The Neurological Examination

7 categories of the neurological exam

- Mental status
- Cranial nerves
- Motor system
- Reflexes
- Sensory system
- Coordination
- Station and gait

The mental status exam

- Level of consciousness
- Attention: alert when you call his name
- Orientation: to time , place and person
- Language — fluency, comprehension, repetition, naming, reading, writing
- Memory — immediate recall, recent, remote
- Higher intellectual function—general knowledge, abstraction, judgment, insight, reasoning
- Mood and affect •

Glasgow Coma Scale

Flash Card

BEHAVIOR	RESPONSE	SCORE
Eye opening response	•Spontaneously	4
	•To speech	3
	•To pain	2
	•No response	1
Best verbal response	•Oriented to time, place, and person	5
	•Confused	4
	•Inappropriate words	3
	•Incomprehensible sounds	2
	•No response	1
Best motor response	•Obeys commands	6
	•Moves to localized pain	5
	•Flexion withdrawal from pain	4
	•Abnormal flexion (decorticate)	3
	•Abnormal extension (decerebrate)	2
	•No response	1

Total score:

- **Mild.** >13
- **Moderate.** 9 - 12
- **Severe** < 8

CNI: Olfactory nerve

-Cannot evaluate if nasal passages obstructed by rhinitis, polyps, etc .

- Eyes closed , Occlude one nostril and test other
- Compare 2 sides
- Use nonirritating substances – Avoid those that stimulate trigeminal nerve endings or taste buds (e.g., peppermint, menthol, ammonia)

CNII: Optic nerve

1-Visual acuity by snellen test

2-Visual fields

3-Fundoscopy

4-Afferent limb of pupillary function

Visual acuity

Begin by assessing the patient's **visual acuity** using a **Snellen chart.** If the patient normally uses **distance glasses**, ensure these are **worn** for the assessment.

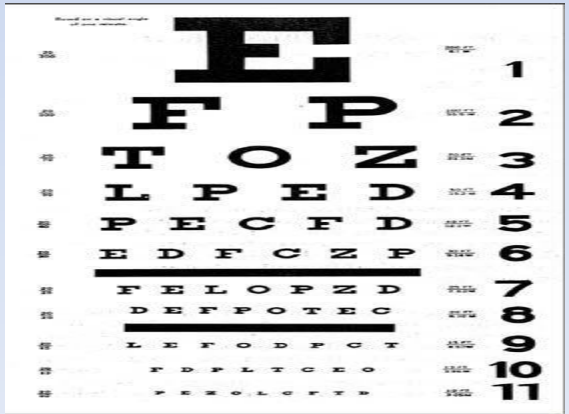
1. Stand the patient at 6 metres from the Snellen chart.

2. Ask the patient to cover one eye and read the lowest line they are able to.

3. Record the lowest line the patient was able to read (e.g. 6/6 [metric] which is equivalent to 20/20 [imperial]).

4. You can have the patient read through a pinhole to see if this improves vision (if vision is improved with a pinhole, it suggests there is a refractive component to the patient's poor vision).

5. Repeat the above steps with the other eye.)



Visual fields

This method of visual field assessment relies on **comparing** the **patient's** visual field with **your own** and, therefore, for it to work:

1. Sit directly opposite the patient, at a distance of around 1 metre.

2. Ask the patient to cover one eye with their hand.

3. If the patient covers their right eye, you should cover your left eye (mirroring the patient).

4. Ask the patient to focus on part of your face (e.g. nose) and not move their head or eyes during the assessment. You should do the same and focus your gaze on the patient's.

5- Assess the patient's peripheral visual field by comparing it to your own and using the visual target. Start from the periphery and slowly move the target towards the centre, asking the patient to report when they first see it. If you are able to see the target but the patient cannot, this would suggest the patient has a reduced visual field.

6- Repeat this process for each visual field quadrant, then repeat the entire process for the other eye..

