
بسم الله الرحمن الرحيم

WHAT IS POSTURE?

- Posture is the attitude taken by the body in any particular situation like standing posture, sitting posture, etc. even during movement, there is a continuously changing posture

- The basis of posture is the ability to keep certain group of muscles in sustained contraction for long periods. Variation in the degree of contraction and tone in different groups of muscle decides the posture of the individual.

Postural Reflexes

- These reflexes resist displacement of the body caused by gravity or acceleratory forces, and they have the following functions:

1. Maintenance of the upright posture of the body
2. Restoration of the body posture if disturbed
3. Providing a suitable postural background for performance of voluntary movements

postural reflexes depends on the following receptors:-

- 1- vestibular apparatus receptors as
- Maculae (utricle & saccule) & SCC cristae.
- 2- visual (vision) & auditory(hearing) receptors:-
  Vision can compensate for loss of auditory, vestibular & proprioception
- -(Tabes dorsalis +ve Romberg's sign)
- 3-Proprioceptors of muscles , tendons , ligaments & joints:-

- **a- Neck Proprioceptors:-**
- **detect head position in relation to trunk**

- **b- Body Proprioceptors**
  proprioceptors of anti-gravity muscles

- **c- pressure receptors as in sole of feet initiate positive supporting reaction (magnet reflex)**

- **- Stretch reflexes & postural reflexes can be modified by coordinated activity ;-**
  - **Spinal cord**
  - **Medulla**
  - **Midbrain**
  - **Cerebral cortex**
  - **cerebellum**

Postural reflexes are:-

A-Static reflexes(at rest)

B-Phasic reflexes (*Statokinetic reflexes*)

A-Static R:- (statotonic):- maintain posture at rest:-

A- Spinal
B-Medullary reflexes
C-Righting reflexes (midbrain)

A-Spinal reflexes:- (Center in S.C)

1- local static reflexes:

Confine to stimulated limb.

i -Stretch reflex

This is the most important local static reflex which controls the tone in those extensor muscles which keep the body upright (antigravity muscles)

ii. Positive supporting reaction (magnet reflex)
(receptors are proprioceptors of flexors(contraction of both flexors & extensors)

2- Segmental static reflexes:-

mediated by one segment of the spinal cord as :-
- Crossed extensor reflex

N.B spinal R can be studied in spinal animal with cut at neck b/w the S.C& brain stem so all S.C is intact.

- -

- B- **Medullary static Reflexes**

- **(Center=medulla oblongata) are:-**

- **Neck& labyrinthine reflexes**

- **1- Neck static reflexes(studied in a decerebrated animal cut above medulla + labyrinth destroyed)**

- **-Stimulus is :-changing head position that (+) neck proprioceptors**

1-- ventroflexion of head

/

Flexion of forelimb + extension of hindlimb

2-dorsiflexion of head /

Extension of forelimb + flexion of hindlimb.

3-- turning head to one side—

Extension of limbs on that side + flexion of other side.

- **2- labyrinthine static reflex:-**
- **(in decerebrated animal) + elimination of neck proprioceptors)(labyrinth intact)**

  - Receptors are otolith organs (maculae)

- **-Stimulus is gravity**
  1-placing the animal in prone position----- 4 limbs flexion

  2- the animal in supine position)-----4 limbs extended.

C- Righting Reflexes:-

- **(Center is midbrain except the visual in C.C):-**

when upright posture is disturbed as in falling down

- **- studied in a decerebrated animal (cut above midbrain)**
-

A- Labyrinthine Righting Reflexes (midbrain):-

1. Labrinthine RR that correct head position

(cover eyes) & animal held in air from pelvis)

- the body is not in the proper position

As in tilting the head (+) otolith organs ->>>>-(+) neck muscles to correct the head level, when head is not in proper site.

receptors; otolith organs,

response; righting of head

- All static labirynthine reflexes have macula as receptors
- but in statokinetic reflexes during motion.
- (macula act in linear & SCC receptors act in angular acceleration)

- **2- Body RR corrects head position(Body on head RR):- :-**
- studied in mid brain animal with destroyed labyrinth

- **stim: pressure on side of body& head is free**
- **receptors; body pressure receptors**
- **Response/ reflex correction of head .**

