

وَأَسْمَاءُ ابْنَةُ مَرْثَدَةَ ابْنَةِ عَمْرِو بْنِ لُؤَيٍّ



**Presentation by:**  
**Abbas Aliaghaei, Ph.D. of Neuroscience, Anatomy and Cell Biology Department,**  
**School Of Medicine, Shahid Beheshty University Of Medical Sciences**

# Spinal cord segments, nerves and vertebrae

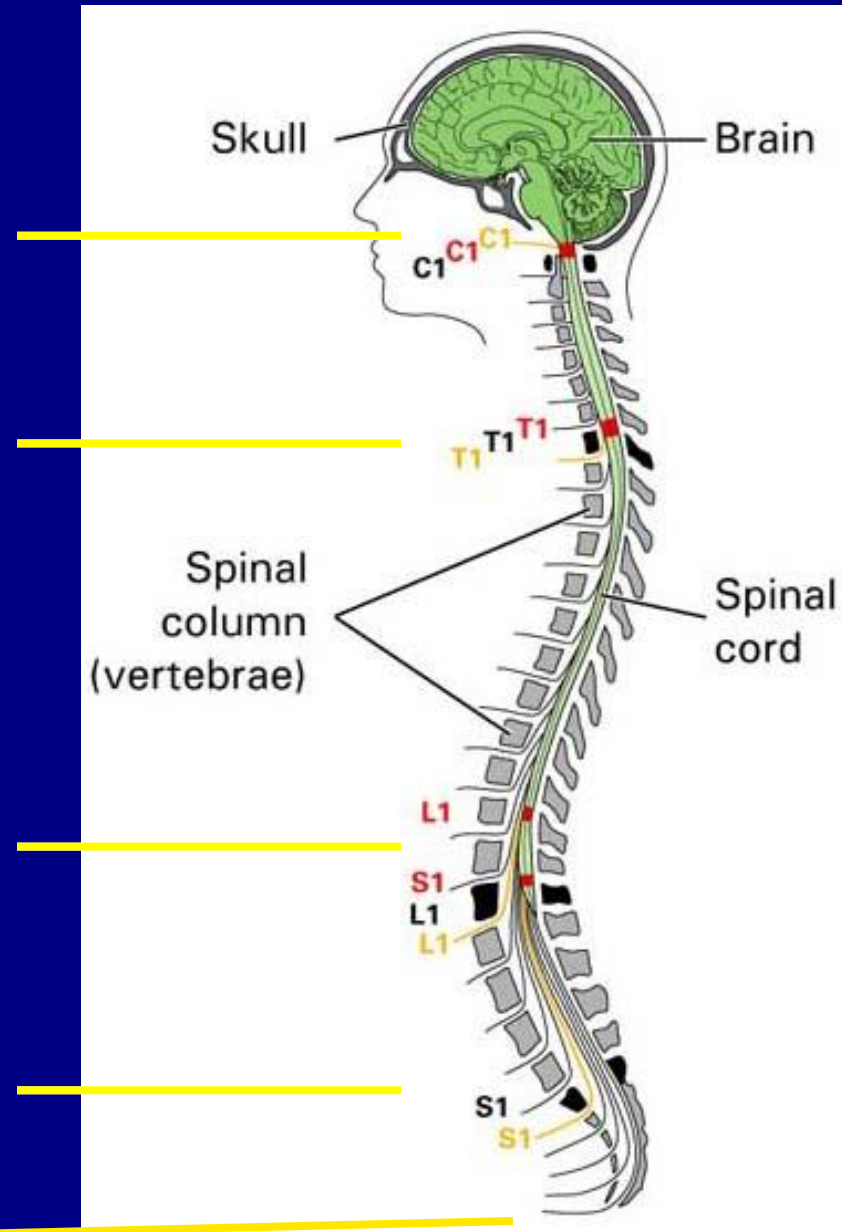
Cervical (C) - Neck  
(C1-8)

Thoracic (T) - Chest  
(T1-12)

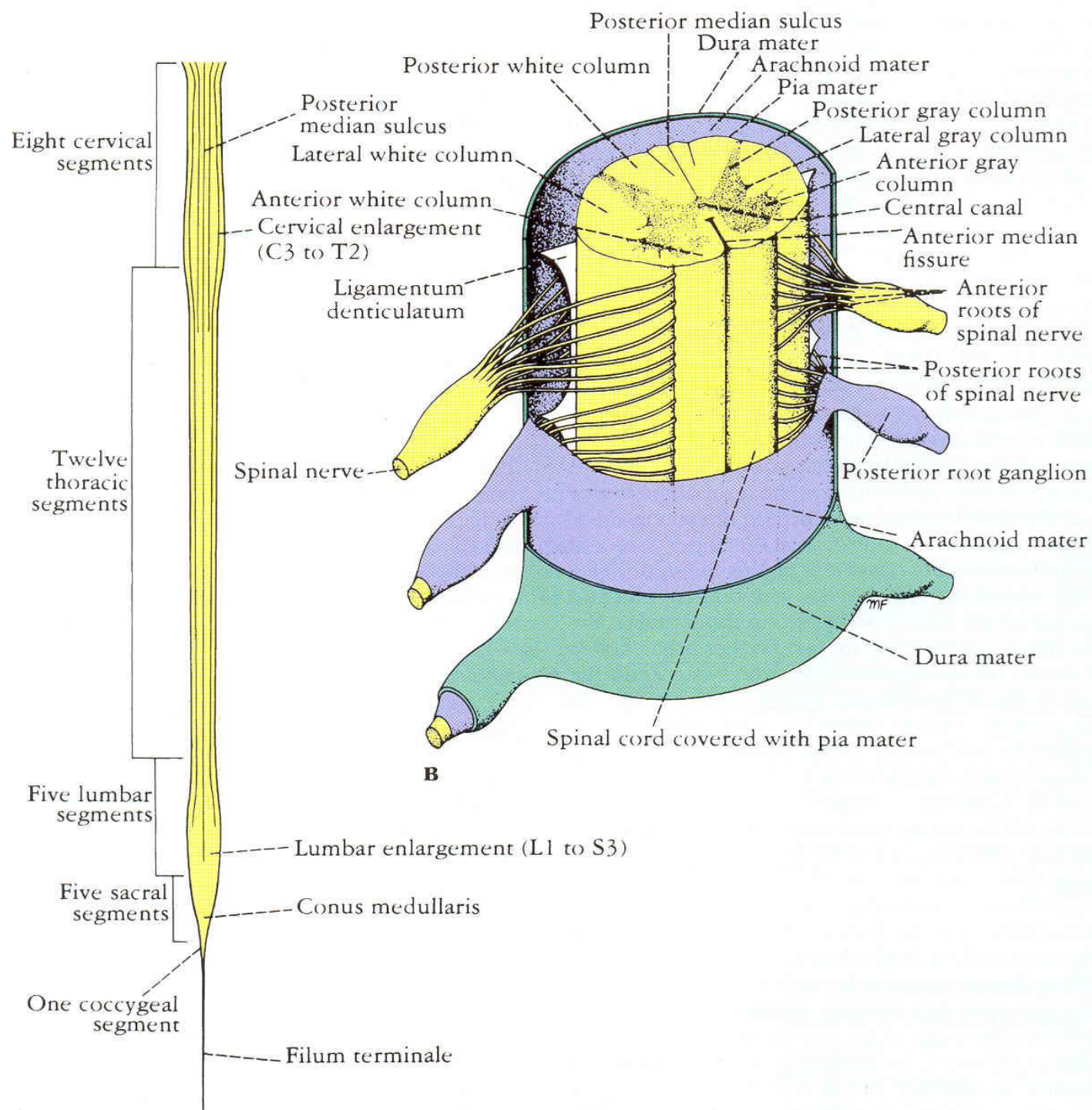
Lumbar (L) - Back  
(L1-5)

Sacral (S) - Pelvis  
(S1-5)

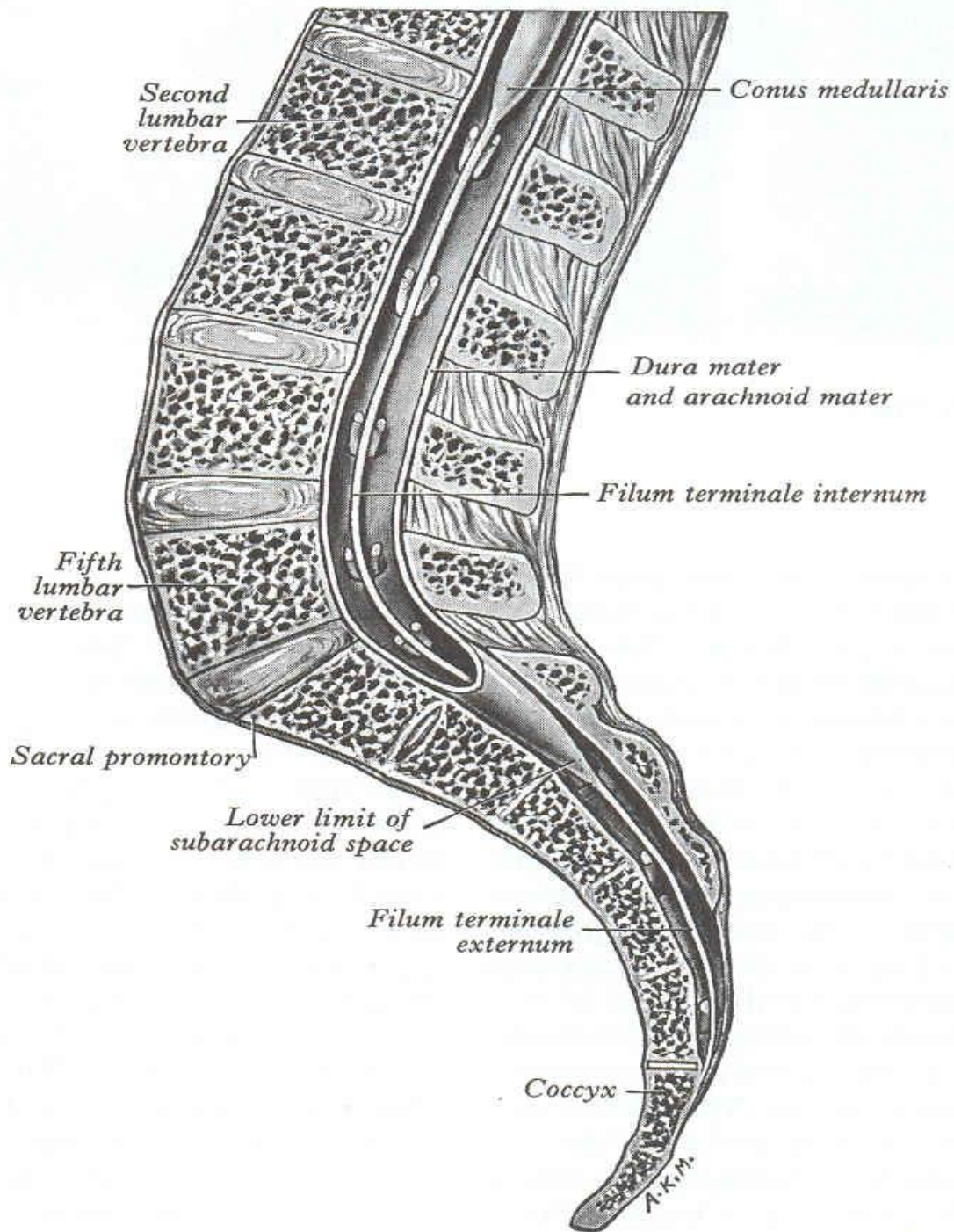
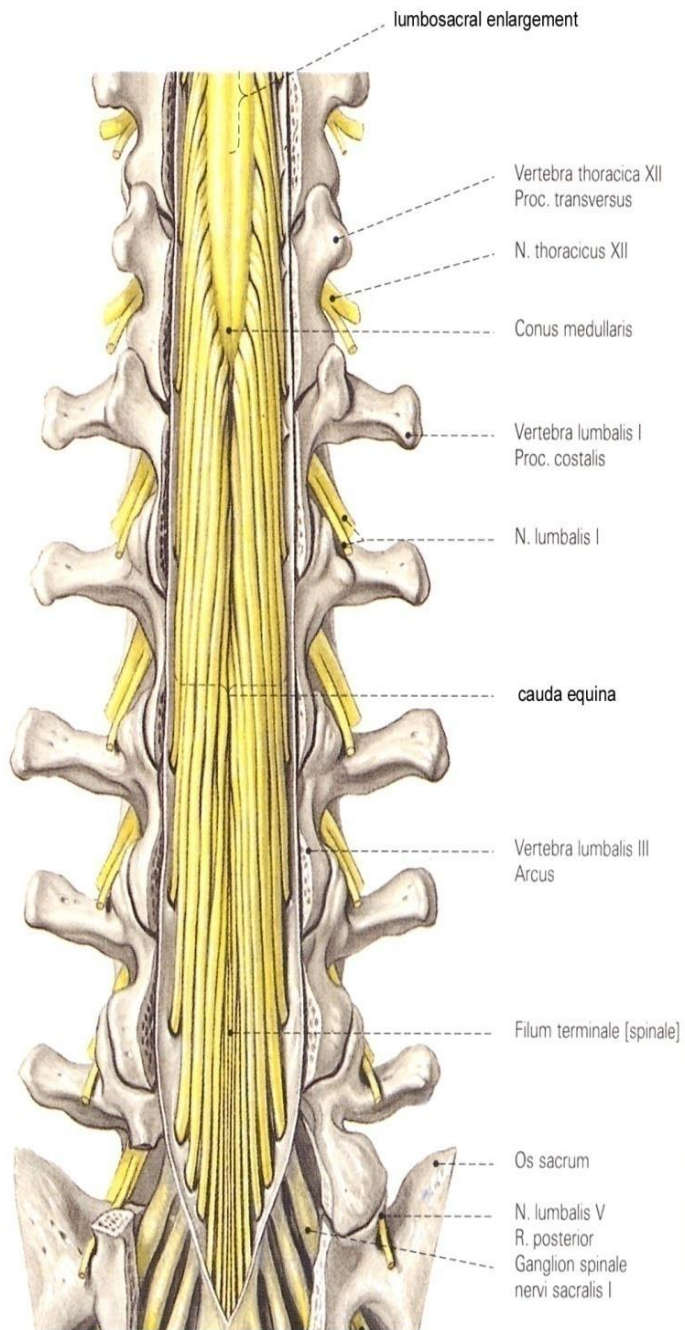
Coxygeal