Types of visual field defects

- **Bitemporal hemianopia**: loss of the temporal visual field in both eyes resulting in central tunnel vision. Bitemporal hemianopia typically occurs as a result of optic chiasm compression by a tumour (e.g. pituitary adenoma, craniopharyngioma).
- **Homonymous field defects**: affect the same side of the visual field in each eye and are commonly attributed to stroke, tumour, abscess (i.e. pathology affecting visual pathways posterior to the optic chiasm). These are deemed **hemianopias** if half the vision is affected and **quadrantanopias** if a quarter of the vision is affected.
- **Scotoma**: an area of absent or reduced vision surrounded by areas of normal vision. There is a wide range of possible aetiologies including demyelinating disease (e.g. multiple sclerosis) and diabetic maculopathy.
- **Monocular vision loss**: total loss of vision in one eye secondary to optic nerve pathology (e.g. anterior ischaemic optic neuropathy) or ocular diseases (e.g. central retinal artery occlusion, total retinal detachment).

CNII & III

-Assess the **direct pupillary reflex**:

-Shine the light from your pen torch into the patient's pupil and observe for pupillary restriction in the **ipsilateral** eye.

-A normal direct pupillary reflex involves constriction of the pupil that the light is being shone into.

- Look for both direct (same eye) and consensual (opposite eye) reaction

Miosis < □2 mm

Mydriasis > □5 mm

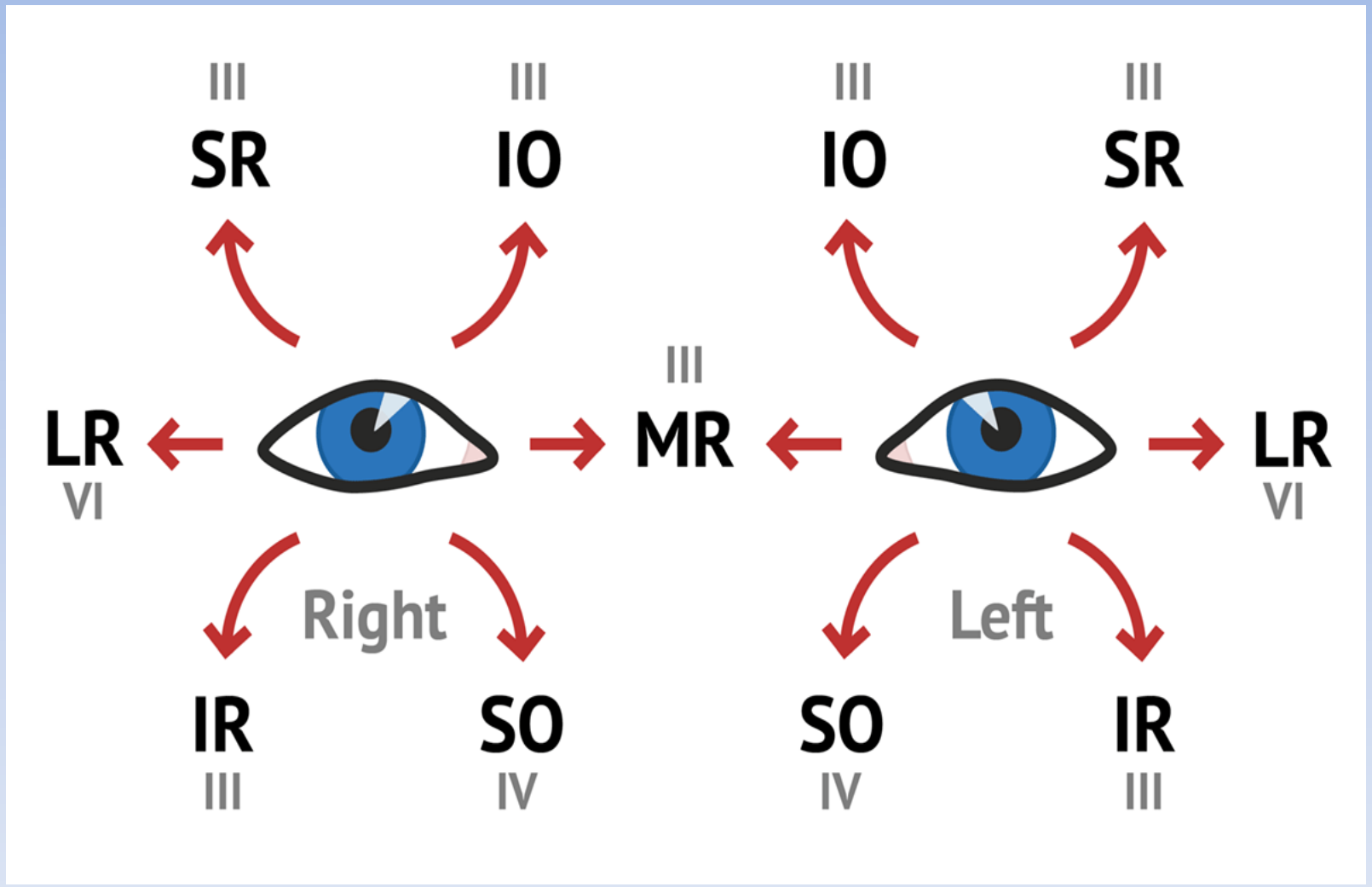
Anisocoria = pupillary asymmetry

Accomodation

- **1**. Ask the patient to focus on a distant object (clock on the wall/light switch).
- **2**. Place your finger approximately 20-30cm in front of their eyes (alternatively, use the patient's own thumb).
