

POSTURE REFLEXES

Objectives:

- ❖ Postural reflexes are needed to keep the body in a proper position while standing, moving. When body posture is suddenly altered it is corrected by several reflexes. These reflexes are operating at spinal cord, medulla, mid-brain and cortical levels. To make the reflex movements smooth cerebellum, basal ganglia and vestibular apparatus are needed. Students are required to know posture-regulating parts of CNS.

Girls Slides Version

Done by:

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★ References:

- 435 girls slides and notes.
- Guyton and hall textbook of medical physiology 12th edition

Color index: Important - Further explanation - Doctors Notes - Numbers.

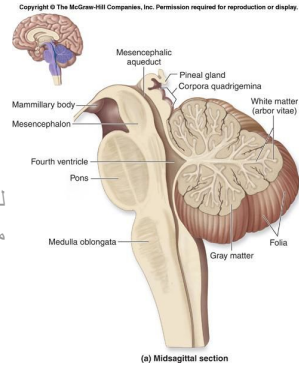
*Please check out [this link](#) before viewing the file to know if there are any additions or changes.

Posture and equilibrium

❖ Definition of posture :

It is maintenance of upright position against gravity (center of body is needed to be between the legs) it needs anti-gravity muscles.

لو سألنا نفسنا كيف راسنا مثلا أخذ وضعية معينة على الرغم من إنه معاكس للجاذبية والجواب هو إن عضلات جسمنا ليها tone معين لو زاد تصير العضلات مشدودة ولو قل تزيد العضلات مرتخية (الفكرة هنا مختلفة عن الانقباض والانبساط) وهذا ال tone شي لا إرادي يعني ما نقدر نتحكم فيه بأنفسنا..



- Upright posture need postural reflexes
- posture depends on muscle tone (static stretch reflex)
- The main pathways concerned with posture are :

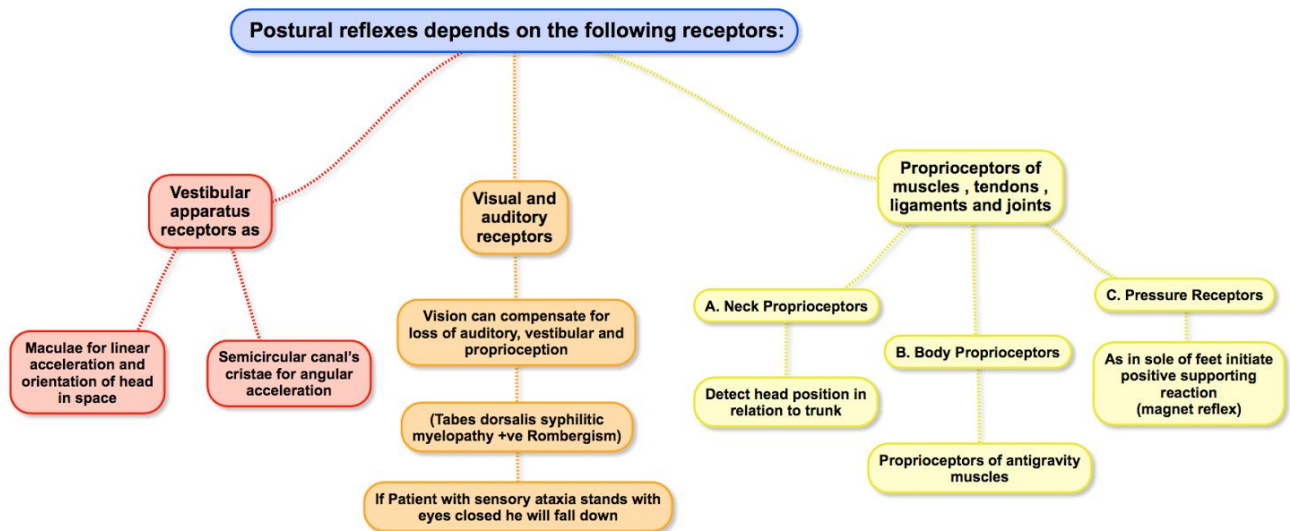
A- Medial (Anterior) tracts as vestibulospinal tract and medial (Anterior) corticospinal tract

“Control proximal limbs and axial muscles for posture and gross movements”

B- Lateral tracts as lateral corticospinal tract and rubrospinal tract

“Control distal limbs ex. fingers and toes”

❖ Receptors of Postural Reflex :



Vision is important for maintaining posture in case of sensory ataxia

- Stretch reflexes and postural reflexes can be modified by coordinated activity of :

- Spinal cord
- Medulla
- Midbrain (righting reflexes)
- Cerebral cortex
- Cerebellum