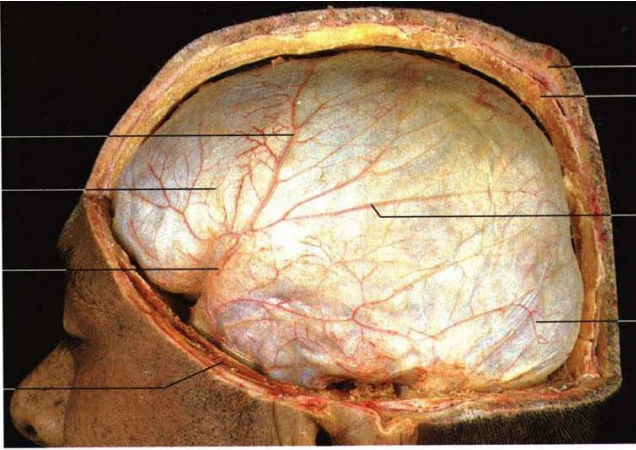
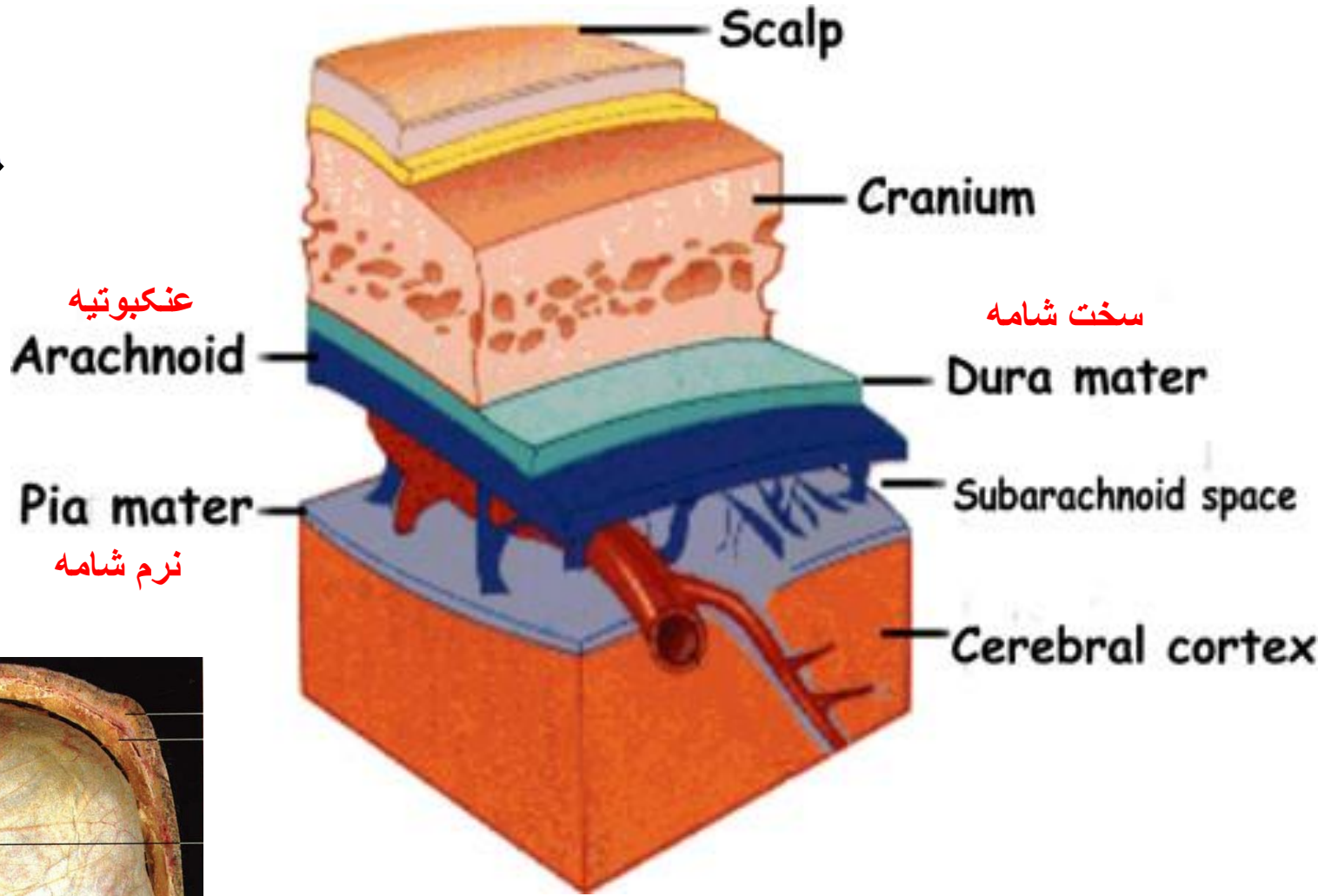
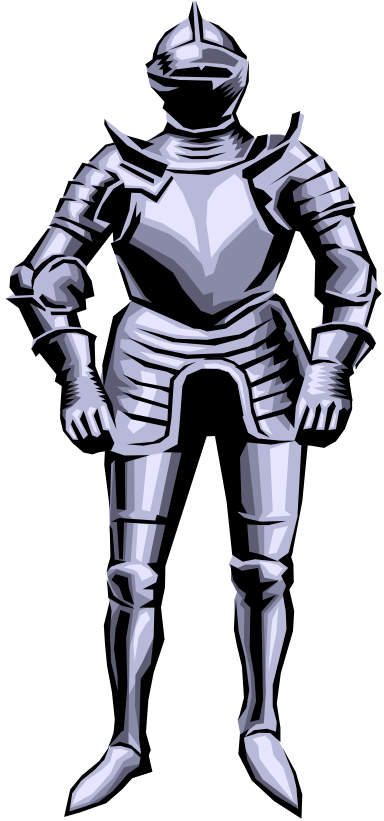
Vertebra  
Spinal segment  
Spinal root



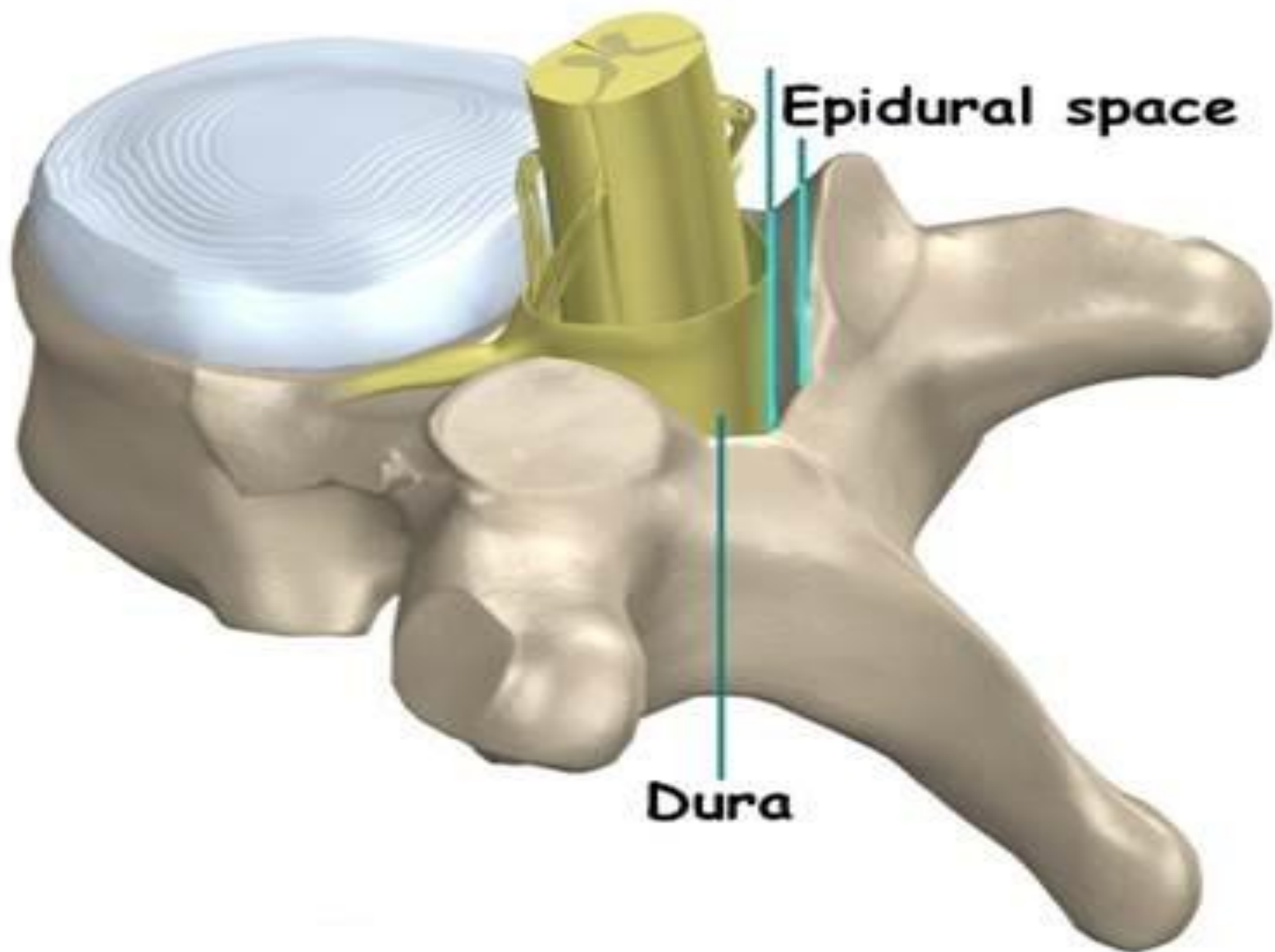


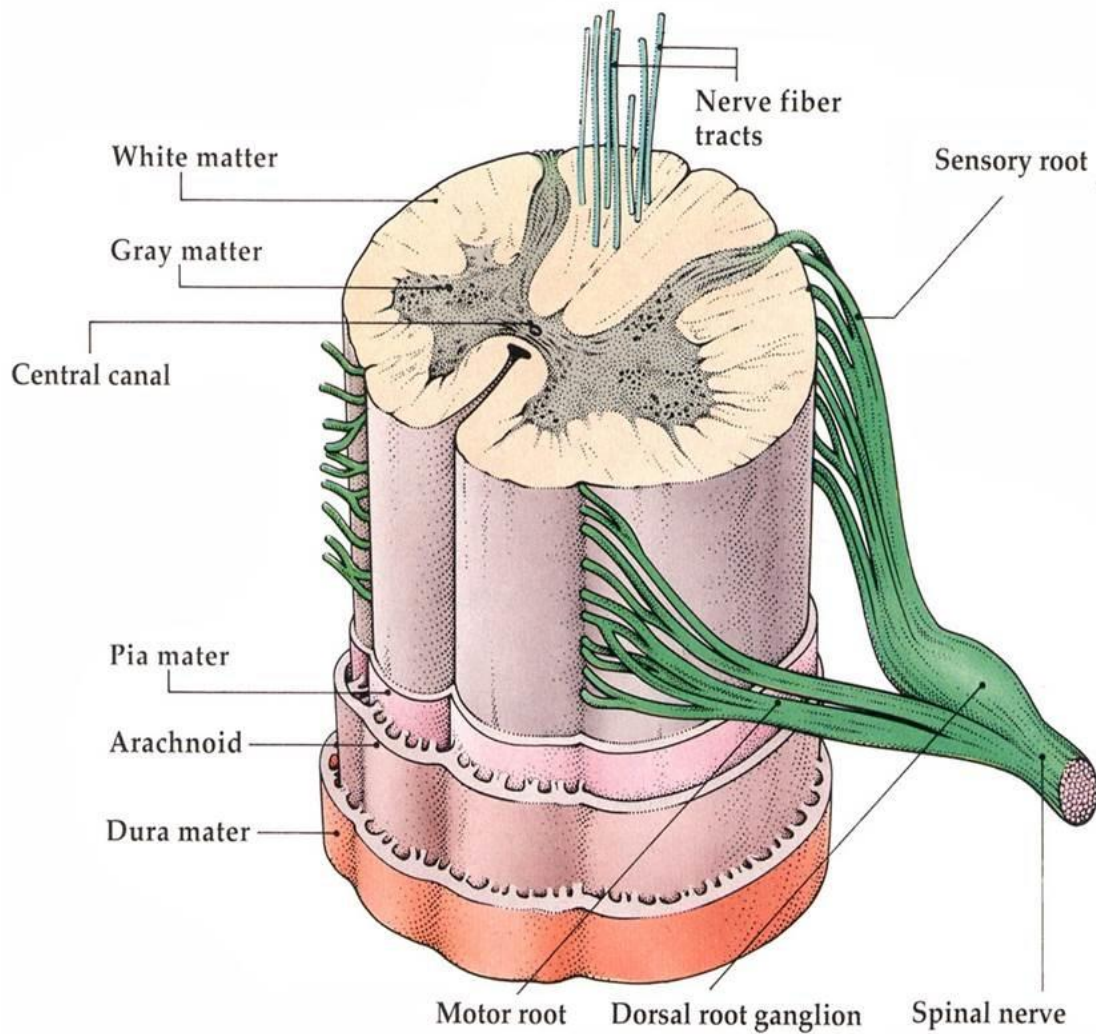


# منتر









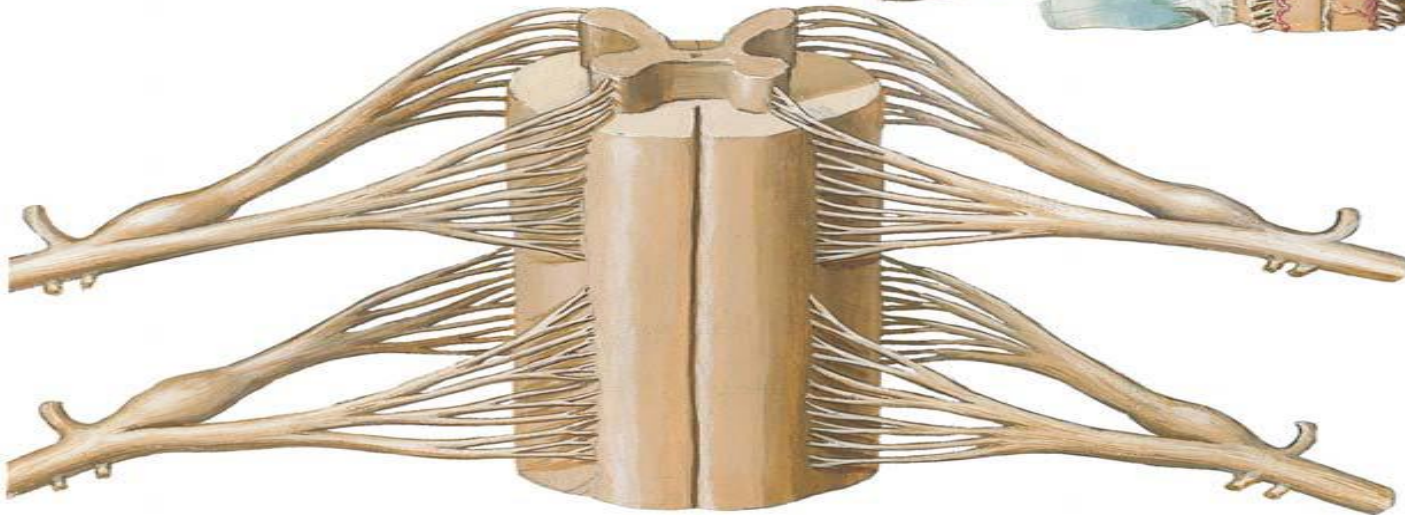
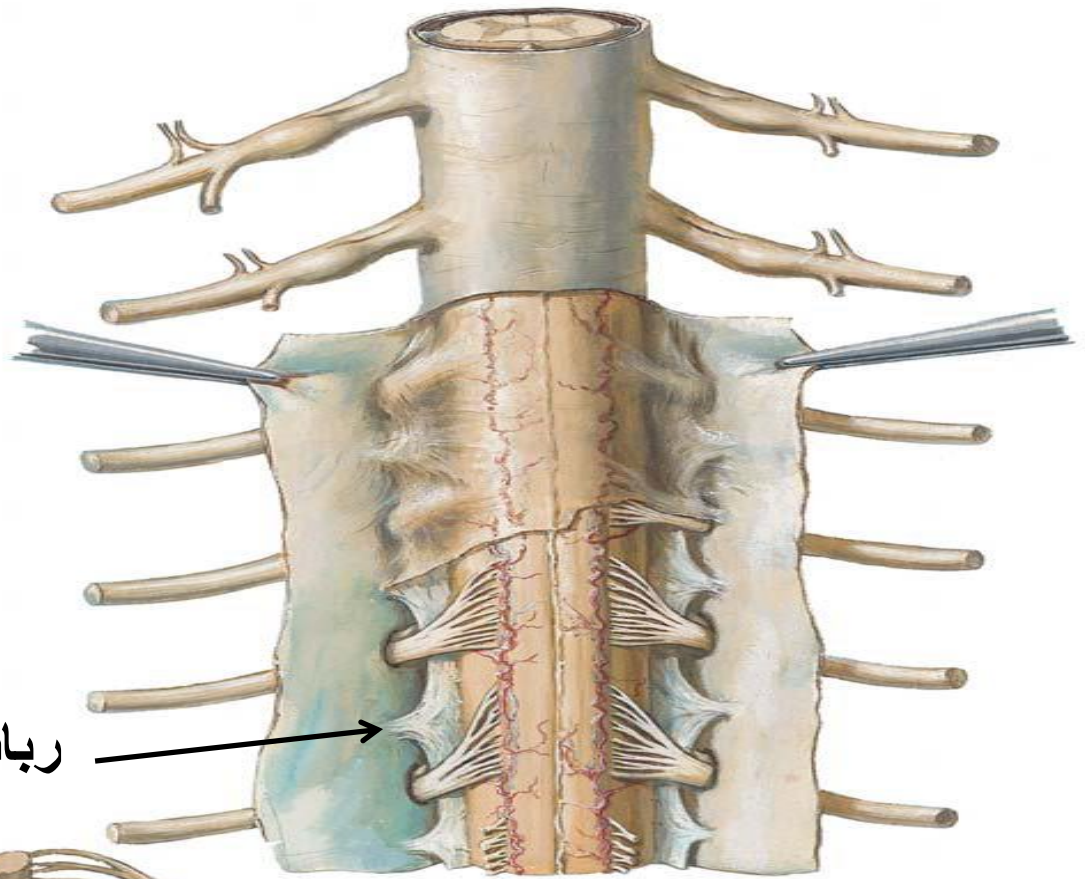
## Spinal Cord

- **anterior root:**  
- **motor**
- **posterior root:**  
- **sensory**

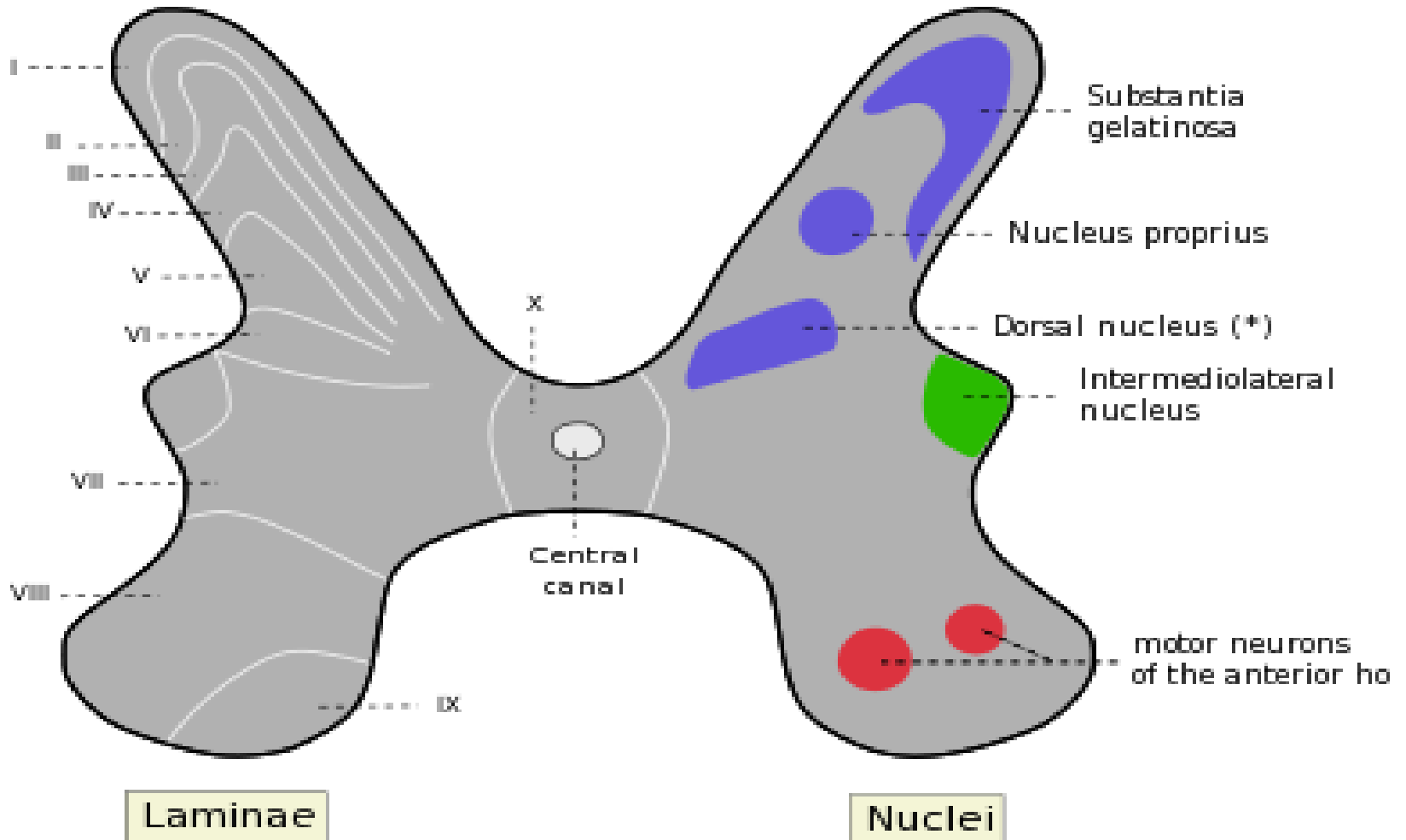
**Law of  
Bell-Magendie**



رباط دنداننه ایی



# هسته های ماده خاکستری نخاع

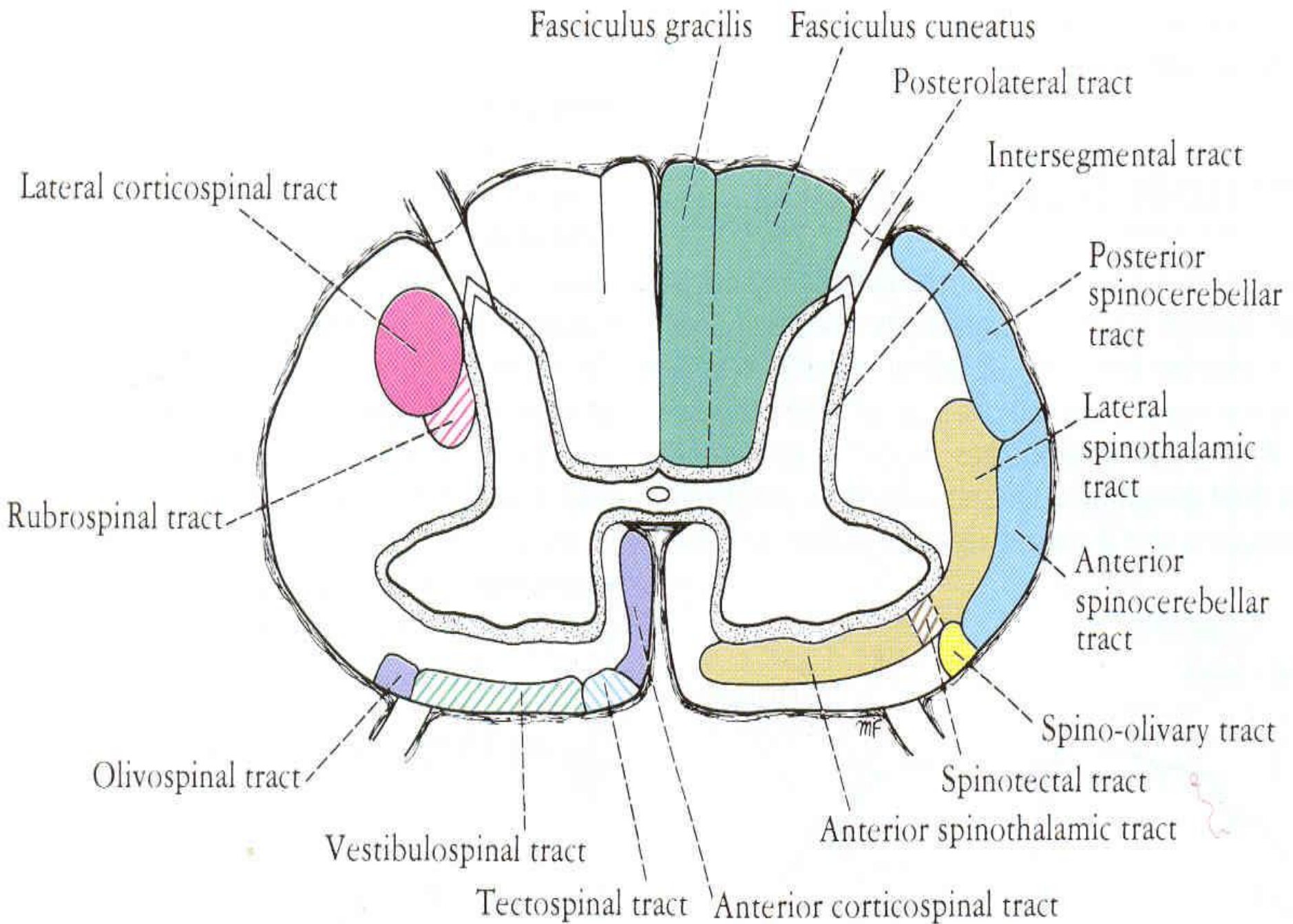


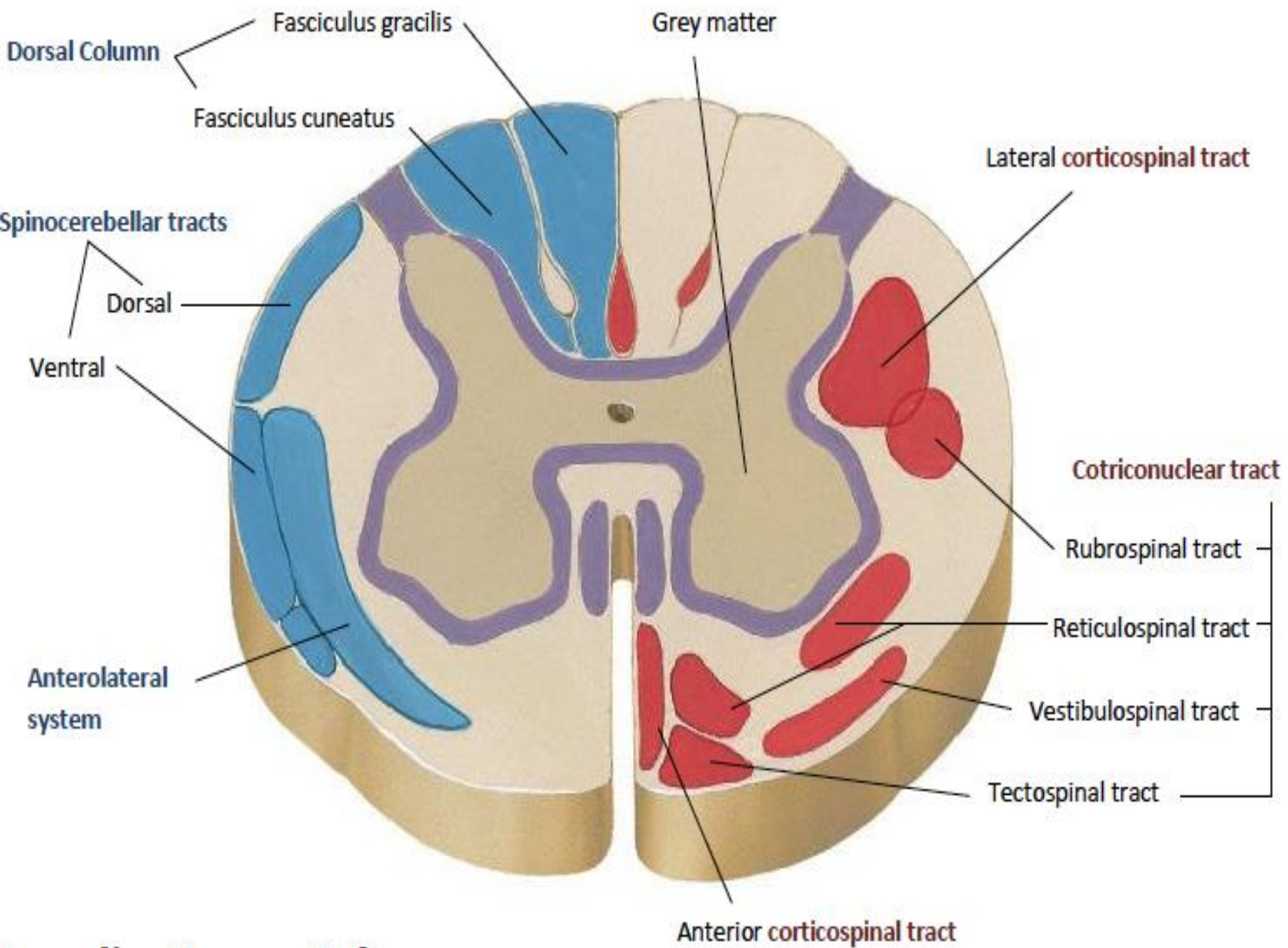
\* Posterior thoracic nucleus or Column of Clarke

# راههای نخاعی

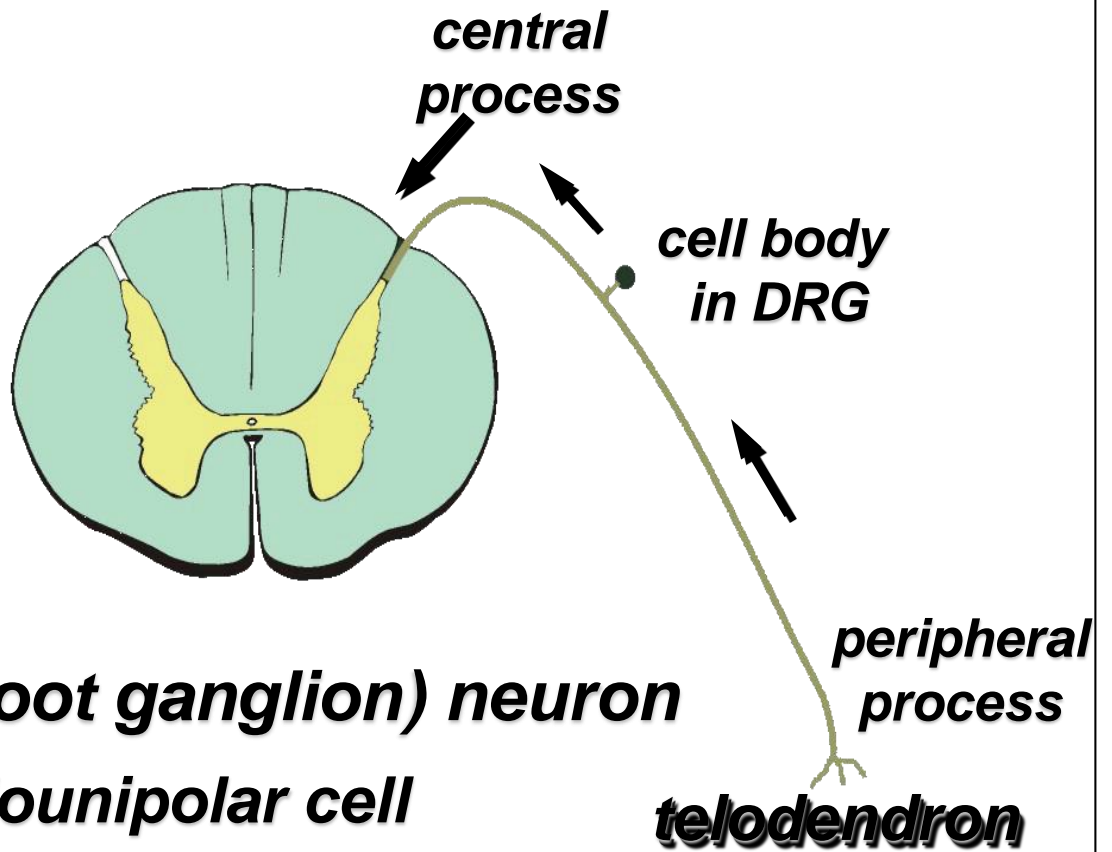
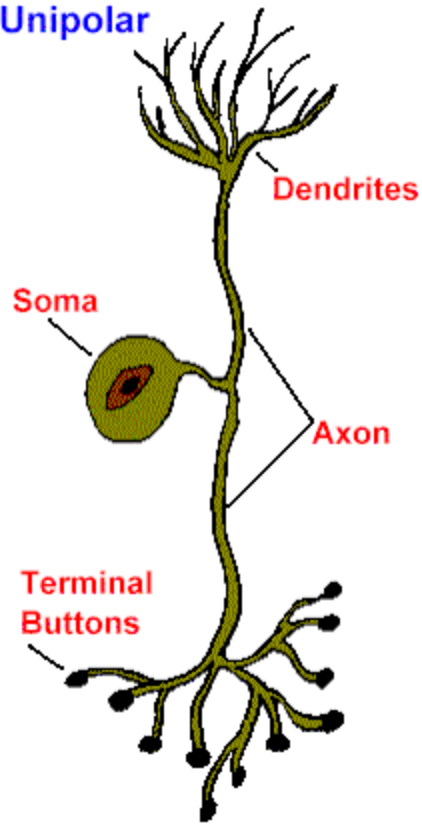
- راههای نخاعی: راههای صعودی ، راههای نزولی و راههای بین سگمانی
- راههای صعودی: انتریور اسپینوتالامیک، لترال اسپینوتالامیک، پوسترئور فانیکولوس، انتریور اسپینوسربلار، پوسترئور اسپینوسربلار، اسپینورتیکولار، اسپینو تکتال، اسپینو اولیواری
- راههای نزولی: کورتیکواسپینال لترال ، کورتیکو اسپینال انتریور، روبرواسپینال، وستیبولواسپینال، اولیوواسپینال، رتیکولواسپینال







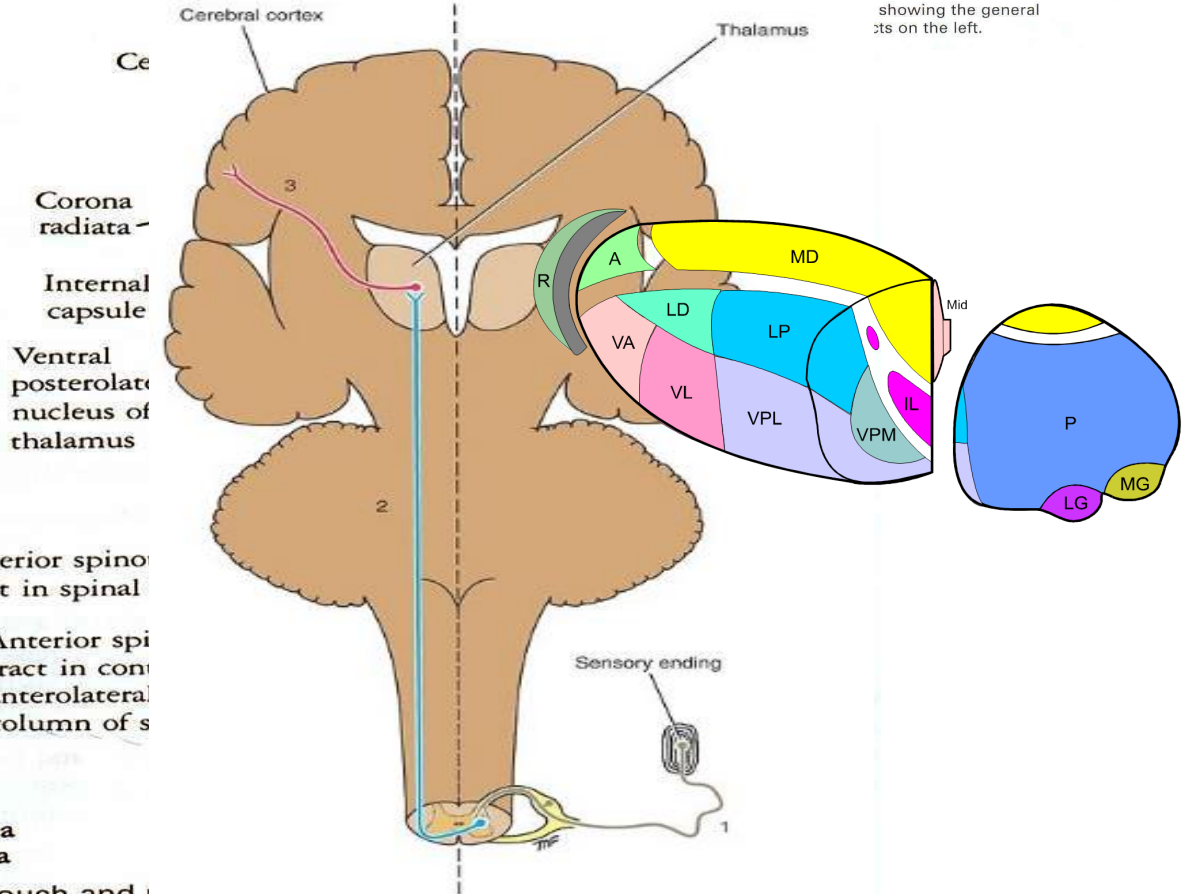
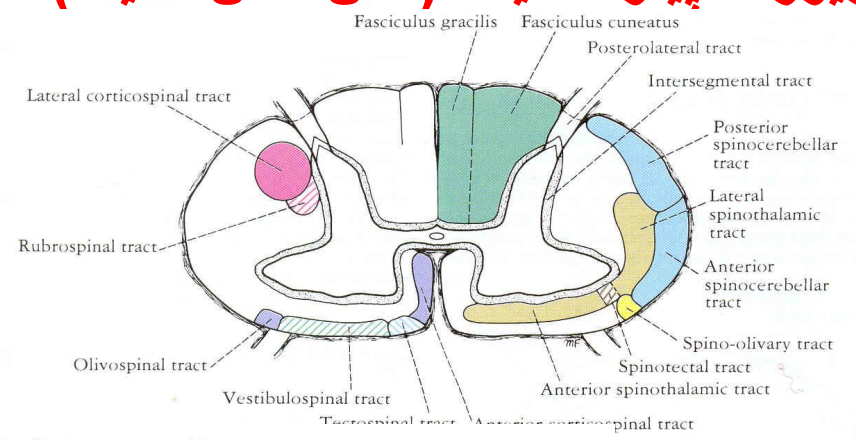
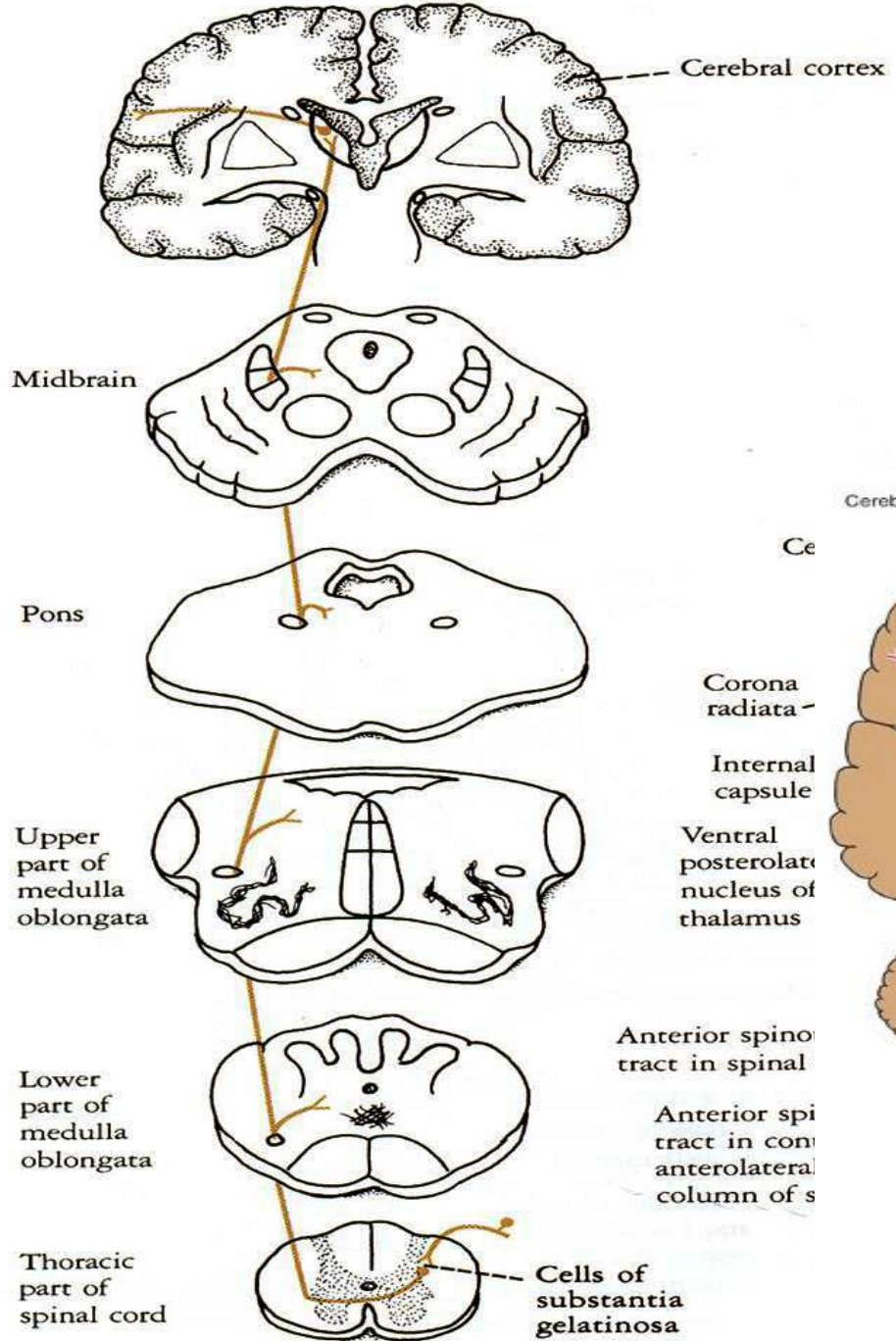
Unipolar



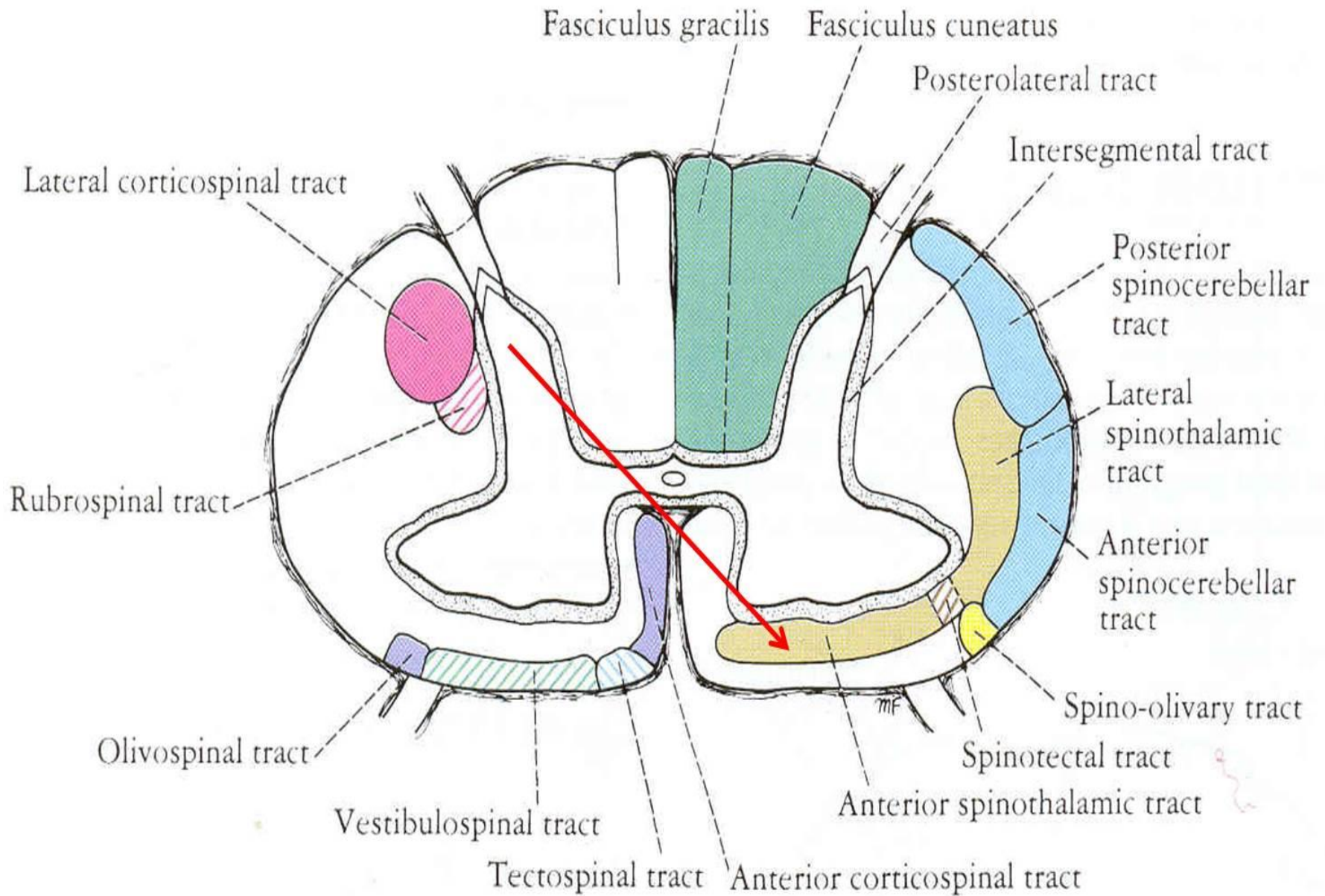
**DRG (dorsal root ganglion) neuron**  
**pseudounipolar cell**



# انٹریور اسپینو تالامیک (حس لمس خفیف)



**Figure 4-11** Light touch and





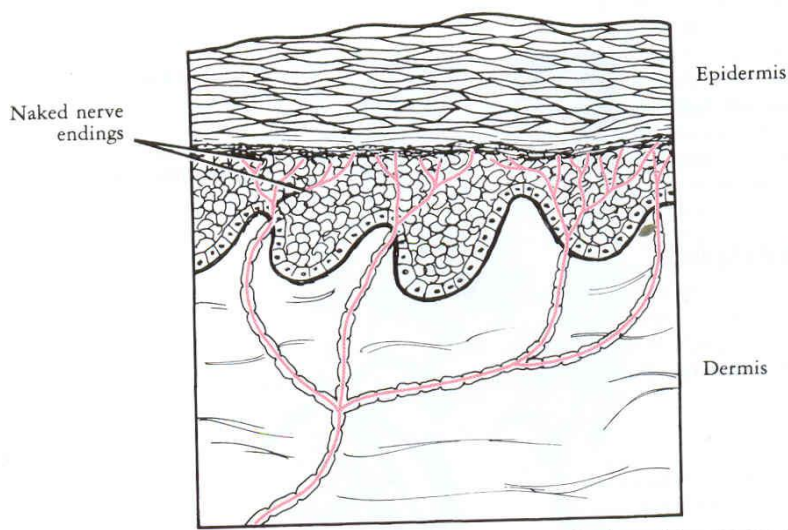


Figure 3-19 Free nerve endings in the skin. The nerve fibers in the epidermis are naked.

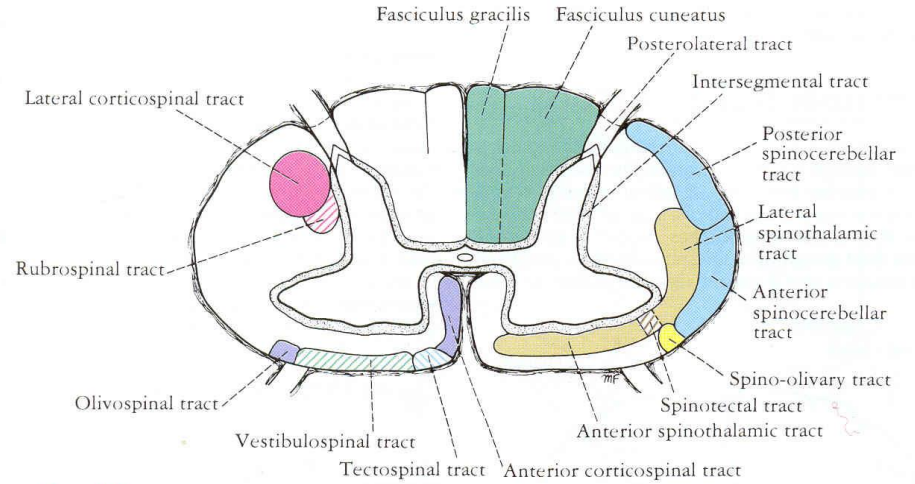
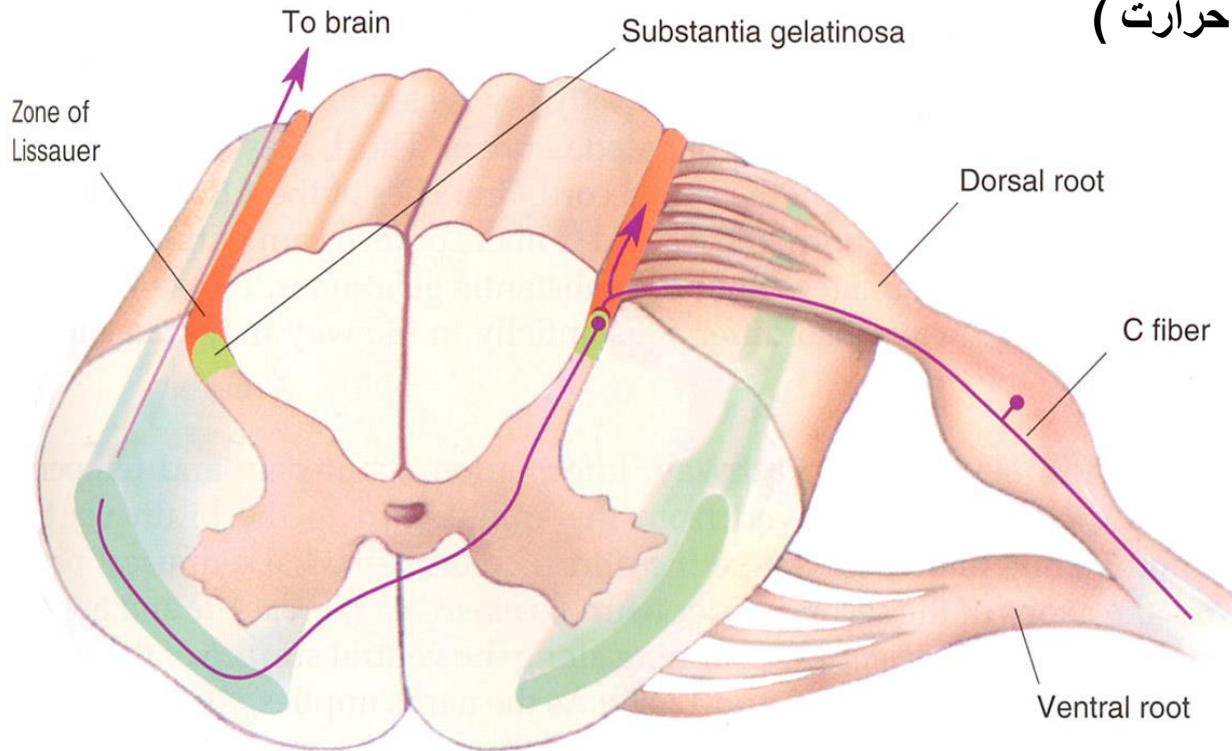


Figure 4-7 Transverse section of the spinal cord at the midcervical level, showing the general arrangement of the ascending tracts on the right and the descending tracts on the left.

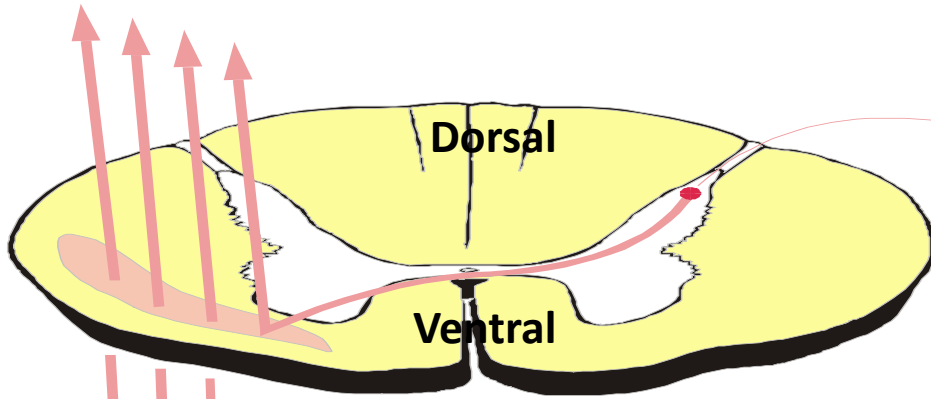
## اسپینوتالامیک لترال (حس درد و حرارت)



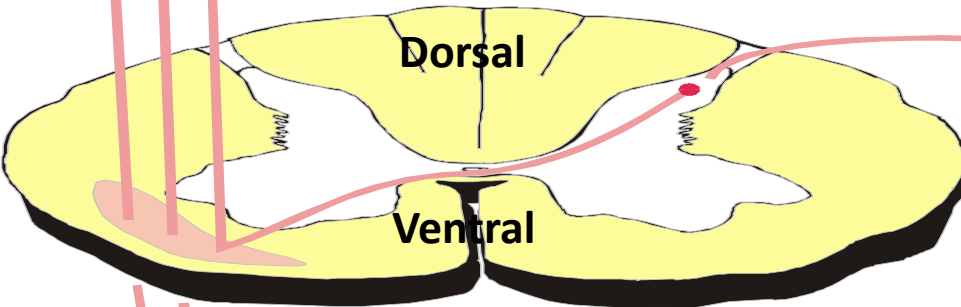


# لترال اسپینو تالامیک

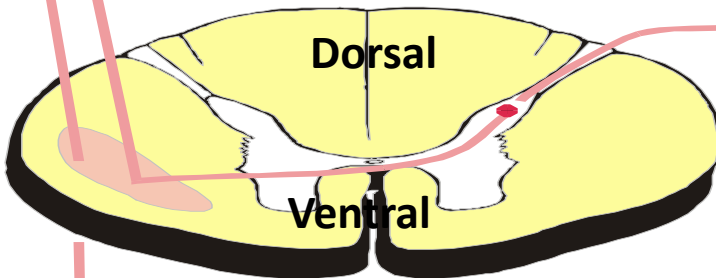
Cervical



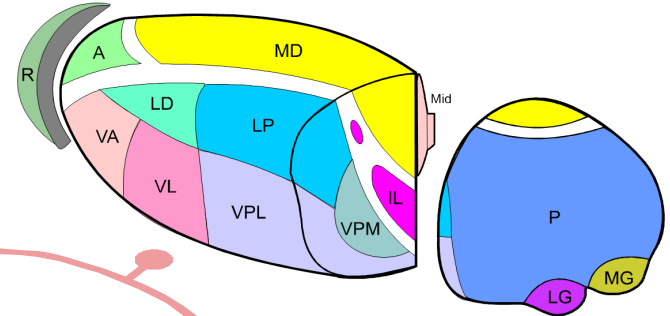
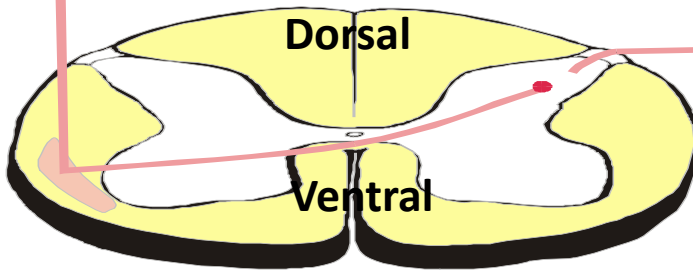
Thoracic



Lumbar



Sacral





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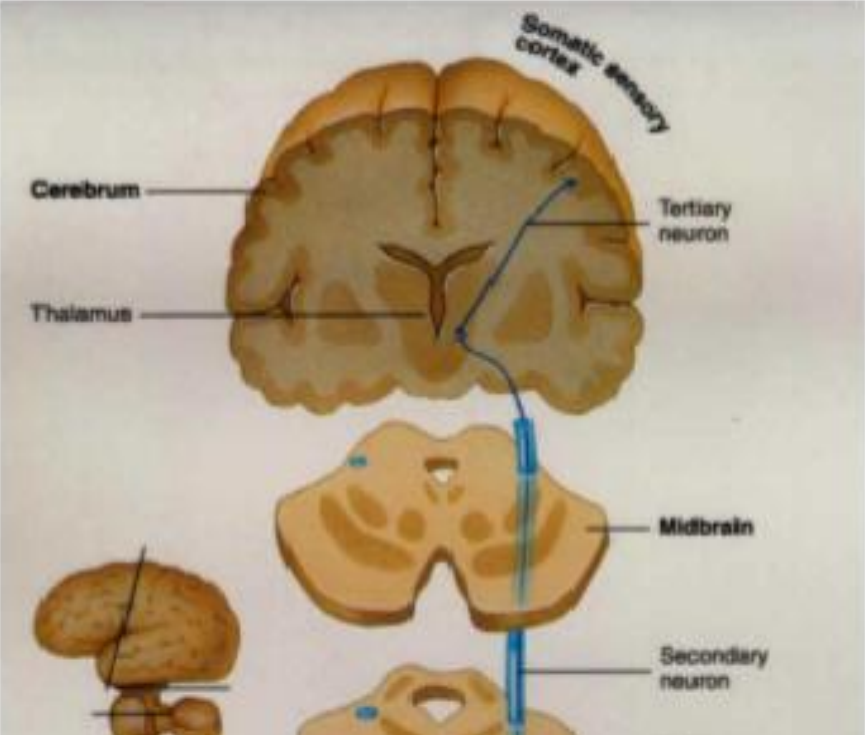
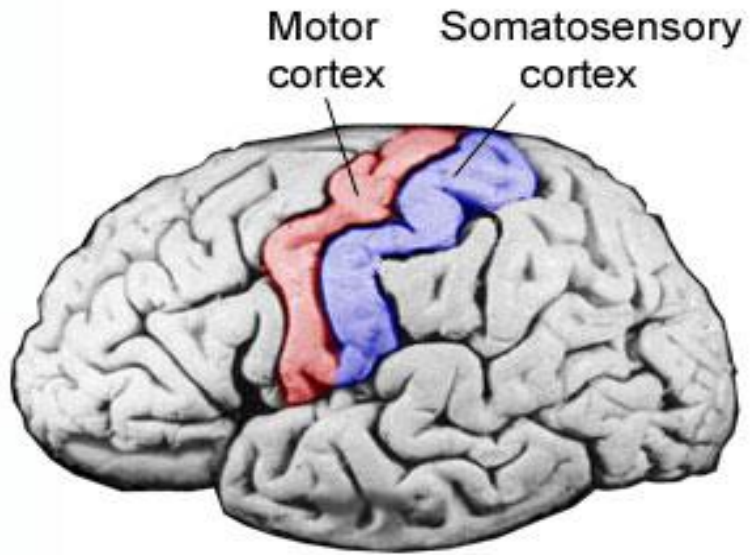
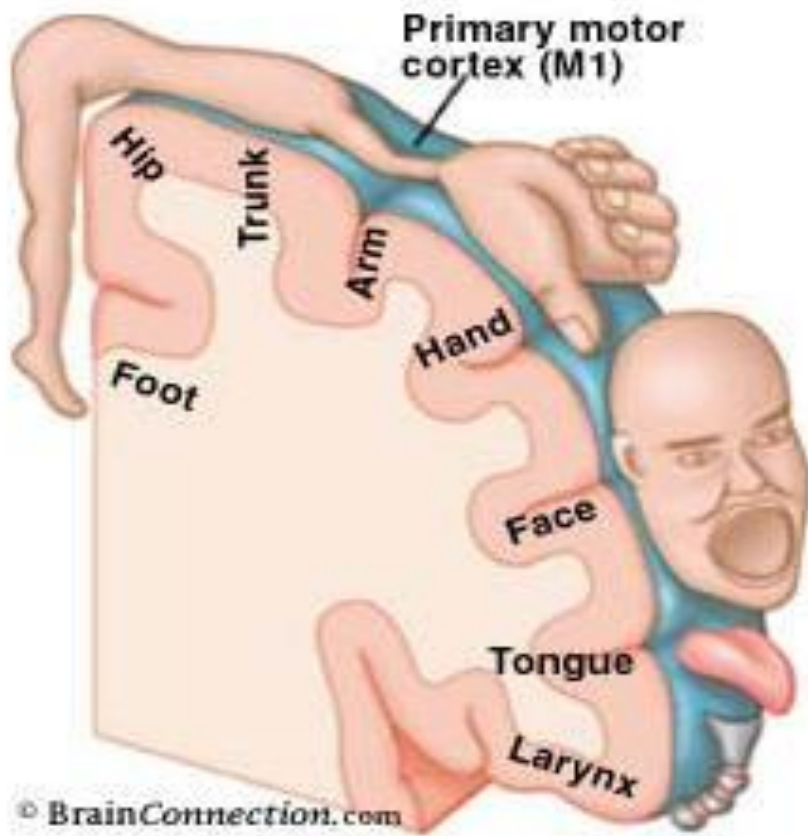
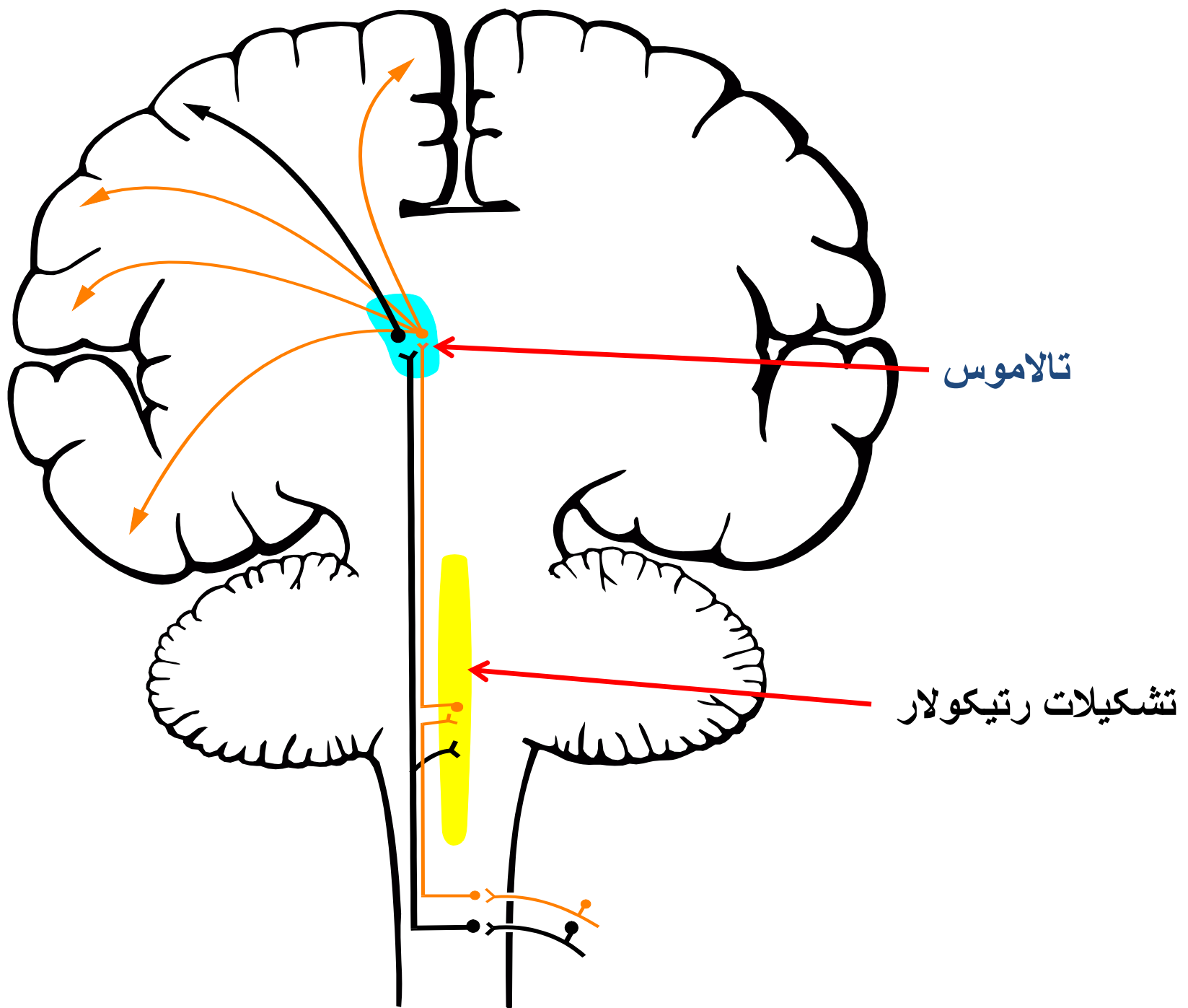