- **3**. Ask the patient to switch from looking at the distant object to the nearby finger/thumb.
- **4**. Observe the pupils, you should see constriction and convergence bilaterally.

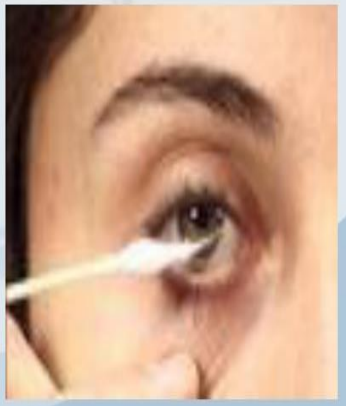
CNIII, IV, VI: Ocular nerves

- Briefly assess for **abnormalities** of **eye movements** that may be caused by underlying cranial nerve palsy (e.g. oculomotor, trochlear, abducens, vestibular nerve pathology).
- **1**. Hold your finger (or a pin) approximately 30cm in front of the patient's eyes and ask them to focus on it. Look at the eyes in the primary position for any deviation or abnormal movements.
- **2**. Ask the patient to keep their head still whilst following your finger with their eyes. Ask them to let you know if they experience any double vision or pain.
- **3**.Move your finger through the various axes of eye movement in a 'H' pattern.
- **4**. Observe for any restriction of eye movement and note any nystagmus (which may suggest vestibular nerve pathology or stroke).


III
SR
III
IO
III
IO
III
SR
III
MR
LR
VI
LR
VI
Right
Left
IR
III
SO
IV
SO
IV
IR
III

CNV: Trigeminal nerve

- Corneal reflex :patient looks up and away.
  - Touch cotton wool to other side.
  - Look for blink in both eyes, ask if can sense it.
  - Repeat other side [tests V sensory, VII motor].



Cranial Nerve V- Trigeminal

- Motor Function
  - Palpate temporal & masseter muscles as patient clenches teeth
    - Try to separate jaw by pushing down on chin

  Jaw strength equal bilaterally
- Sensory Function
  - Test light sensation with cotton ball over
    - Forehead (ophthalmic)
    - Cheeks (maxillary)
    - Chin (mandibular)

Sensation intact and equal bilaterally

CNVII Facial nerve

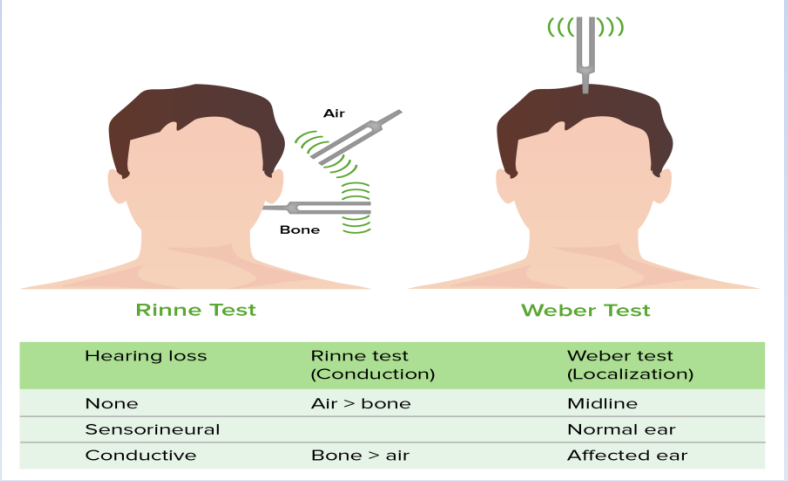
CNVIII: Auditory nerve

Hearing (cochlear nerve) – Test with finger rubbing at arm's length

–If can't hear strong rubbing→impaired

–If can hear faint rubbing→normal

– Tuning fork tests (Weber, Rinne) have extremely poor sensitivity



Hearing loss	Rinne test (Conduction)	Weber test (Localization)
None	Air > bone	Midline
Sensorineural		Normal ear
Conductive	Bone > air	Affected ear

CNIX & X: Glossopharyngeal & vagus nerves

Testing centers on motor function

- Palate elevation
- Swallowing
- Voice
- Cough
- Gag reflex

CNXI: accessory nerve

Trapezius – Push head back against resistance – Shrug shoulders

- Sternocleidomastoid – Place hand on lower face and have patient rotate head toward that side – Observe contraction of opposite SCM

CNXII: Hypoglossal nerve

Note tongue position at rest and on protrusion – Does tongue deviate in either position?

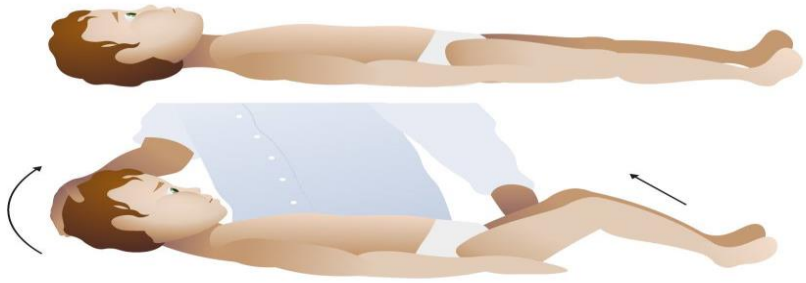
- Note strength and rapidity of movements
- Have patient push tongue into each cheek

Meningeal signs

1- Nuchal rigidity

2- Kernig’s sign

3- brudzinski’s sign



Brudzinski’s sign:
Flexion of the hips and knees in response to neck flexion

Kernig’s sign:
Resistance to extension of leg while the hip is flexed

Motor exam

Compare left to right, proximal to distal, arms to legs

– Bulk (muscle mass)

– Tone (muscle tension at rest) ,test with passive manipulation

– Power or Strength

Muscle Tone

Tone is the resistence felt by examiner when moving the joints passively .

Ask the patient to lie supine and relax and then passively move every joint in its range of movement both slowly and quickly .

-Hypertonia means increase muscle tone and suggest upper motor neuron lesion, occurs in 2 forms (rigidity and spasticity).

-Hypotonia means reduced muscle tone and indicate lower motor neuron lesion .

Muscle power

-First ask for pain which may interfere with the test

-Test upper limbs while patient sitting on the edge of the bed and lower limbs while patient lying down .

-Assess whether he can overcome gravity then resistence .

-Check at muscle distribution according to next table .

11.21 Nerve and muscle supplies of commonly tested movements

Movement	Muscle	Nerve/root
Shoulder abduction	Deltoid	Axillary C5
Elbow flexion	Biceps Brachioradialis	Musculocutaneous C5, 6 Radial C6
Elbow extension	Triceps	Radial C7
Wrist extension	Extensor carpi radialis longus	Posterior interosseus nerve (radial) C6
Finger extension	Extensor digitorum communis	Posterior interosseous (radial) C7
Finger flexion	Flexor pollicis longus (thumb) Flexor digitorum profundus (index and middle fingers) Flexor digitorum profundus (ring and little fingers)	Anterior interosseus (median) C8 Ulnar C8
Finger abduction	First dorsal interosseous	Ulnar T1
Thumb abduction	Abductor pollicis brevis	Median T1
Hip flexion	Iliopsoas	Iliofemoral nerve L1, 2
Hip extension	Gluteus maximus	Sciatic L5/S1
Knee flexion	Hamstrings	Sciatic S1
Knee extension	Quadriceps	Femoral L3/4
Ankle dorsiflexion	Tibialis anterior	Deep peroneal L4, L5
Ankle plantar flexion	Gastrocnemius and soleus	Tibial S1/2
Great toe extension (dorsiflexion)	Extensor hallucis longus	Deep peroneal L5
Ankle eversion	Peronei	Superficial peroneal L5/S1
Ankle inversion	Tibialis posterior	Tibial nerve L4, 5