- **3- Neck righting reflexes corrects body position) :-**

- **stim: stretch of neck muscles**

- **(if head is corrected & body still tilted**

- **-righting of shoulders & body.**

- **receptors; proprioceptors of neck muscles**

- **response; righting of body.**

4- Body RRcorrects body position (Body on body RR) :

- pressure on side of the body and head is fixed)
- Receptors/ body pressure receptors
- response /reflex correction of body

B- Visual Righting Reflexes(cortical):-

- *Studied in intact animal with destroyed labyrinth and cutting upper 3 cervical nerves*
  - Visual image can correct position of head & body if position is disturbed
- - center is c.c -
- - stim: visual stim,
- - receptors; eye receptors,

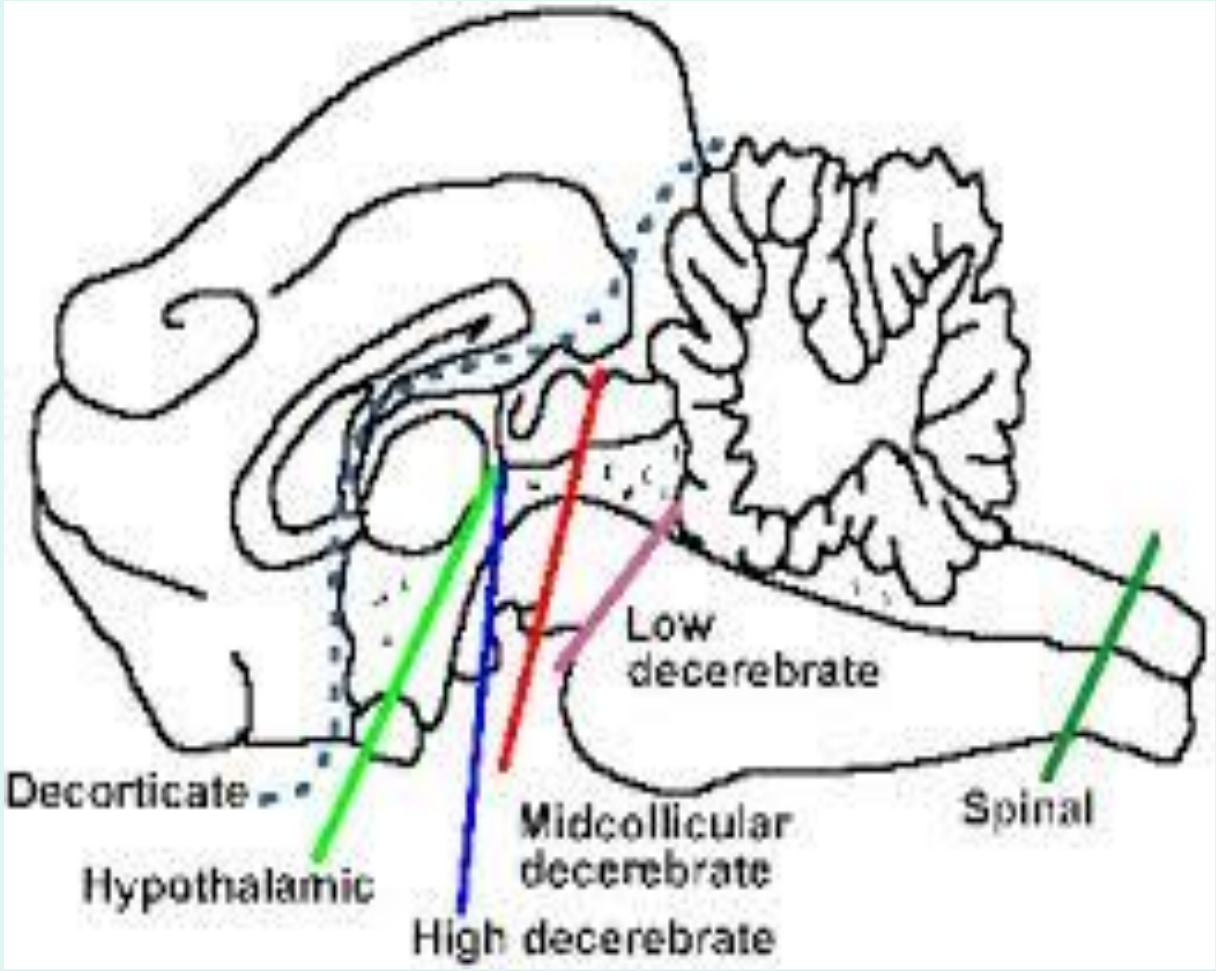
B- Phasic reflexes (statokinetic reflexes)(center in C.C):-

- **-maintain posture during motion**
- **a- Hopping reaction:-**
- **- when animal is pushed laterally }}}}} reflex hopping to keep limbs in position to support body.**
- **The receptors ;muscle spindle.**

- **b- Placing reaction :-**

- **- blind folded animal suspended in air & moved towards a supporting surface, the feets will be placed firmly on the supporting surface (receptors are touch receptors& proprioceptors in soles of feet)**

Decerebrate rigidity& Decorticate rigidity



Decerebrate Rigidity

- ✓ Site of lesion → between the superior and inferior colliculi of the midbrain , lesion below Red Nucleus , resulting in
- ✓ extensive extensor posture of all extremities → Rigidity of all 4 limbs
- ✓ All limbs extended arms extended by the sides & rotated internally (outward)
- ✓ (hallmark → elbows extended)
- ✓ Head may be arched to the back
- ✓ It is due to →
- ✓ (1) increased general excitability of the motor neuron pool → especially Gamma efferent discharge (due to facilitatory effects of the un inhibited Vestibulospinal Tract) .

Decerebrate posture results from damage to the upper brain stem. In this posture, the arms are adducted and extended, with the wrists pronated and the fingers flexed. The legs are stiffly extended, with plantar flexion of the feet.

- **In a decerebrate animal :**
- damage to (level below red nucleus)
- **Features of decerebrate rigidity**
- - hyperextension of all four limbs
- - dorsiflexion (hyperextension) of tail and head
- - extreme hyperextension of the spine(opisthotonus) produces concave configuration of the back
- - the animal can be made to stand on four limbs but is easily toppled by slight push

  –
- Reflexes that are lost/absent
- Righting Reflexes (optical)
- Reflexes that are retained /still present (i.e., reflexes the do not depend primarily on cerebrum :
- (1) Tonic Labyrinthine reflexes
- (2) Tonic Neck Reflexes

- **Mechanism of Decerebrate Rigidity**
- Rigidity occurs due to increased activity of motor neurons that facilitate stretch reflex
- Facilitation of stretch reflexes occur due to increased rate of γ motor neuron discharge

Decorticate Rigidity

- In humans , where true decerebrate rigidity is rare , since the damage to the brain centers involved in it are lethal.
- However decorticate rigidity can be caused by bleeding in the internal capsule which causes UMNL (damage to upper motor neurons) .
- Symptoms & Signs :
- Flexion in the upper limbs and extension in the lower limbs.

Decorticate posture results from damage to one or both corticospinal tracts. In this posture, the arms are adducted and flexed, with the wrists and fingers flexed on the chest. The legs are stiffly extended and internally rotated, with plantar flexion of the feet.

- **In a decorticate animal :**
- Decorticate animal is one in whom the whole cerebral cortex is removed but the basal ganglia and brain stem are left intact

Characteristic features:

Moderate rigidity is present

- Cortex inhibit medullary reticulospinal tract
- Therefore, removal of cortex results in facilitation of γ motor neuron discharge
- Seen only when the animal is at rest

- Reflexes that are lost/absent
- (1) Placing Reaction , Hopping Reaction
- (2) Visual righting reflex
- Reflexes that are retained /still present (i.e., reflexes the do not depend primarily on cerebral cortex :
- (1) Tonic Labyrinthine reflexes
- (2) Tonic Neck Reflexes
- (3) Other Righting Reflexes