Figure F-3: Motor and Somatosensory Cortex

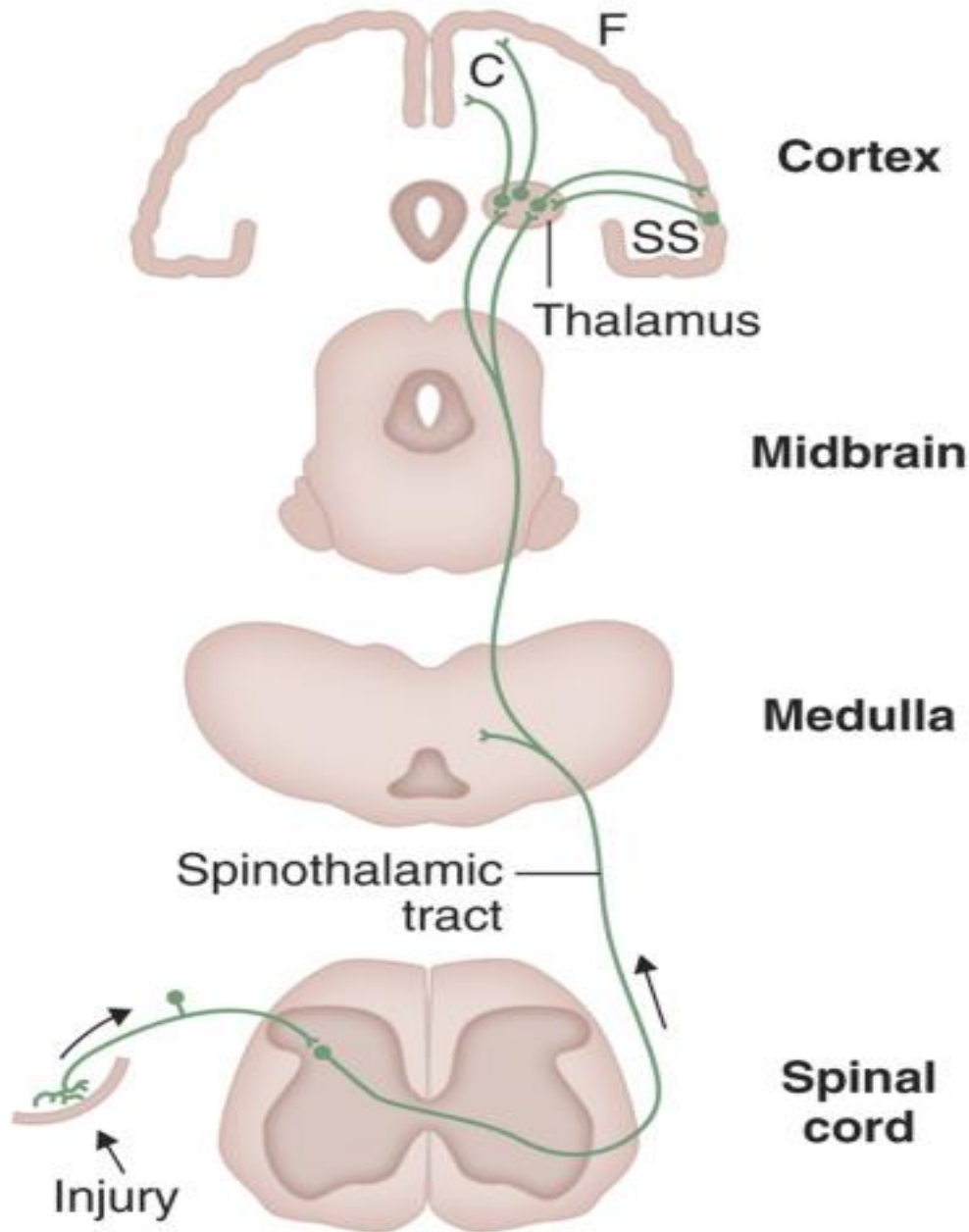






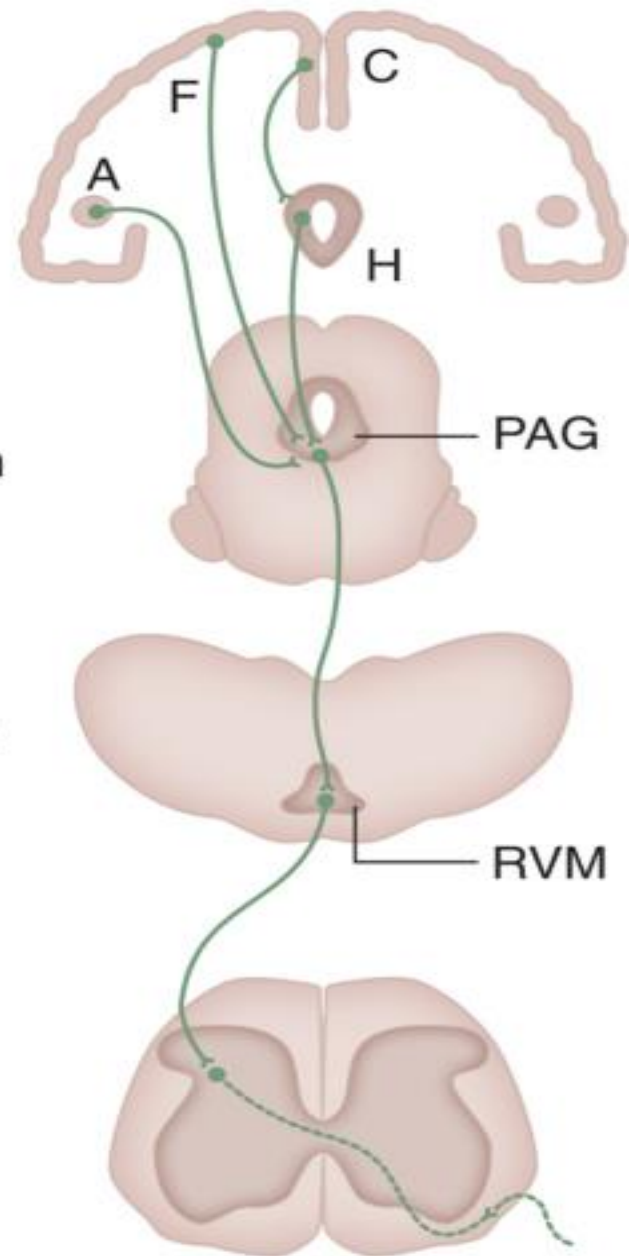
درد سریع

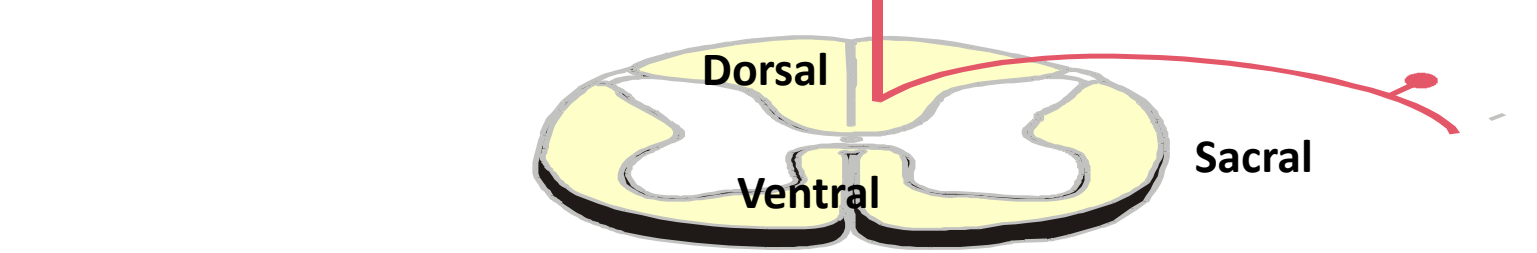
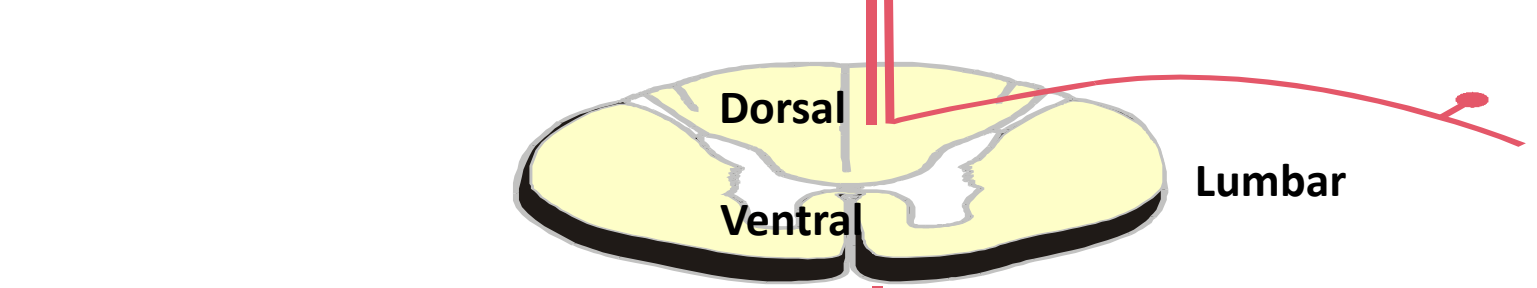
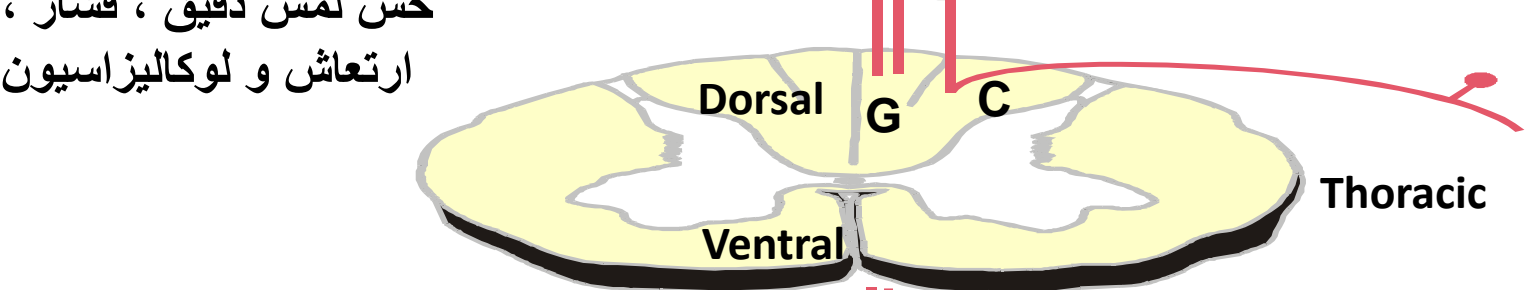
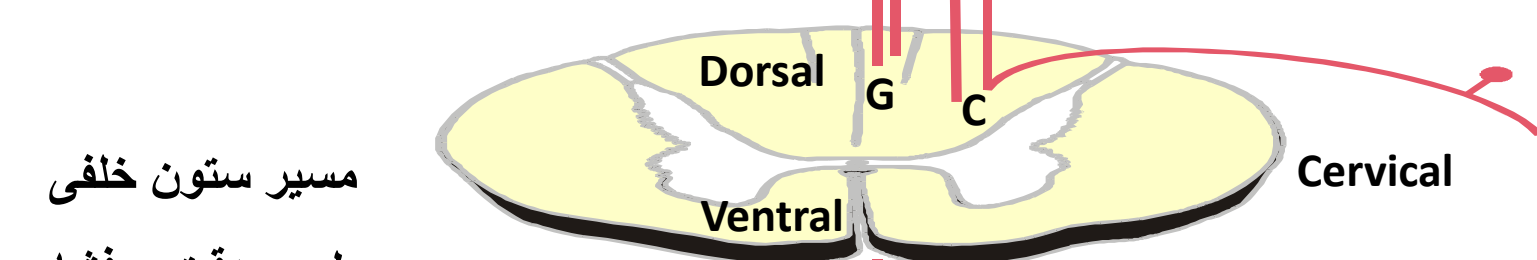
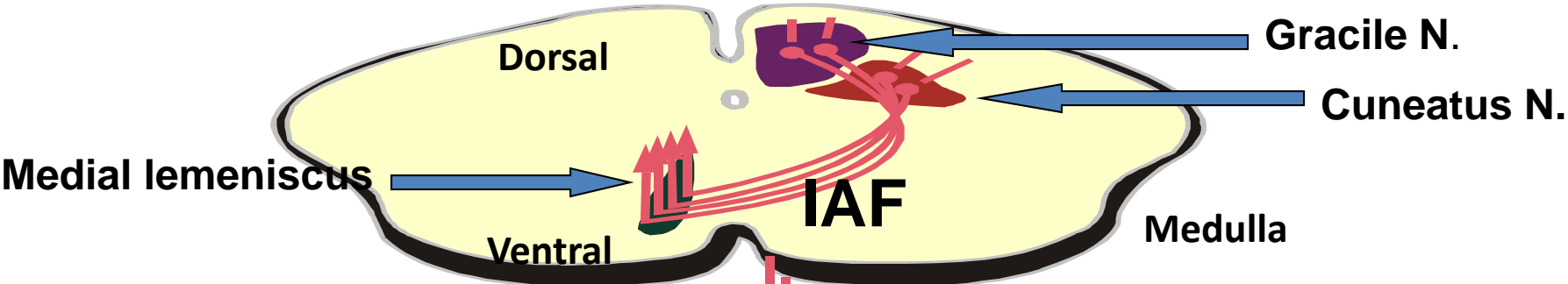
## Transmission



درد آهسته

## Modulation





مسیر ستون خلفی  
 حس لمس دقیق ، فشار ،  
 ارتعاش و لوکالیزاسیون

Glossopharyngeal (IX) and  
vagus (X) nerves

Facial nerve (VII)

Inferior cerebellar peduncle

Cuneate tubercle **تکمه کونناتوس**

Hypoglossal nerve (XII)

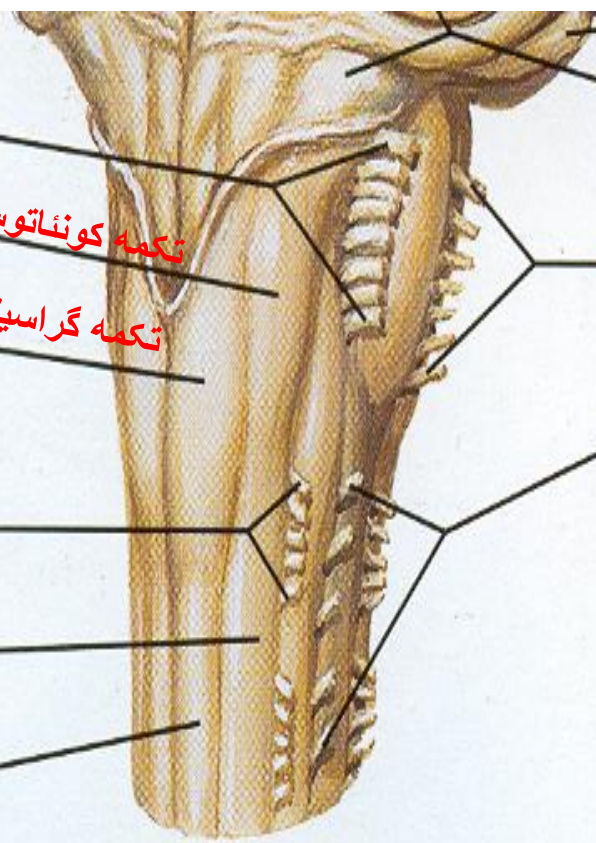
Gracile tubercle **تکمه گراسیلیس**

Accessory nerve (XI)

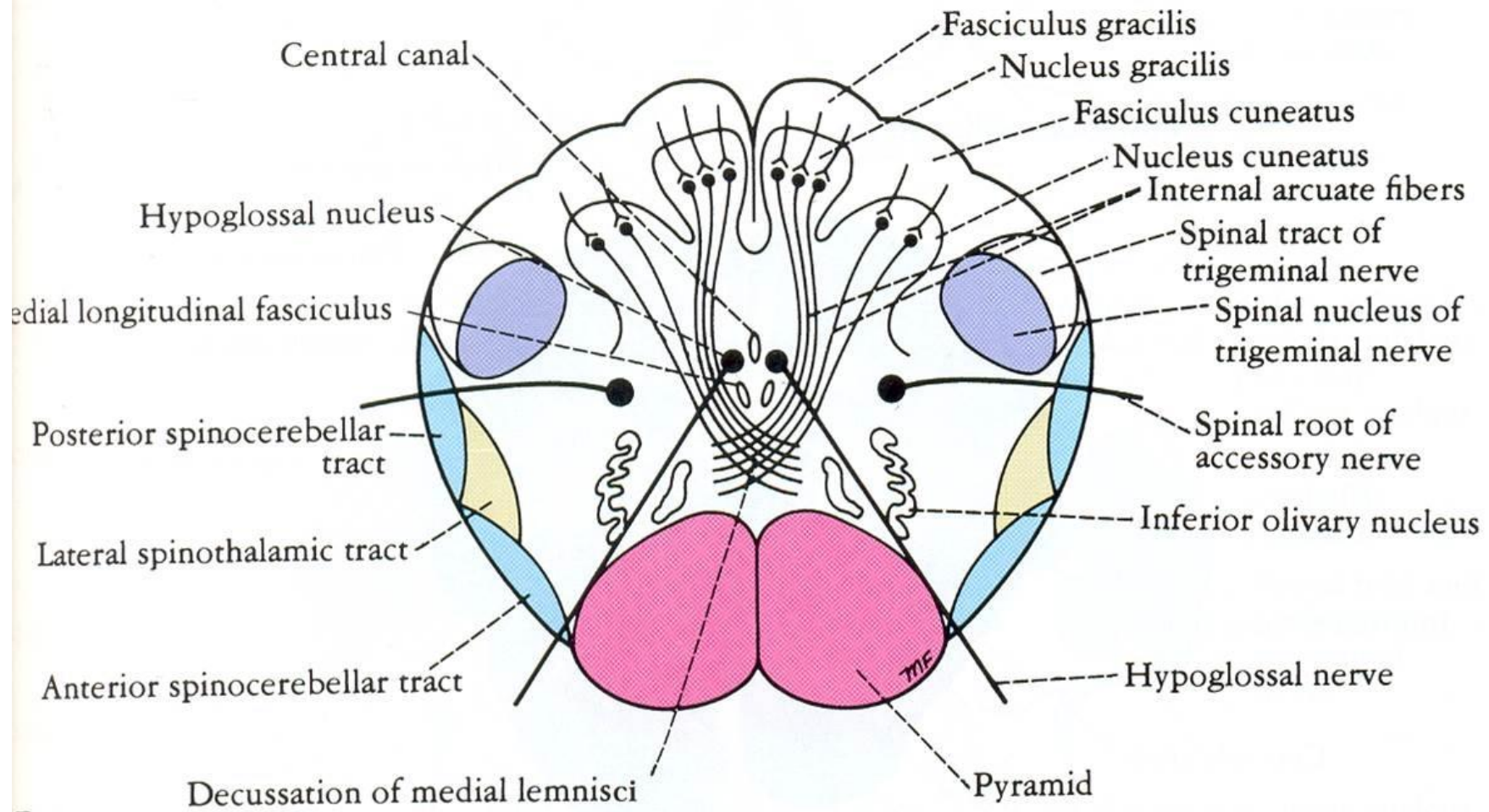
Dorsal roots of  
1st spinal nerve (C1)