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Grades of muscle power

0-No muscular contraction

1-Visible muscle contraction, but no movement at joint

2-Movement at the joint, but not against gravity
3-Movement against gravity, but not against resistance

4-Movement against some resistance, but < full
5 Movement against full resistance; normal strength

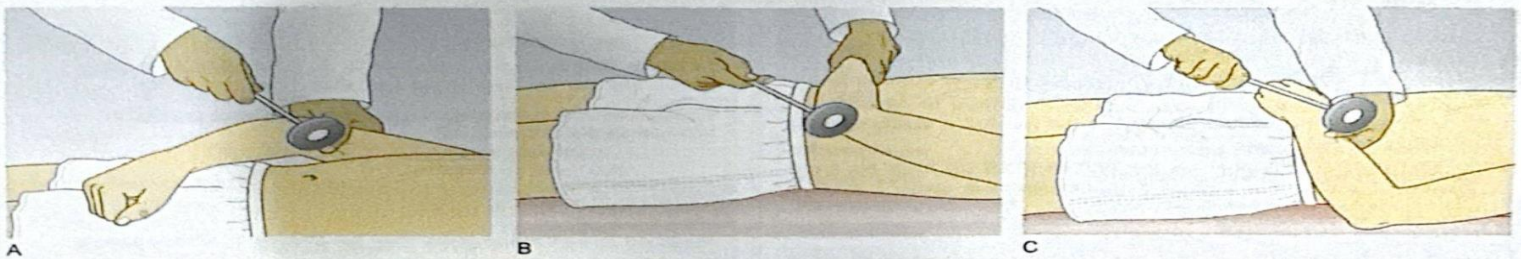
Reflexes

1-Deep tendon reflexes

Involuntary contraction of a muscle in response to stretch.

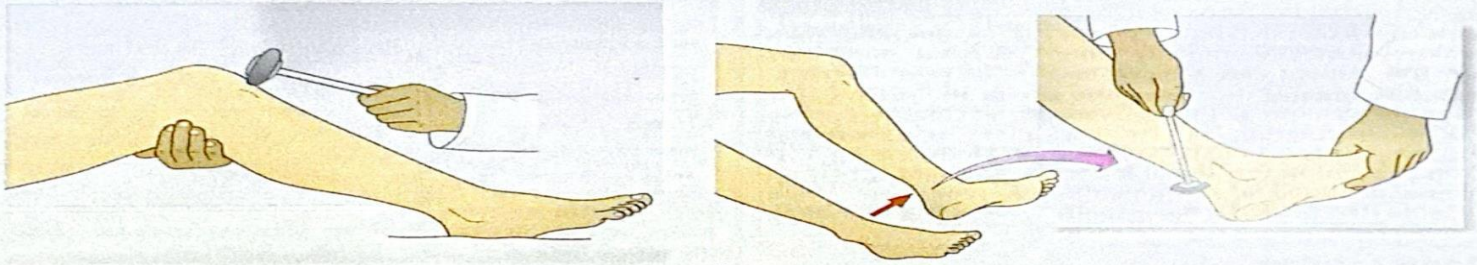
2- Superficial reflexes: resulted from cutaneuous stimulation rather than stretch for example (planter , abdominal and cremastric reflex)

-Ask the patient to lie supine and relaxed , flex your wrist and strike the tendon with your hummer head . Record as normal , absent , increased or dimineshed .



A B C

Fig. 11.18 Testing the **deep tendon reflexes of the upper limb. (A)** Eliciting the biceps jerk, C5. **(B)** Triceps jerk, C7. **(C)** Supinator jerk, C6.



A B

Fig. 11.19 Testing the deep tendon reflexes of the lower limb. **(A)** Eliciting the knee jerk (note that the legs should not be in contact with each other), L3, L4. **(B)** Ankle jerk of recumbent patient, S1.