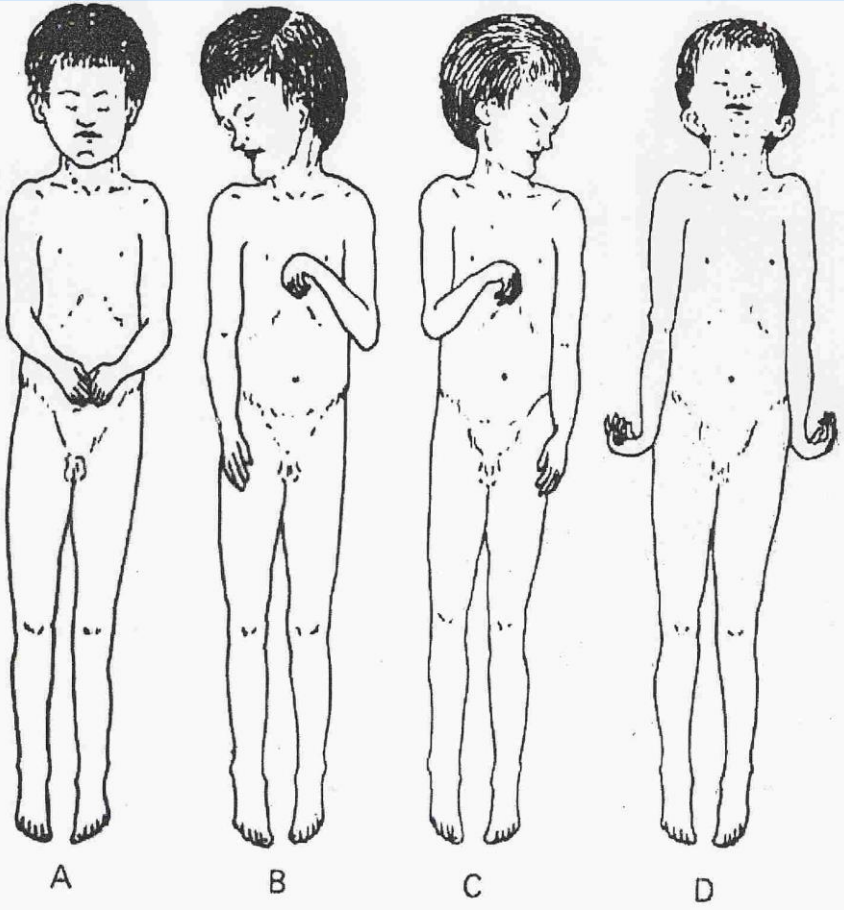


Figure 12–7. Human decorticate rigidity ***(A–C)*** and true decerebrate rigidity ***(D).*** In ***A*** the patient is lying supine with the head unturned. In ***B*** and ***C,*** the tonic neck reflex patterns produced by turning of the head to the right or left are shown. (Reproduced, with permission, from Fulton JF [editor]: *Textbook of Physiology,* 17th ed. Saunders, 1955.)

Table 12–2. Principal postural reflexes.

Reflex	Stimulus	Response	Receptor	Integrated In
Stretch reflexes	Stretch	Contraction of muscle	Muscle spindles	Spinal cord, medulla
Positive supporting (magnet) reaction	Contact with sole or palm	Foot extended to support body	Proprioceptors in distal flexors	Spinal cord
Negative supporting reaction	Stretch	Release of positive supporting reaction	Proprioceptors in extensors	Spinal cord
Tonic labyrinthine reflexes	Gravity	Contraction of limb extensor muscles	Otolithic organs	Medulla
Tonic neck reflexes	Head turned: (1) To side (2) Up (3) Down	Change in pattern of extensor contraction (1) Extension of limbs on side to which head is turned (2) Hind legs flex (3) Forelegs flex	Neck proprioceptors	Medulla
Labyrinthine righting reflexes	Gravity	Head kept level	Otolithic organs	Midbrain
Neck righting reflexes	Stretch of neck muscles	Righting of thorax and shoulders, then pelvis	Muscle spindles	Midbrain
Body on head righting reflexes	Pressure on side of body	Righting of head	Exteroceptors	Midbrain
Body on body righting reflexes	Pressure on side of body	Righting of body even when head held sideways	Exteroceptors	Midbrain
Optical righting reflexes	Visual cues	Righting of head	Eyes	Cerebral cortex
Placing reactions	Various visual, exteroceptive, and proprioceptive cues	Foot placed on supporting surface in position to support body	Various	Cerebral cortex
Hopping reactions	Lateral displacement while standing	Hops, maintaining limbs in position to support body	Muscle spindles	Cerebral cortex