1-Static reflexes (statotonic)

maintain posture at rest

Spinal reflexes	Medullary reflexes	Righting reflexes
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A-Spinal reflexes (center in spinal cord)

1- Local static reflexes يعني وأنا واقفة رجلي فيها flexors and extensors muscles for supporting تشغل بنفس الوقت وتكون شاملة وزني وهنا الاستثناء الوحيد أنه الإثنين يشتغلوا مع بعض (استثناء عن ال reciprocical)	-Positive supporting reaction (magnet reflex ¹) (تكون بوسنيّف لما تكون الأرجل على الأرض) -Receptors are proprioceptors of flexors (contraction of both flexors and extensors) -Protective reflex
2 -Stretch reflex	
3- Segmental static reflexes ماخذ السقمنت من اليمين إلى اليسار/ شال الموتر نيورن حقت السقمنت كلها من الجهتين للقراي ماتر *withdrawal reflex in one side*	-Mediated by one segment of the spinal cord as: Crossed extensor reflex مثال: أمشي وأدعس على دبوس, الإحساس ينتقل ل spinal cord ل عشان أسحب رجلي وبنفس الوقت يروح للموتر نيورن للجهة الثانية تخلي الاكستنسور هي اللي تنتشط فنوقف عليها (اسحب رجل وحدة و عشان ما نطيح جسمنا بالرجل الثانية)
4- Negative supporting reflex لما أرفع رجولي Extensors and flexors are relaxed	-Release positive supporting reaction -Receptors are proprioceptors of extensors of the released limb في حالة المشي رجل راح تكون بوسنيّف والثانية نيفاتف

- Spinal reflexes can be studied in spinal animal with cut at neck **between** the spinal cord and brain stem so all spinal cord is **intact**.

B-Medullary static Reflexes (center in the medulla oblongata)

	Neck static reflexes	labyrinthine static reflex:
studied in	-Decerebrated ² animal (Cut above medulla + labyrinth destroyed)	-Decerebrated animal (Elimination of neck proprioceptors + labyrinth intact)
Stimulus is	Changing head position	Gravity
Receptors	Neck proprioceptors	Otolith organs (maculae)



Neck static reflexes:

1- Ventroflexion of head	2-Dorsiflexion of head	3-Turning head to one side
Arms flexion Extended hindlimb (as in decortication)	Arms are extended Flexed hindlimb 	Extension of limbs on that side and flexion of other side. 

¹ A reflex in which light finger pressure on a toe pad causes a slow reflex contraction of the lower extremity, which seems to follow the examiner's hand, as if drawn by a magnet. The magnet reaction is seen in animals that have had the cerebellum removed.

² to eliminate cerebral function by transecting the brainstem or by ligating the common carotid arteries and basilar artery at the center of the pons.

labyrinthine static reflex: controlled by maculae in inner ear

1-Ventroflexion of head (prone position)	2- Dorsiflexion of head (supine position)
4 limbs flexion	4 limbs extended (as in decortication)
 <p>لما يكون البببي نايم على وجهه يصير فلكتشن لكل اطرافه</p>	 <p>لما كان البببي نايم على ظهره يصير اكستنتشن لكل اطرافه والعكس بال ventroflexion</p>

C-Righting reflexes

-when upright posture is disturbed as in falling down

مثل لما الواحد يمشي وأحد يدفه راح يتغير مكان الرجل عشان ال body center يبقى بين الرجلين والشخص ما يطيح

- studied in a decerebrated animal (cut above midbrain)

Reflex	Center	Stimulus	Receptors	Response
1-Visual righting reflexes	Cerebral cortex	visual stimulus	eye receptors	correct position of head & body if position is disturbed by Visual image
2- labyrinthine righting reflexes (check pictures below)	Midbrain	When the eyes are covered and the object is held in air from pelvis Ex: Tilting the head with covered eyes	otolith organs	righting of head by stimulating neck muscles to correct the head level, when head is not in proper site.
3- Body on head righting reflexes		pressure on side of body	trunk proprioceptors	reflex correction of head
4- Body on body righting reflexes		pressure on side of the body (and head is fixed)		reflex correction of body
5- Neck righting reflexes الراس يكون معرل فيروح يعدل وضع جسمه		stretch of neck muscles (if head is corrected & body still tilted)	muscle spindles of neck muscles	righting of body and shoulders

All **static** labyrinthine reflexes have **macula** as **receptors**

• but in statokinetic reflexes during motion.

(macula act in linear and semicircular canal's cristae receptors act in angular acceleration)

2- Phasic reflexes (statokinetic reflexes):

- Center in cerebral cortex
- Maintain posture during motion

- **Hopping reaction:**

when animal is pushed laterally → reflex hopping to keep limbs in position to support body.

