



## 19<sup>th</sup> Lecture

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## Postural Reflex

**PHYSIOLOGY TEAM – 430**

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# Postural Reflexes

There are several sites in the CNS that are involved in postural reflexes and they are:

Site	Type of reflexes
Spinal Cord	1. Stretch reflex 2. Inverse stretch reflex 3. Crossed extensor reflex 4. (+ve) and (-ve) supporting reaction
Medulla Oblongata	1. Tonic labyrinthine reflex 2. Tonic neck reflex
Mid Brain	1. Righting reflex
Cortex	1. Optical Righting reflex 2. Hopping & Placing reflexes

## 1) At Spinal Cord:

- (+ve) & (-ve) supporting reaction:

It means when you want to walk you will lift one leg up and keep the other one on the floor, the leg that have been lifted gave us (-ve) supporting reaction while the one on the ground gave us (+ve) supporting reaction

## 2) At Medulla:

- Tonic labyrinthine
- Tonic neck reflex

## 3) At Mid Brain:

- Righting reflex:

It is the reflex that happens when the person falls down and he wants to correct his position, it contains five reflexes (four at the level of Mid Brain):

- ✓ Labyrinthine righting reflex
- ✓ Neck righting reflex
- ✓ Body on head righting reflex
- ✓ Body on body righting reflex

#### 4) At Cortex:

- Optical righting reflex (The 5<sup>th</sup> Righting reflex): Seeing what's around you after you fall down
- Hopping reflex
- Placing reflex

#### Righting reflex:

When the person falls down all five righting reflexes work together to correct the position:

Optical Reflex → Labrynthine → Neck Righting Reflex → Body on head → Body on body

#### • Summary for the reflexes

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

- **Vestibular System:**

- It contains the Semicircular Canals + Vestibule (Utricle + Seccule)
- Vestibular apparatus deals changes in head position with the help of two Otolith (Receptor in the vestibular system) organs and the semicircular canals:

1. **Seccular Otoliths:**

- Oriented **Vertically** and detects changes in linear acceleration in the vertical plane
- Detects changes in head position during **lateral tilt** of the head

2. **Utricular Otoliths:**

- Oriented **Horizontally** and detects changes in linear acceleration in the horizontal plane
- Detects changes in head position during **flexion and extension of the neck**

3. **Semicircular canals:**

- Detect **Angular** acceleration in all three planes of Three-Dimensional space

**Note:**

All of these three parts of the vestibular system works together at the same time

- **Lesions that cause effects on the reflexes:**

### 1- Decorticate:

- Removal of the cortex
- Some movement is still possible
- All Mid Brain reflexes are present
- Hypothalamic Functions are still present (Temperature regulation and visceral homeostatic mechanisms)
- Upper limb flexed, Lower limbs extended (Rigidity)

**Note:**

The reason why there is flexion of upper limb is that there is a tract known RubroSpinal tract, it is responsible for flexion of the upper limbs, this tract originate from the red nucleus and it is controlled by the cortex, so after we remove the cortex it will not be controlled anymore which will result in flexion of upper limbs

### 2- Decerebrate:

- Lesion is between the superior and inferior colliculus of Mid Brain
- Righting reflexes are lost (Except for the optical righting reflex because it's at the level of the cortex)
- All four limbs are extended

**Note:**

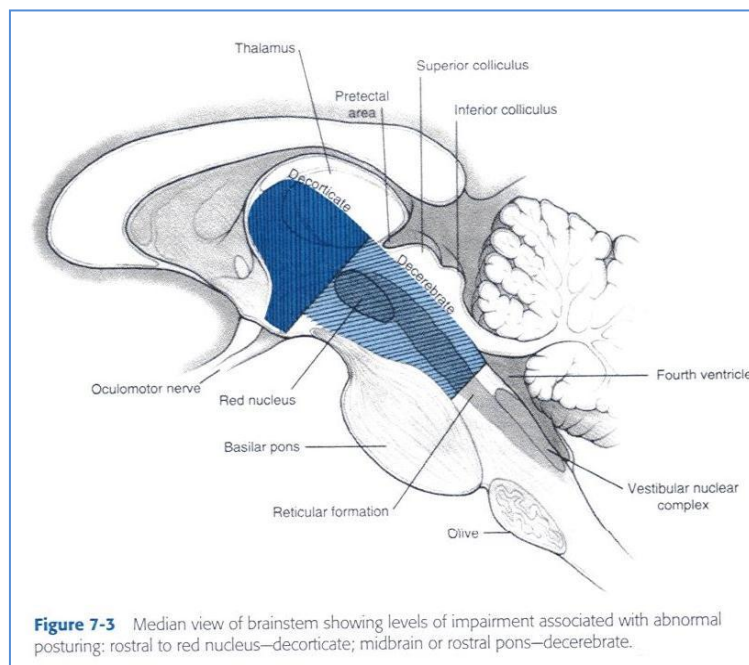
The reason why there is extension of all limbs is that the inhibitory signals from the brain and red nucleus are blocked, that will result in excitation of Medial Reticulospinal & Vestibulospinal tracts



- Summary of the lesions:

	Decorticate	Decerebrate
Site of lesion	Removal of Cerebral Cortex	Mid Brain
Reflexes absent	Visual Righting Reflex Placing and Hopping Reactions	Righting Reflexes
Reflexes present	Tonic Labrynthine Tonic Neck Reflexes Mid Brain Righting Reflexes	Tonic Labrynthine Tonic Neck Reflex Visual Righting Reflex
Muscular Appearance	Flexion of upper and extension of lower limbs	All four Limbs are Extended

- Sites of lesions:



- Muscular Appearance:

