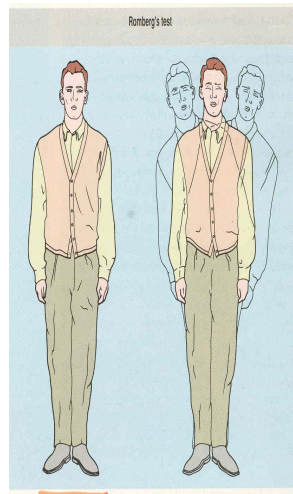


3. Muscle Sense: done by pinching the calf or abdominal muscles.

4. Nerve Sense: e.g. press the ulnar nerve against bone.
Normally results in electric-like sensation.

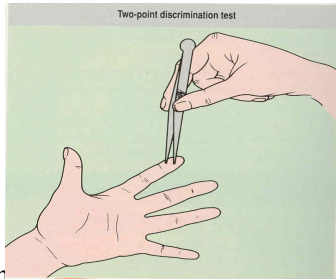
5. Rombergism Test: Ask the patient to stand with closed eyes. In deep sensory loss, he tends to fall on the ground.

- Loss deep sensation with preserved superficial sensation occur in posterior column lesion as in Tabes dorsalis, subacute combined degeneration (SCD), pellagra.



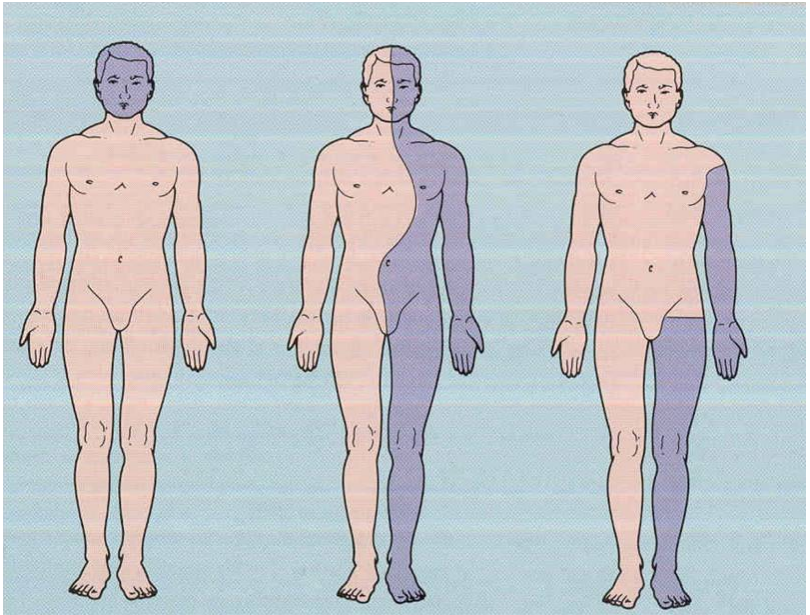
c. Cortical Sensation

1. **Tactile localization:** localize site of pain prick over the body.
2. **Tactile discrimination:** “two points discrimination”.
Localize two stimulation pin pricks
(a minimal distance between them i.e. 5 mm in finger & 5 cm over back).
3. **Stereognosis:** recognition of a familiar object in hand (e.g. a key).
4. **Graphosthesia:** recognition of a number or letter drawn on hands.



Non-Organic Sense Loss

(Functional or Hysterical Sensory Loss)





Thank You