The receptors are in **muscle spindles**.

- **Placing reaction :**

مثل لما نربط عيون البببي وتشيله بالهواء و نقره من مكان مسطح راح يحاول البببي يثبت رجليه على المكان المسطح

blindfolded animal suspended in air and moved towards a supporting surface, the feet will be placed firmly on the supporting surface

Receptors are **touch receptors** and **proprioceptors in soles of feet**

❖ Lesions:

Decerebrate rigidity: More common in children

at three levels:

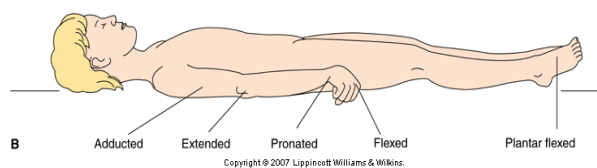
- 1- low decerebration : above medulla oblongata
- 2- Mid collicular decerebration : between superior and inferior colliculi
- 3- high decerebration : above the brainstem

In section between **superior and inferior colliculi of midbrain**

(below the level of the red nucleus (mid-collicular lesion) → block normal inhibitory signals from **brain and red nucleus in midbrain** to tonically active **pontile R.F and Vestibular nucleus** .

Causing:

1. **maintained** tonic static postural reflexes that support animal against gravity (medullary tonic neck & labyrinthine Reflex).
2. **Absent** midbrain righting Reflex
3. **extension** of head and 4 limbs extensors
 - The **jaw may be clenched** with the neck hyperextended due to increased extensor tone from **vestibulospinal and reticulospinal (pontine reticulospinal tracts)** tracts to extensor motor neurons
4. spasticity, rigidity and extension in antigravity muscles
 - In human by vascular lesion of brain stem between red nucleus and vestibular nucleus



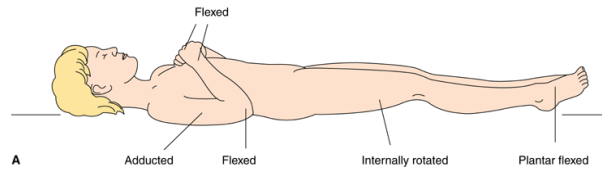
Decorticate rigidity: More common in adult

more common in human than decerebrate rigidity

1. lesion in cerebral cortex but brainstem is intact (hemiplegic patients Hemorrhagic gastroenteritis of internal capsule)
2. Medullary tonic neck and tonic labyrinthine reflexes **present**
3. Righting midbrain reflexes **present**
4. **Visual righting, placing and hopping reflexes lost**
5. It causes extensor rigidity in legs and moderate flexion of arms if head unturned as supine position (tonic neck reflexes)

- the hands are clenched into fists and the legs extended and feet turned inward

6. Tonic neck reflexes are produced by turning the head to one side e.g to the left → extension of limbs on left side & flexion of Right side



Since the corticospinal tract is interrupted, the pontine reticulospinal and the vestibulospinal extend lower limb and disinhibition of the red nucleus with facilitation of the rubrospinal tract flex upper limb (normally suppressor area 4 strip in the anterior edge of precentral gyrus inhibit red nucleus if lost red nucleus is disinhibited)
 The effects on these two tracts (corticospinal and rubrospinal) by lesions above the red nucleus is what leads to the characteristic flexion posturing of the upper extremities and extensor posturing of the lower extremities.
 There is loss of inhibitory cortical signals to gamma motor neurons via reticulospinal (from suppressor area 4 strip in the anterior edge of precentral gyrus)

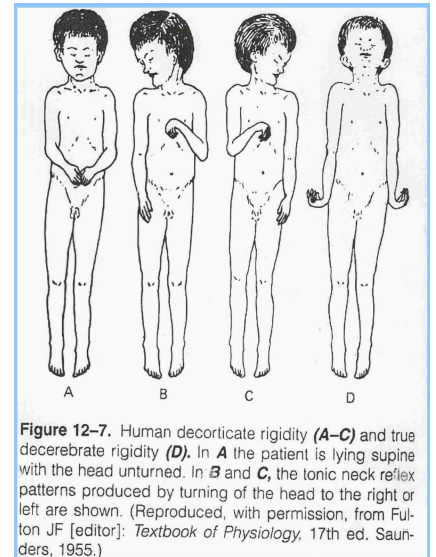


Figure 12-7. Human decorticate rigidity (A-C) and true decerebrate rigidity (D). In A the patient is lying supine with the head unturned. In B and C, the tonic neck reflex patterns produced by turning of the head to the right or left are shown. (Reproduced, with permission, from Fulton JF [editor]: *Textbook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

