

# **The Neurological Examination**

The neurological exam consists of several subdivisions we will discuss:

1. Examination of the upper limbs
2. Examination of the lower limbs

Before you start the examination make sure to wash your hands, introduce yourself to the patient, take permission to perform the exam, explain to the patient the nature of each test before performing it and respect the patient's privacy and dignity.

To examine the upper and lower limbs you need tendon hammer, neurotip (sterile sharp object), Cotton wool and tuning fork (128Hz)

## **Examination of the upper limbs**

The examination consists of:

1. Inspection
2. Testing muscle tone
3. Testing muscle power
4. Testing sensations
5. Testing deep tendon reflexes
6. Testing coordination.

### **Inspection**

- Look for Asymmetry between the right and left upper limbs
- Look for scars, wasting, involuntary movements, fasciculations, and tremor. (SWIFT)
- Assess for pronator drift extend the arms with palms in supination then ask the patient to close his eyes if the arms pronate this indicates upper motor lesion

### **Tone**

- Ask the patient to relax (go floppy)
- Passively flex and extend his shoulder, elbow and wrist joints
- Feel for abnormalities of tone as you assess each joint (e.g. spasticity, rigidity, hypotonia).

### **Power**

- Assess shoulder, elbow and wrist
- Compare the right and left sides
- Assess for the patient's ability to push against your hand
- Remember strength varies with age, occupation and fitness.

- Test: shoulder (abduction, adduction), elbow (flexion, extension), wrist (flexion, extension)
- Grade muscle power using the Medical Research Council (MRC) scale

7.8 Medical Research Council grading of muscle power	
Grade	Description
0	No muscle contraction visible
1	Flicker of contraction but no movement
2	Joint movement when effect of gravity eliminated
3	Movement against gravity but not against resistance
4 <sup>s</sup>	Movement against resistance but weaker than normal
5	Normal power

### Sensation

- Ensure the patient has his eyes closed.
  - Show the patient how the sensation feels on sternum first.
  - Assess sensation across each of the upper limb dermatomes, comparing left to right at equivalent regions as you progress.
  - Assess light touch sensation using a cotton wool.
  - Assess pain sensation using a neurotip
  - Assess vibration sensation using a tuning fork
  - Assess Proprioception; joint position sense
- ❖ For proprioception and vibration we start distally (distal interphalangeal joint) if the sensation is intact conclude the test, if there is an abnormality test a more proximal joint.

### Reflexes

- Check the deep tendon reflexes using impulses from a tendon hammer delivered to the tendon NOT the muscle.
- The limbs should be in a relaxed and symmetric position, it is important to compare each reflex immediately with its contralateral counterpart so that any asymmetries can be detected.
- Check the: Biceps reflex (C5/6), and Triceps reflex (C7)
- Deep tendon reflexes are often rated according to the following scale:
  - Increased (+++)
  - Normal (++)
  - Decreased (+)
  - Absent (0).

## **Coordination**

- Perform Finger-to-nose test.
  - Ask the patient to touch their nose with the tip of their index finger and then touch your fingertip as fast as they can while you continually move your finger.
  - The presence of dysmetria and intention tremor is suggestive of a cerebellar pathology.
- Perform rapid-alternating movement test
  - Ask the patient to place their left palm on top of their right palm then turn over their left hand and touch the back of it onto their right palm then return their left hand to the original position and repeat the sequence quickly
  - The inability to perform the test is a feature of a cerebellar pathology

## **Examination of the lower limbs**

The examination consists of:

1. Inspection
2. Observation of the gait
3. Testing muscle tone
4. Testing muscle power
5. Testing sensations
6. Testing deep tendon reflexes
7. Testing coordination

## **Inspection**

- Look for Asymmetry between the right and left lower limbs
- Look for scars, wasting, involuntary movements, fasciculations, and tremor. (SWIFT)

## **Gait**

- Ask the patient to walk to the end of the examination room and then turn and walk back whilst you observe his gait paying attention to: Speed, Stability, Arm swing, Steps, Turning and Balance. Let the patient perform tandem gait, tip-toe gait and heel gait.
- Some abnormal gaits:
  - Ataxic gait: broad-based, unsteady and associated with either cerebellar pathology or sensory ataxia
  - Parkinsonian gait: small, shuffling steps, stooped posture and reduced arm swing

- Perform Romberg Test
  - Ask the patient to put his feet together, arms by his side then close his eyes. Loss of balance = positive Romberg's sign. BE READY TO CATCH THE PATIENT
  - Loss of balance that only occurs on eye closure (positive Romberg's sign) indicates proprioceptive sensory loss (sensory ataxia) or bilateral vestibular failure.
  - Cerebellar ataxia is NOT usually associated with a positive Romberg test.

