1 Motor System

1. What is a motor unit?

Ans. The nerve cell, its axons and the muscle fibres they subserve constitutes the motor unit.

2. What is muscle tone?

Ans. The slight resistance that normal relaxed muscles offer to passive movement is muscle tone.

3. What are ramp and ballistic movements?

Ans. *Ramp movements*: Movements that are performed slowly.

Ballistic movements: Movements that are performed rapidly.

4. What is Sherrington's law of reciprocal innervation?

Ans. For a movement to be smooth, the entensor muscles (antagonists) must relax at the same time as the flexors contract.

5. What are the tracts which mediate movement of distal muscles?

Ans. Corticospinal tracts

Rubrospinal tracts.

6. Which tracts mediate proximal limb and axial muscles and help in antigravity postural mechanisms?

Ans. i. Reticulospinal tracts

ii. Vestibulospinal tracts.

7. What is muscle tone and tendon reflex activity dependent on?

Ans. It depends on:

- Muscle spindles and their afferent fibres
- Alpha motor neurons
- Gamma motor neurons.

8. Where does upper motor neuron arise from?

Ans. 40% of fibres arise in the parietal lobe.

60% of fibres arise in the frontal lobe.

9. In what proportion does the corticospinal fibres decussate?

Ans. 80% of the fibres cross.

20% of the fibres descend ipsilaterally.

10. Which body parts have the largest cortical representation?

Ans. The body parts with the most delicate movements have the largest cortical representation.

11. What movements are not affected due to UMN lesions?

Ans. Movements not affected due to UMN lesions are:

- Eyes
- Upper face
- Jaw
- Pharynx
- Larynx
- Neck
- Thorax
- Diaphragms are affected little or not at all.

This happens because these muscles are bilaterally innervated, i.e. stimulation of either the right or left motor cortex results in contraction of these muscles on both sides of the body.

12. Can extra-pyramidal signs occur in internal capsule lesion?

Ans. Yes, because thalamocortical fibres pass through the internal capsule and cerebral white matter. Thus, lesions in these parts affect both corticospinal and extra-pyramidal systems.

13. What is automatisms (synkinesia)?

Ans. It is the activation of paralyzed muscles as parts of certain automatisms. The paralyzed arm may move suddenly during yawning and stretching.

14. What are mirror movements?

Ans. Volitional movements of the paretic limb may evoke imitative (mirror) movements in the normal one or *vice versa.*

15. What are associated movements?

Ans. Attempts by the patient to move the hemiplegic limbs may result in a variety of associated movements. Flexion of the arm and leg may result in involuntary pronation.

16. What is Broadbent's law?

Ans. Lesions above the level of the facial nucleus in the pons affect only the lower part of the face, hand and arm muscles. Upper part of the face and leg muscles are affected only to a lesser extent.

17. What is spinal shock?

Ans. It is a state of acute flaccid paralysis following spinal cord (cervical cord) lesions due to complete acute lesions of the upper motor neurons which not only cause a paralysis of voluntary movement but also abolishes temporarily the spinal reflexes subserved by segments below the lesion.

18. What are the characteristics of spasticity?

Ans. The characteristics of spasticity are:

- Predilection of anti-gravity muscles (flexors of the upper limb and extensors of the lower limb).
- Resistance increases linearly in relation to velocity of stretch.
- Exaggeration of tendon reflexes.

19. What is Babinski sign?

Ans. i. Toe extension when viewed from a physiologic perspective is a flexor protective (nocifensive) response.

ii. A nocifensive flexor synergy involves:

- Flexion of the knee and hip
- Dorsiflexion of the foot and big toe

} triple flexion response

20. What is clonus?

Ans. Clonus is a series of rhythmic involuntary muscular contractions occurring at a rate of 5 to 7 Hz in response to an abruptly applied and sustained stretch stimulus.

21. Explain the mechanism and the components of the inverted supinator reflex.

Ans. *Mechanism*: It is due to spread of reflexes. The spread being due to the propogation of the vibration wave from bone to muscle, stimulating the excitable muscle spindles in its path. *Components*: In the case of a lesion of the fifth or sixth cervical segment, the biceps and brachioradialis reflexes are abolished and only the triceps and finger flexors whose reflex arcs are intact respond to a tap over the distal radius.

22. What is abulia?

Ans. Lesions of the frontal lobes have the effect of reducing the impulse to think, speak and act which is called abulia or reduced cortical tone.

23. What is apraxia?

Ans. It is a state in which a clear minded patient has no weakness, ataxia or other extra-pyramidal derangement and no defect of the primary modes of sensation, loss of ability to execute highly complex and previously learned skills and gestures.

24. What is ideational apraxia?

Ans. The failure to conceive or formulate an action either spontaneously or to command is known as *ideational apraxia.*

25. What is ideomotor apraxia?

Ans. The patient may know and remember the planned action but because the dominant parietal lobe or its connections are interrupted, he cannot actually execute it with either hand, this is known as ideomotor apraxia.