Cuneate fasciculus

Gracile fasciculus







B



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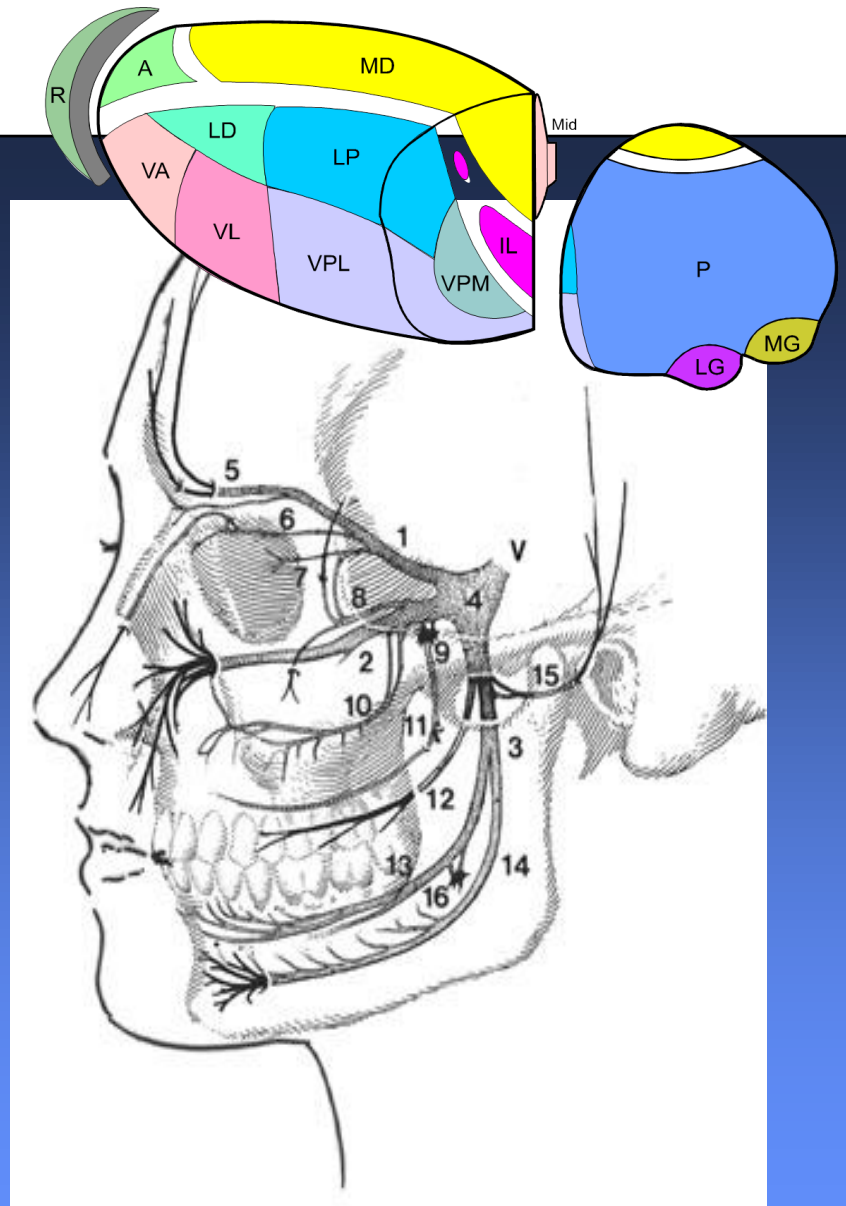
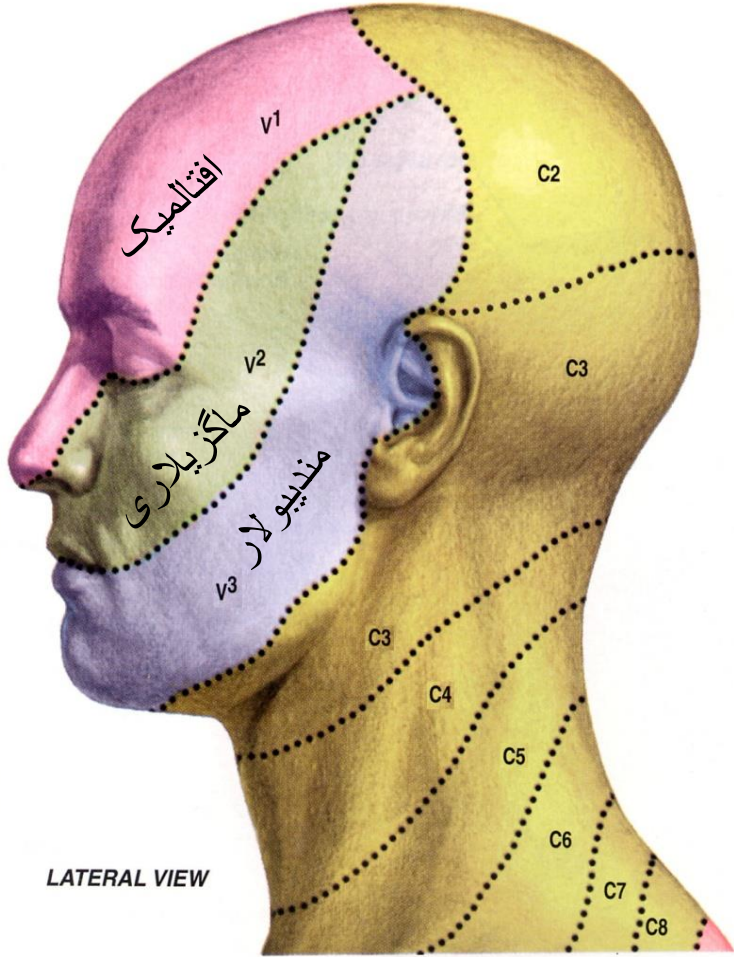


[Flash-swf-converter.com](http://Flash-swf-converter.com)





# مسیر تریجمینو تالامیک



انتریور اسپینوسربلار

هسته کونئاتوس فرعی

پوستریور اسپینوسربلار &  
کونئاتوسربلار

Medulla

Cervical

Thoracic

Lumbar

Sacral

Dorsal

Ventral

Dorsal

Ventral

Dorsal

Ventral

Dorsal

Ventral

Dorsal

Ventral

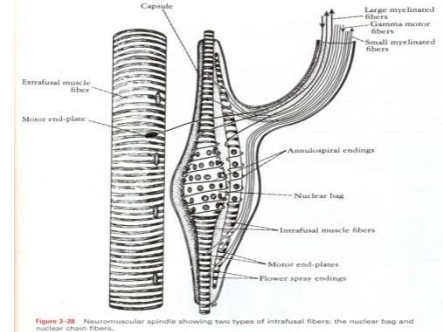


Figure 3-28 Neuromuscular spindle showing two types of intrafusal fibers: the nuclear bag and nuclear chain fibers.

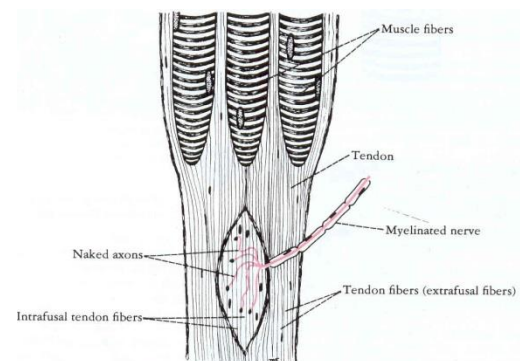
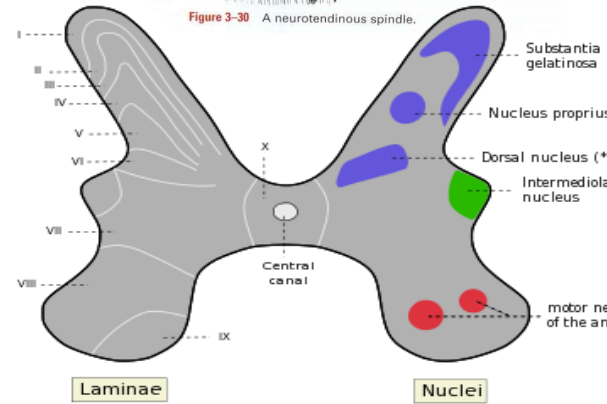


Figure 3-30 A neurotendinous spindle.



\* Posterior thoracic nucleus or Column of Clarke



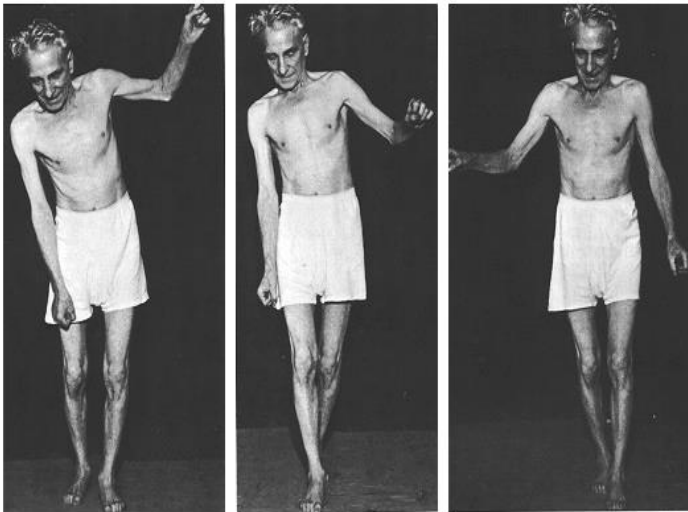


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# Posterior Column Ataxia

Friedreich's ataxia



# SOMATIC MOTOR SYSTEM

upper motor neuron  
UMN

Brain Stem  
Descending  
Pathway

VOLUNTARY  
CONTROL

*Pyramidal Tract*

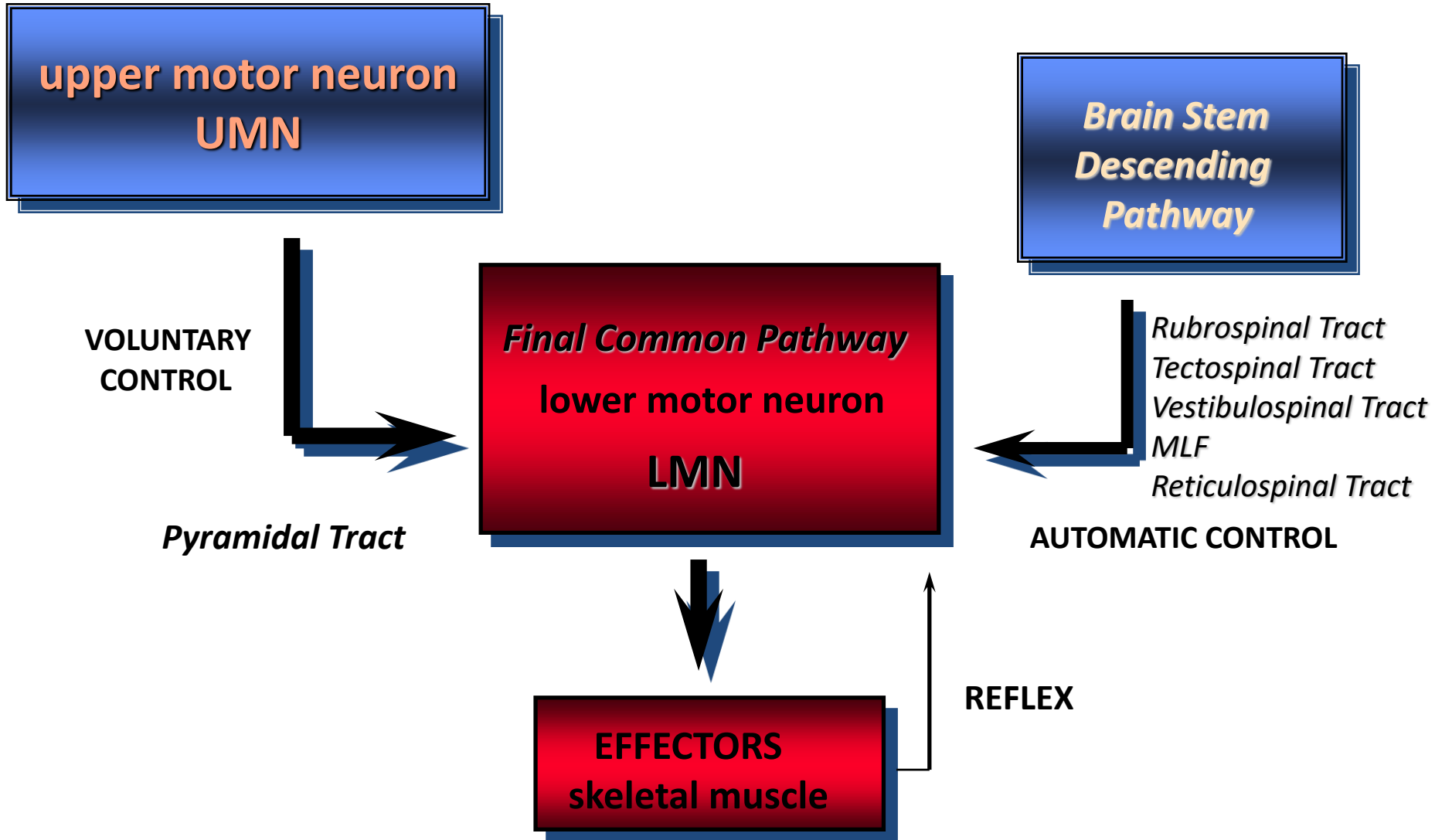
*Final Common Pathway*  
lower motor neuron  
LMN

*Rubrospinal Tract*  
*Tectospinal Tract*  
*Vestibulospinal Tract*  
*MLF*  
*Reticulospinal Tract*

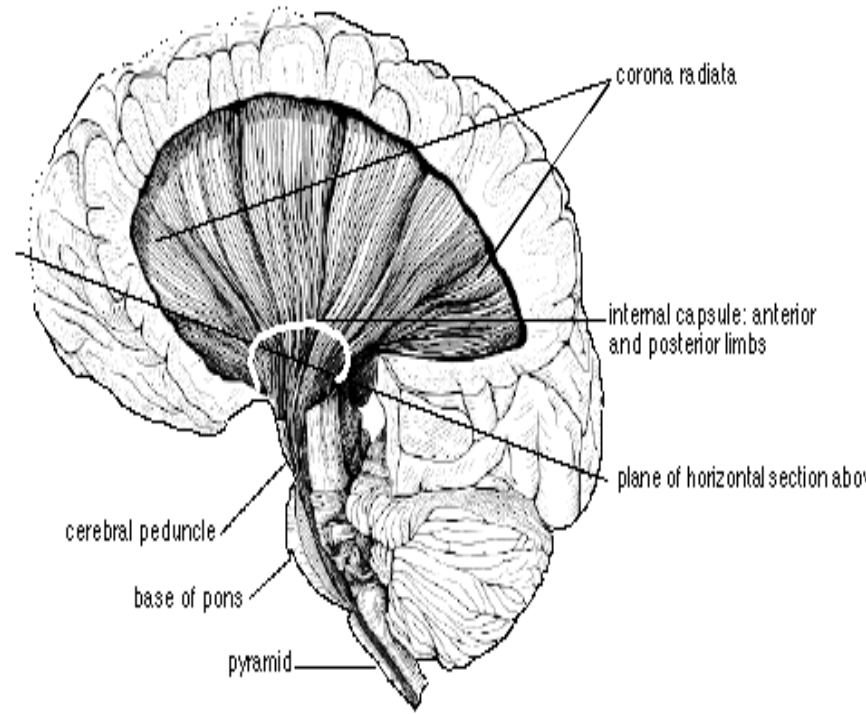
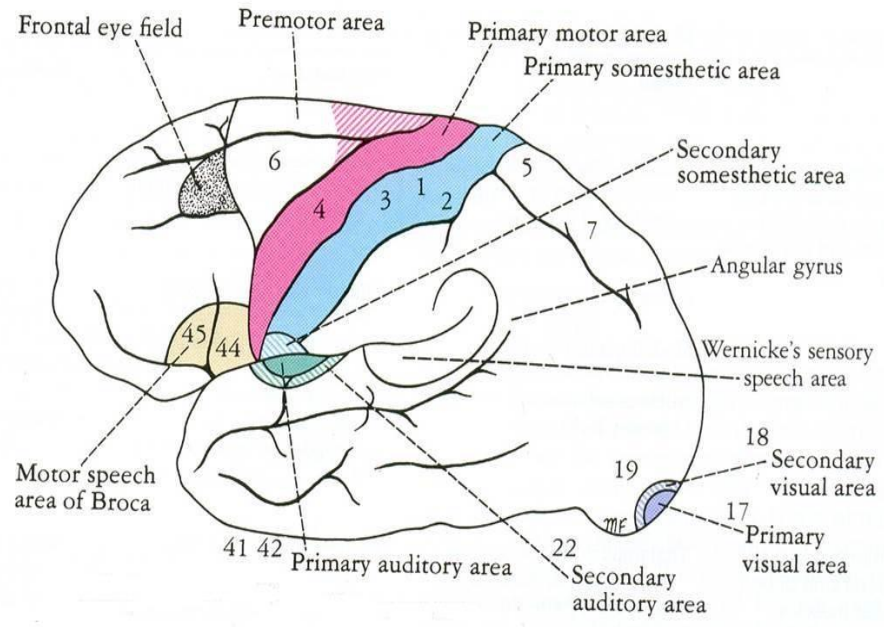
AUTOMATIC CONTROL