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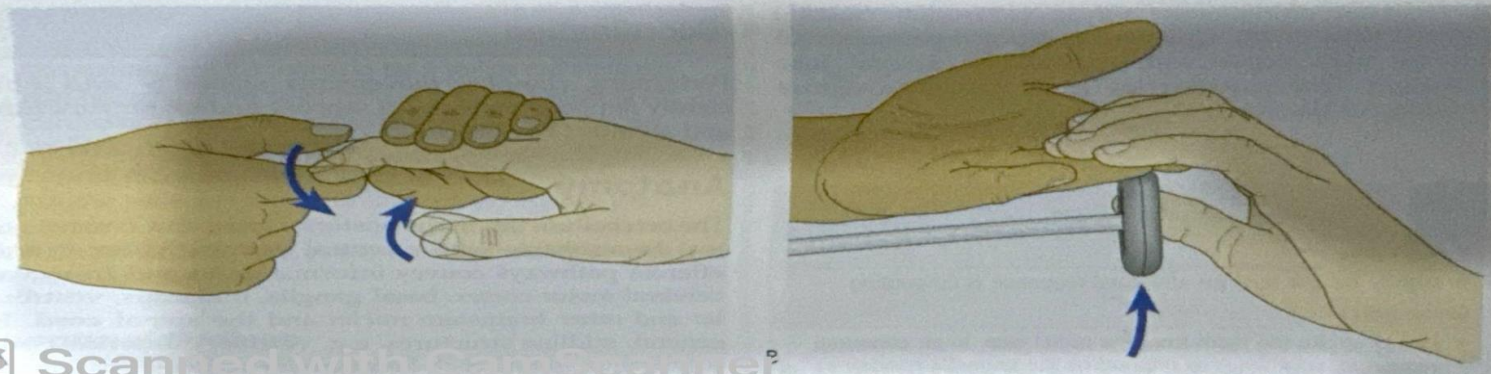

Fig. 11.21 Testing the deep tendon reflexes of the hand. **(A)** Hoffmann's sign. **(B)** Eliciting a finger jerk.

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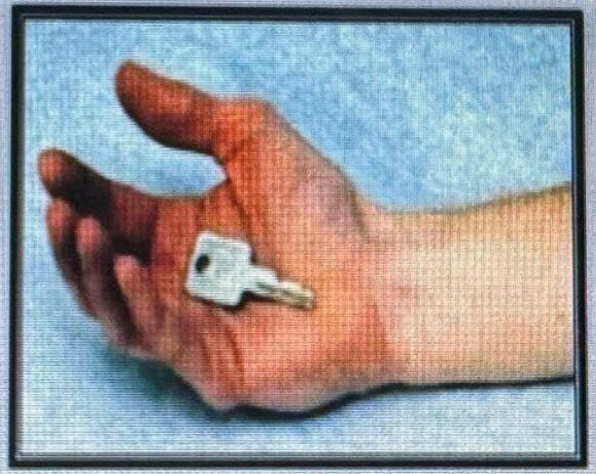
Sensory exam

Primary sensation – Pain and temperature – Light touch/pressure – Vibration – Proprioception. Caracterize as normal, absent, reduced, exaggerated, or perverted (dysesthesias) •

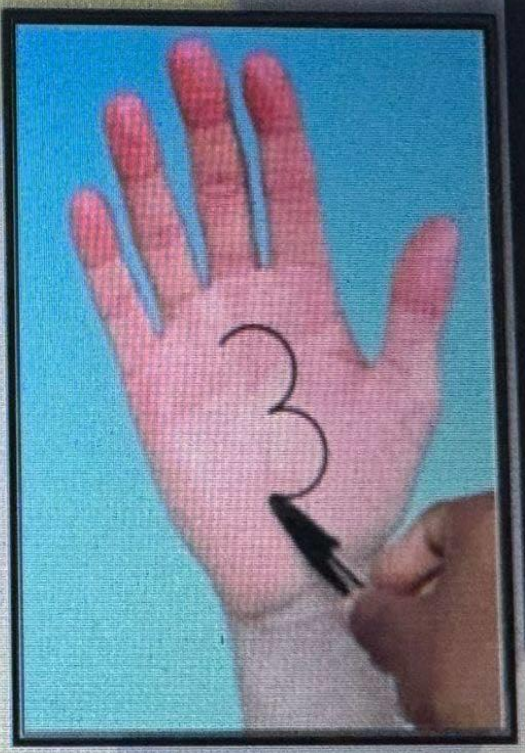
Integrative sensation: Graphesthesia, 2 point discrimination and Stereognosis