26. What is sympathetic apraxia?

Ans. By destroying the origin of the fibres that connect the left and right motor association cortices, a lesion in the more anterior part of the corpus callosum or the subcortical white matter underlying Broca's area and contiguous frontal cortex on left side causes an apraxia of commanded movements of the left hand, this is known as sympathetic apraxia.

27. What is the commonest apraxia in practice?

Ans. Facio-oral apraxia is the most common in practice. The lesion is left supramarginal gyrus or left motor association cortex.

28. Are dressing apraxia and constructional apraxias really apraxias?

Ans. These abnormalities are not apraxias in the strict sense. They are instead symptoms of contralateral extinction or neglect of the body schema and of extra personal space. They are therefore seen in right parietal lobe.

29. What is diplegia?

Ans. It is a special form of quadriplegia where legs are affected more than arms.

30. What is alien hand?

Ans. i. The hand undertakes complex and seemingly purposeful movements such as reaching into a pocket or handbag.

ii. The patient is aware of the movements but has the sense that the actions are beyond his control.

iii. Infarction in the territory of opposite ACA and left supplementary motor area and corticobasal ganglionic degeneration produces this phenomenon.

31. What is kinetic limb apraxia?

Ans. It involves clumsiness of a limb usually the right or dominant hand in the performance of a skilled act that cannot be accounted for by paresis, ataxia or sensory loss.

32. How does one differentiate between cortical and brain stem lesions of hemiplegia?

Ans. i. *Cortical/subcortical lesion*: It includes presence of
- Seizures
- Language disorder (aphasia)
- Loss of discriminative sensation (asterognosis, impairment of tactile localization)
- Anosognosia
- Homonymous visual field defects

ii. *Brain stem lesion*: It includes ipsilateral cranial nerve palsy with contralateral hemiplegia.

33. What are the common causes of hemiplegia (according to frequency)?

Ans. a. CVA (ischaemia, haemorrhage)
b. Trauma (brain contusion, epidural and subdural haematoma)
c. Brain tumour (bleeding into the brain tumour)
d. Brain abscess
e. Demyelinative disease
f. Vascular complications of meningitis and encephalitis
g. Migraine
h. Hysteria

34. What are the causes of paraplegia?

Ans. 1. *Acute paraplegia*
a. Spinal cord trauma (fracture dislocation of the spine)
b. Haematomyelia (due to vascular malformation)
c. Arteriovenous malformation of the cord that causes ischaemia by an obscure mechanism
d. Infarction of the cord
i. Occlusion of the anterior spinal artery

ii. Occlussion of the segmental branches of the aorta (due to dissecting aneurysm or atheroma, vasculitis and nucleus pulposus embolism)

2. *Less acute paraplegia*
   - Post-infectious myelitis (transverse demyelination)
   - Demyelinating or necrotizing myelopathy
   - Epidural abscess
   - Tumour with spinal cord compression
   - Epidural/subdural haemorrhage
   - Paralytic poliomyelitis
   - Acute Gullain-Barré syndrome
3. *Adult subacute and chronic spinal paraplegia*
   - Multiple sclerosis
   - Tumour
   - Protruded cervical disc and cervical spondylosis
   - Epidural and other infections (tuberculosis, fungal and other granulomatous diseases)
   - Syphilitic meningomyelitis
   - Motor system disease
   - Subacute combined degeneration (vitamin B_{12} deficiency)
   - Syringomyelia
   - Degenerative disease of the lateral and posterior columns of unknown cause
4. *Pediatric paraplegia*:
   - Congenital cerebral disease due to periventricular leukomalacia accounts for a majority of infantile diplegia.
   - Congenital malformation or birth injury of the spinal cord.
5. *Slowly progressive and appearing during childhood and adolescence*:
   - Fredricke's ataxia
   - Familial paraplegia
   - Muscular dystrophy
   - Tumour
   - Chronic varieties of polyneuropathy

35. What are the causes of monoplegia?

Ans. 1. *Monoplegia without muscular atrophy*
- Cerebrovascular lesion (thrombotic or embolic infarction)
- Circumscribed tumour or abscess

2. *Atrophic brachial monoplegia*
- *Infant*: Brachial plexus trauma from birth
- *Child*: Poliomyelitis or other infection of the spinal cord
- *Adult*:
  - Poliomyelitis
  - Syringomyelia
  - Amyotrophic lateral sclerosis
  - Brachial plexus lesion

3. *Atrophic crural (leg) monoplegia*
- Thoracic or lumbar cord lesion
  - Trauma
  - Tumour
  - Myelitis
  - Multiple sclerosis
  - Progressive muscular atrophy
  - Late radiation effect
- ACA infarction
- Prolapsed intervertebral disc, retroperitoneal tumour or haematoma.

36. What is Hoover's sign?

Ans.
- It is a sign to find out hysterical paralysis.
- The normal leg fails to demonstrate downward pressure when the hysteric is asked to elevate the supposedly paralyzed one thereby indicating a lack of voluntary effort.