

Living anatomy

Neurological examination 1: Motor system

Clinical examination of the neuromuscular system

1. Observation

Examine the three Ss

- a. Size
- b. Shape
- c. Symmetry
- d. Involuntary movements
- e.

Abnormal Clinical signs:

- Atrophy
- Hypertrophy
- Asymmetry

2. Tonus is a small, continuous resistance to passive movement:

- a. Ask the patient to relax.
- b. Test passive movements at main joints - hip, knee, ankle, elbow, wrist, fingers
- c.

Abnormal Clinical signs:

- Hypotonia - decreased muscle tone
- Hypertonia - increased muscle tone
- Flaccid - complete loss of tonus
- Spasticity / rigidity
 - cog wheel rigidity (step-wise resistance to movement)
 - lead pipe rigidity (uniform resistance to movement)

3. Muscle strength

Test movement against resistance and grade as follows:

Grade 0	No muscle movement
Grade 1	Visible muscle movement, but no movement at the joint
Grade 2	Movement at the joint, but not against gravity
Grade 3	Movement against gravity, but not against added resistance
Grade 4	Movement against resistance, but less than normal
Grade 5	Normal strength

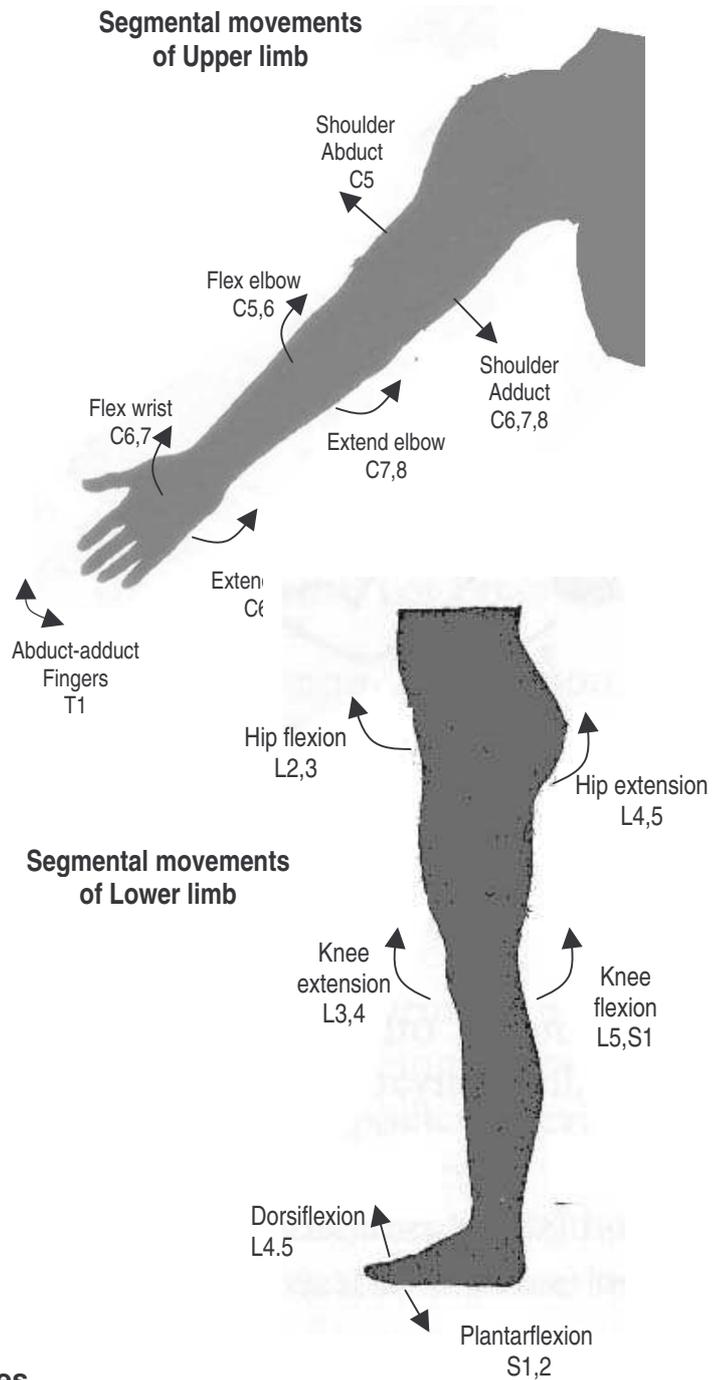
4. Muscle (tendon) reflexes.