Cortical sensation

2 Point Discrimination test



Stereognosis test

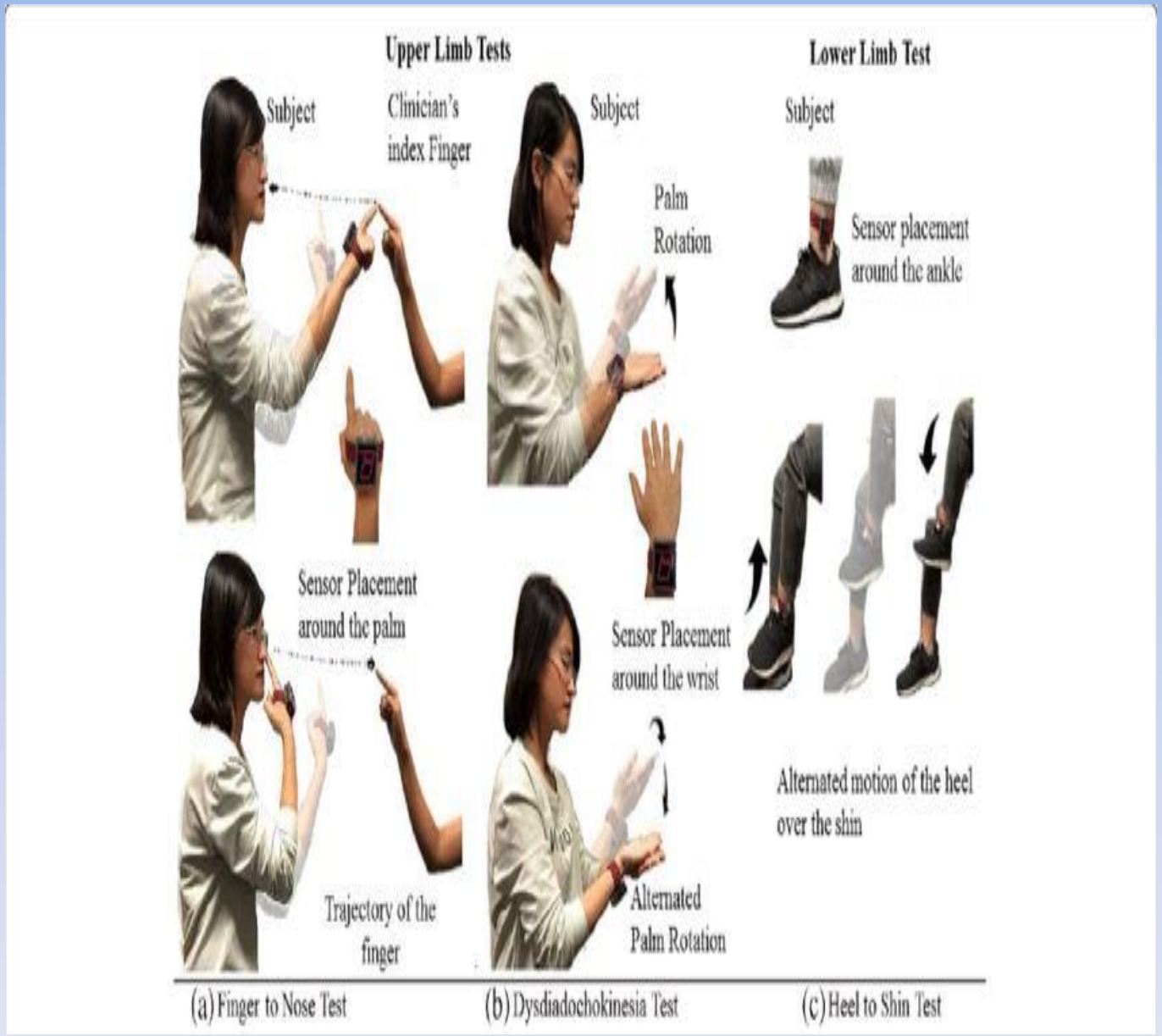


Graphesthesia test

Coordination/cerebellar

Test at rest and with action in trunk and limbs

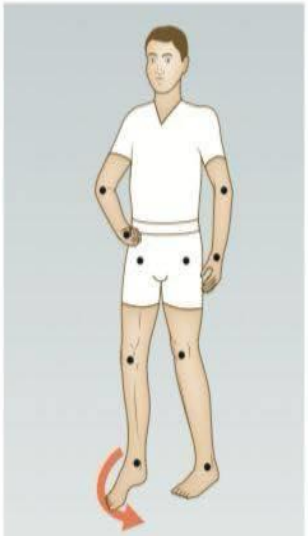
- Finger-nose-finger
- Rapid alternating movements
- Heel-knee-shin
- Finger or toe tapping


Upper Limb Tests
Lower Limb Test
Subject
Clinician's index Finger
Subject
Palm Rotation
Subject
Sensor placement around the ankle
Sensor Placement around the palm
Sensor Placement around the wrist
Alternated motion of the heel over the shin
Trajectory of the finger
Alternated Palm Rotation
(a) Finger to Nose Test
(b) Dysdiadochokinesia Test
(c) Heel to Shin Test

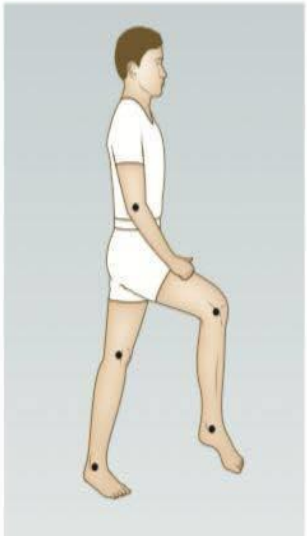
Gait

Posture of body and limbs

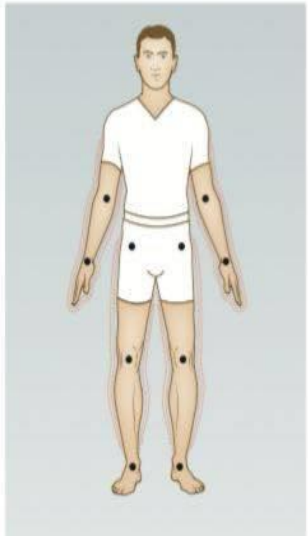
- Length, speed, and rhythm of steps
- Symmetry and base of gait
- Steadiness
- Arm swing
- Turns
- Test with normal gait, toe walking, heel walking.



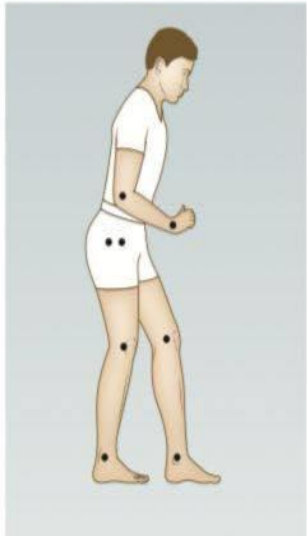
A Spastic hemiparesis
One arm held immobile and close to the side with elbow, wrist and fingers flexed
Leg extended with plantar flexion of the foot
On walking, the foot is dragged, scraping the toe in a circle (circumduction)
Caused by upper motor neurone lesion, e.g. stroke



B Steppage gait
Foot is dragged or lifted high and slapped on to the floor
Unable to walk on the heels
Caused by foot drop owing to lower motor neurone lesion



C Sensory or cerebellar ataxia
Gait is unsteady and wide-based. Feet are thrown forward and outward and brought down on the heels
In sensory ataxia, patients watch the ground. With their eyes closed, they cannot stand steadily (positive Romberg sign)
In cerebellar ataxia, turns are difficult and patients cannot stand steadily with feet together whether eyes are open or closed
Caused by polyneuropathy or posterior column damage, e.g. syphilis



D Parkinsonian gait
Posture is stooped with head and neck forwards
Arms are flexed at elbows and wrists. Little arm swing
Steps are short and shuffling and patient is slow in getting started (festinant gait)
Caused by lesions in the basal ganglia

Thank you •