### Tone

- Ask the patient to relax (go floppy)
- We must test hip, knee and ankle muscle groups
- Roll each leg to assess tone in the muscles responsible for the rotation of the hip
- Lift each knee briskly off the bed and observe the movement of the leg.
- Test for ankle clonus:
  - Support the patient's leg, with both the knee and the ankle resting in 90-degree flexion. Briskly dorsiflex and partially evert the foot, sustaining the pressure.
  - Clonus is felt as repeated beats of dorsiflexion/ plantar flexion.
  - Associated with upper motor neuron lesions.

### Power

- Assess the hip, knee and ankle
- Compare the right and left sides
- Assess for the patient's ability to push against your hand
- Remember strength varies with age, occupation and fitness.
- Test: hip (flexion, extension, abduction, adduction), knee (flexion, extension), and ankle (dorsiflexion, plantarflexion, inversion, eversion)
- Grade muscle power using the Medical Research Council (MRC) scale

### Sensation

- Ensure the patient has his eyes closed.
- Assess sensation across each of the lower limb dermatomes, comparing left to right at equivalent regions as you progress.
- Assess light touch sensation, pain sensation, vibration sensation and proprioception.

## Reflexes

- Check the deep tendon reflexes using impulses from a tendon hammer.
- The limbs should be in a relaxed and symmetric position, it is important to compare each reflex immediately with its contralateral counterpart.
- Check the: knee-jerk reflex (L3, L4), ankle-jerk reflex (S1),
- Check plantar reflex : Run a blunt object (key) along the lateral border of the sole of the foot towards the little toe. Normally plantar flexion of the toes will happen.
  - Positive Babinski reflex = Dorsiflexion of the great toe and abduction (fanning) of the other toes indicates UMN lesion

## Coordination

- Heel-to-shin test
  - ✓ Ask the patient to lift the heel into the air and to place it on their opposite knee, then slide their heel up and down their shin between knee and ankle as quickly as he can.
  - ✓ Inability to perform the test might be due to cerebellar disease , loss of proprioception or muscle weakness (check muscle power first).

## Important Notes

- Tremor is an involuntary, oscillatory movement about a joint or a group of joints, resulting from alternating contraction and relaxation of muscles.
  - Parkinson's disease causes a slow , coarse, 'pill-rolling' tremor, worse at rest (resting tremor) but reduced with voluntary movement. It is more common in the upper limbs.
  - Intention tremor is absent at rest but maximal on movement and on approaching the target (hunting tremor), and is usually due to cerebellar damage. It is best assessed with the finger-to-nose test
- Spasticity and rigidity both involve increased tone
- Spasticity is associated with increased tone in the initial part of the movement which then suddenly reduces past a certain point. It is "Velocity-Dependent", meaning the faster you move the limb, the worse it is. It is "Direction- dependent", meaning it is worse with flexion or extension. It is associated with pyramidal tract lesions (e.g. stroke)
- Rigidity is a hypertonic state characterized by constant resistance throughout range of motion that is **INDEPENDENT OF THE VELOCITY AND DIRECTION OF MOVEMENT**. It is associated with extrapyramidal tract lesions (e.g. Parkinson's disease).

7.6 Features of motor neurone lesions		
	Upper motor neurone lesion	Lower motor neurone lesion
Inspection	Usually normal (may be disuse wasting in longstanding lesions)	Muscle wasting, fasciculations
Tone	Increased with clonus	Normal or decreased, no clonus
Weakness	Preferentially affects extensors in arms, flexors in leg	Usually more focal, in distribution of nerve root or peripheral nerve
Deep tendon reflexes	Increased	Decreased/absent
Plantar response	Extensor (Babinski sign)	Flexor

### **Important Links**

1. Upper limb examination: <https://www.youtube.com/watch?v=0hhcxaeOCYs>
2. Lower limb examination: [https://www.youtube.com/watch?v=-7ERNH\\_o5Ss](https://www.youtube.com/watch?v=-7ERNH_o5Ss)