These are monosynaptic, spinal and segmental reflexes. Tapping a tendon or muscle belly elicits contraction of the muscle. The muscle must be relaxed and the patient positioned properly. Interference from voluntary movements may be eliminated by asking the patient to perform isometric contraction of other muscles e.g. clenching teeth or making a tight fist. Reflexes are graded from 0 to 4 as follows:

Grade 0	Absent
Grade 1	Decreased
Grade 2	Normal
Grade 3	Increased
Grade 4	Increased with clonus

5. **Segmental Innervation.** Testing various movements and reflexes to reflect segmental innervation as follows

	Movements
C5	Shoulder Abduction, lateral rotation
C6,C7,C8	Shoulder Adduction, medial rotation
C5, C6,	Elbow Flexion (biceps)
C7, C8	Elbow Extension (triceps)
C6	Forearm supination
C7,C8	Forearm pronation
C6,C7	Wrist Flexion Wrist Extension
C7,C8	Finger Flexion Finger Extension
T1	Finger abduction, adduction Thumb opposition
T8 to T12	Flexion of abdominal muscles
L2, L3	Hip Flexion (iliopsoas) Hip Adduction (adductors)
L4, L5, S1	Hip Extension (gluteus maximus) Hip Abduction (gl.medius, minimus)
L3, L4	Knee Extension (quadriceps)
L5, S1	Knee Flexion (hamstrings)
L4,L5	Ankle Dorsiflexion (extensors)
S1, S2	Ankle Plantar flexion (soleus)
L4	Foot Inversion
L5,S1	Foot Eversion



	Reflexes
C5, C6	Biceps reflex
C5,C6	Brachioradialis reflex
C6, C7	Triceps reflex
T8 to T12	Abdominal reflex
L2, L3, L4	Knee reflex
S1, S2	Ankle reflex

6. **Summary of segmental muscle reflexes .**

For upper limb reflexes place upper limb in position of rest – elbow semi-flexed, semi prone; hand hanging free.

- Biceps reflex (C5, C6) - Place your finger firmly on the biceps tendon and strike your finger with the reflex hammer. You should feel the response even if you can't see it.
- Triceps reflex (C6, C7) Strike the triceps tendon above the olecranon
- Brachioradialis reflex (C5, C6) Strike the tendon as it lies over the radius about 1-2 inches above the wrist. Watch for flexion and supination of the forearm.

- d. Abdominal reflex (T8 to T12). Using a blunt pointed object stroke the abdomen lightly on each side above the umbilicus (T8, T9, T10) and below the umbilicus (T10, T11, T12). Note the contraction of the abdominal muscles and deviation of the umbilicus towards the stimulus.

For lower limb reflexes the knee is supported in the flexed position with heel resting on a surface or the leg is hanging free in the sitting position

- e. Knee reflex (L2, L3, L4) Strike the patellar tendon. Note contraction of the quadriceps and extension of the knee.
- f. Ankle reflex (**S1**, S2). Dorsiflex the foot at the ankle. Strike the Achilles tendon. Watch and feel for plantar flexion at the ankle.
- g. Plantar (Babinski) reflex . Stroking the lateral aspect of the sole with a blunt pointed object normally produces plantar flexion of the great toe (negative Babinski sign). Dorsiflexion of the great toe (positive Babinski sign) suggests an upper motor neuron lesion, and also be associated with fanning out of the other toes.

7. **Involuntary movements**

These are always abnormal. They consist of:

- a. **Fasciculations** are random involuntary contractions of muscle fasciculi. They occur in some neuromuscular diseases e.g. amyotrophic lateral sclerosis (ALS).
- b. **Tics** are involuntary contractions of single muscles groups producing stereotyped movements. Most are benign but may occur in some conditions.
- c. **Myoclonus** is a brief generalized body-jerk. .
- d. **Dystonias** are prolonged muscle contractions that are result in spasms. E.g. blepharospasm (involuntary closure of eyes); spasmodic torticollis (wry neck).
- e. **Athetosis** is an involuntary slow writhing movement producing inappropriate grimacing or jerky movements. Variants are chorea (literally meaning dance) and hemiballismus (literally meaning half-dance that affects part of the body)
- f. **Seizures** are fits of spontaneous jerky sustained contractions of muscles which may be generalized or restricted to a part of the body.

8. **Distinguishing Upper and Lower Motor Neuron lesions**

	Lower Motor Neuron Lesion	Upper motor Neuron Lesion
Muscle strength	Paralysis	Paralysis
Muscle tone	Flaccid	Spastic
Muscle reflexes	Absent	Increased
Recovery	Possible if there is nerve continuity	Absent *

*** Limited recovery is possible if damage is due to oedema**