REFLEX

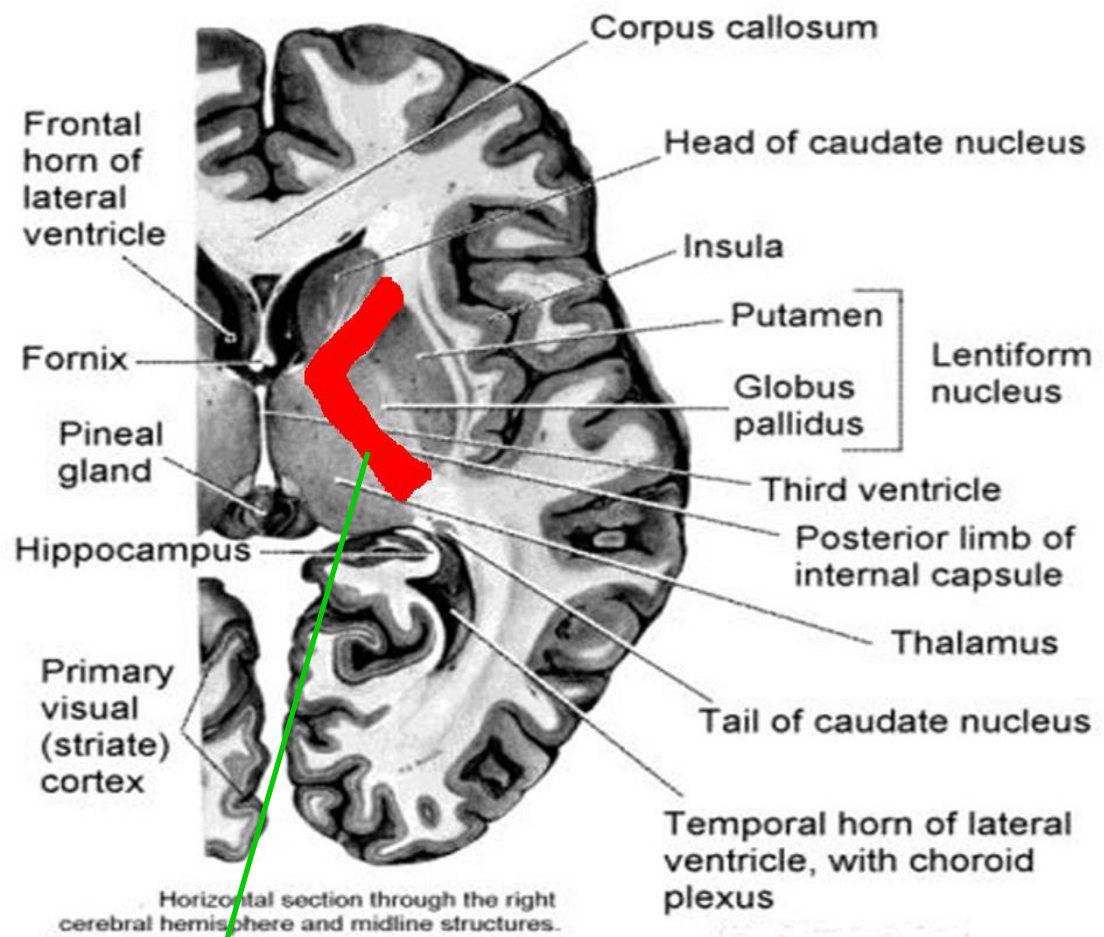
EFFECTORS  
skeletal muscle



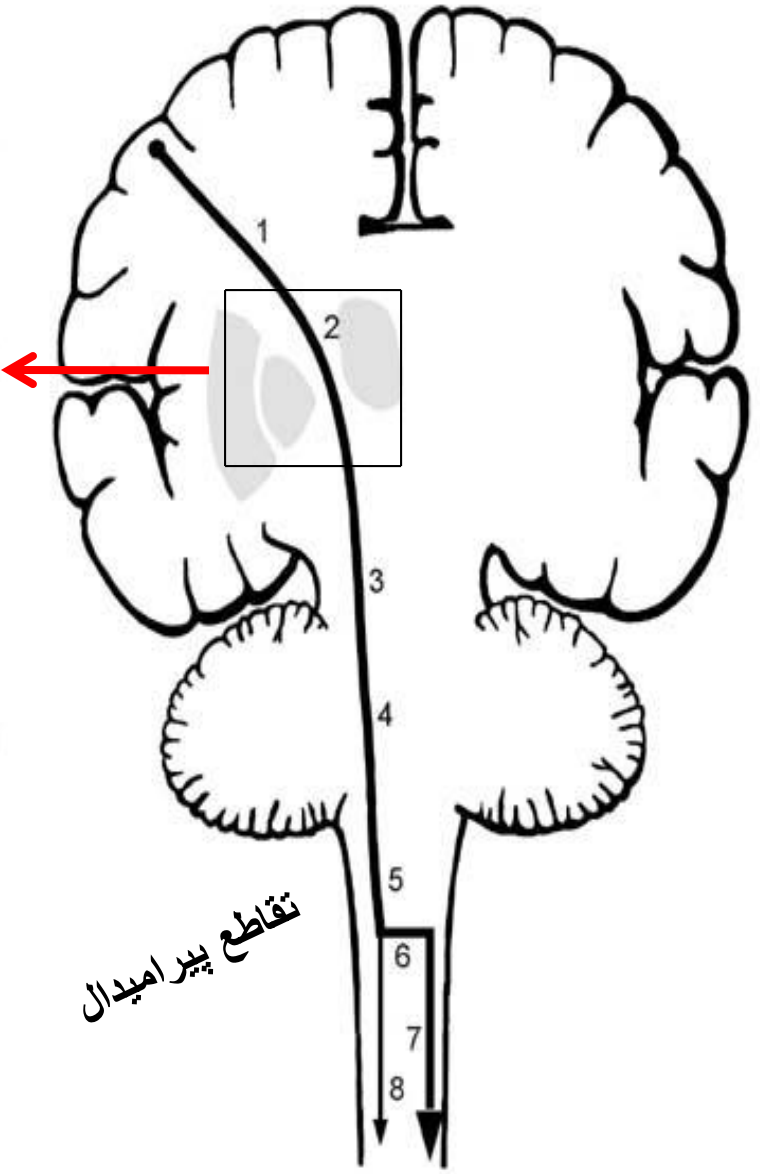
# cortico spinal tract    مسیر کورتیکو اسپینال



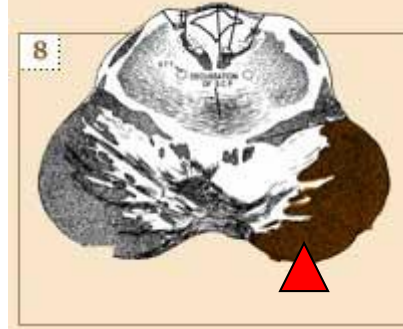
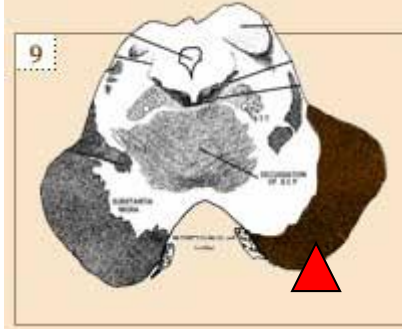
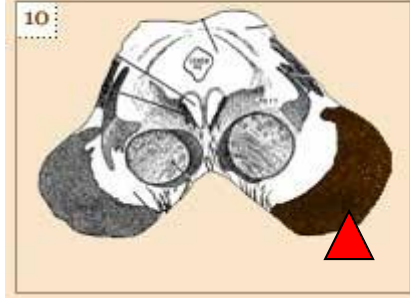




**Internal Capsule**



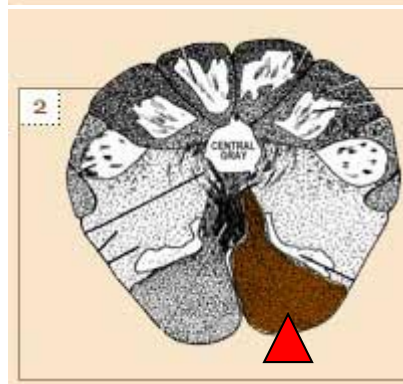
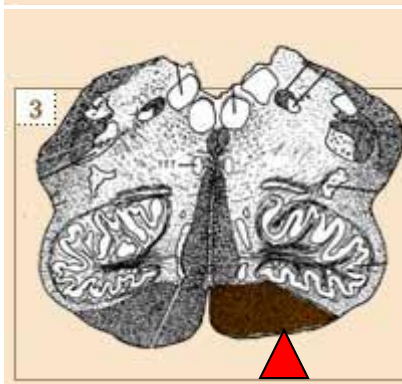
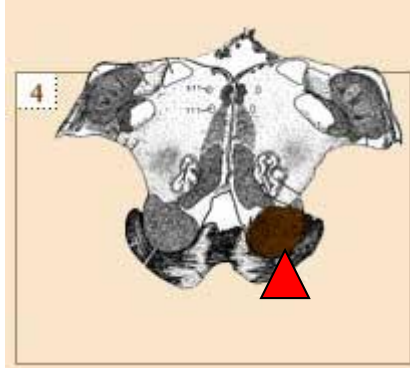
# مسیر کورتیکو اسپاینال



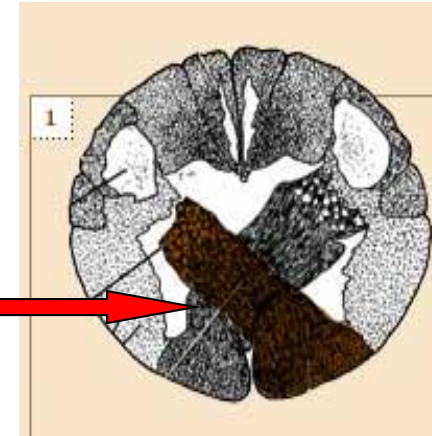
مغز میانی



پل مغزی

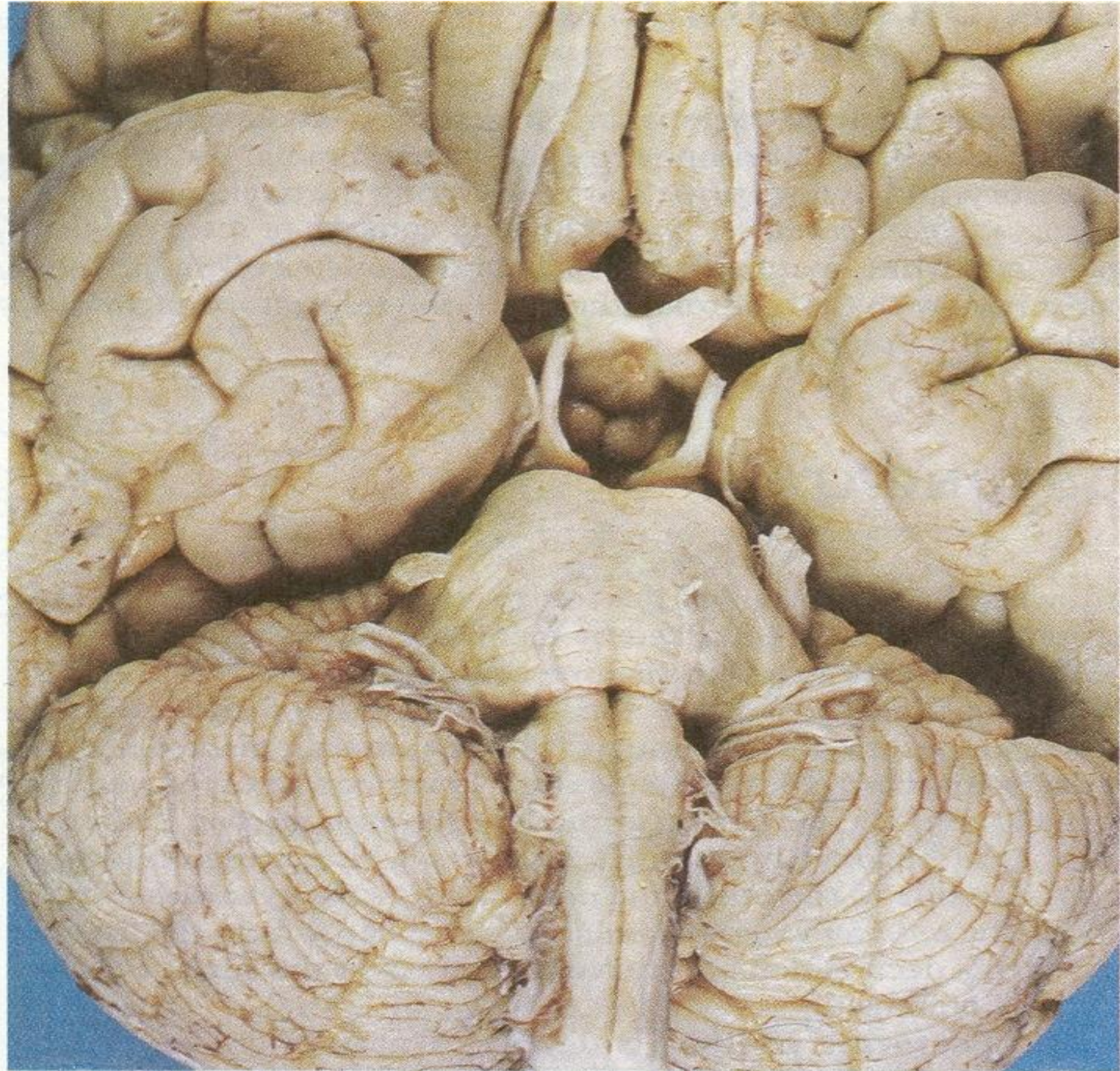


بصل النخاع

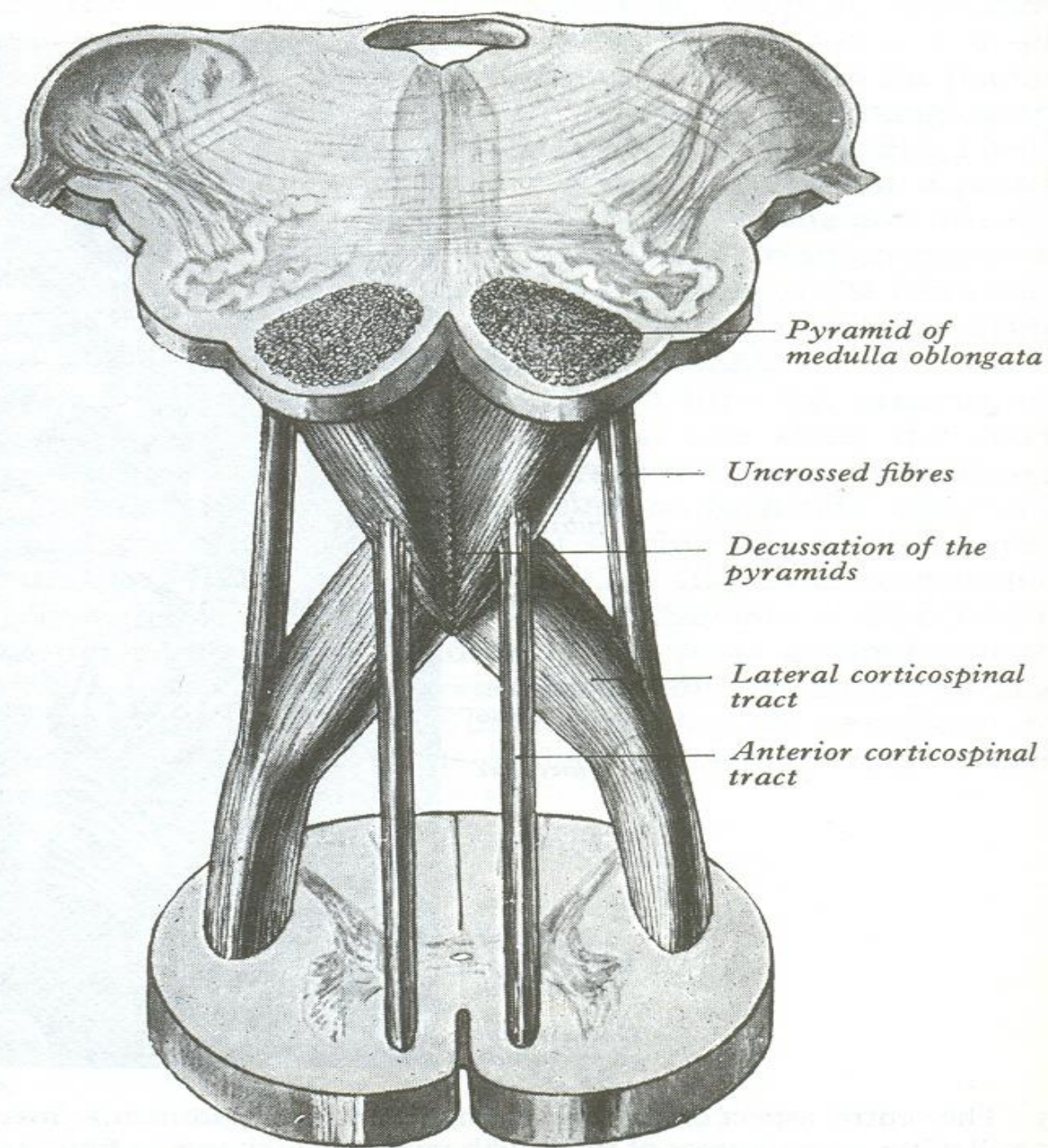


تقاطع پیرامیدال









57 Schematic dissection to show the decussation of the pyramids.





# آسیب بہ مسیر کورٹیکو اسپینال – علامت بابینسکی

## EXAMINATION TIP



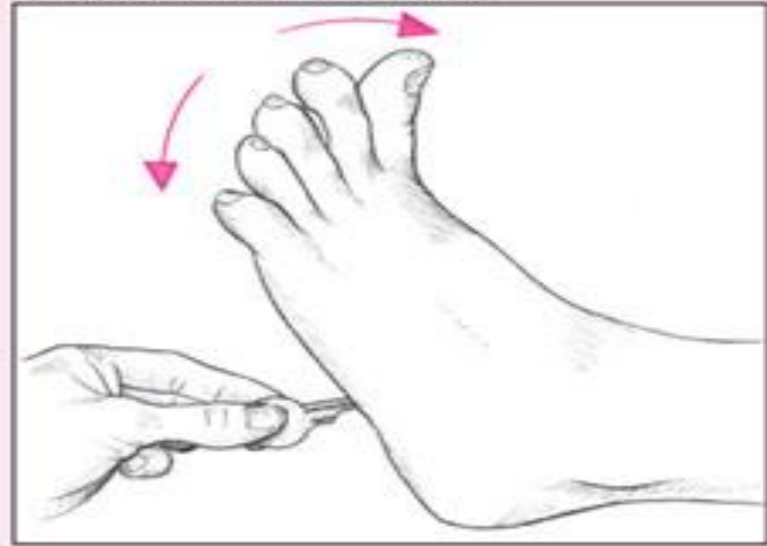
### How to elicit Babinski's reflex

To elicit Babinski's reflex, stroke the lateral aspect of the sole of the patient's foot with your thumbnail or another moderately sharp object. Normally, this elicits flexion of all toes (a negative Babinski's reflex), as shown below in the left illustration. With a positive Babinski's reflex, the great toe dorsiflexes and the other toes fan out, as shown in the right illustration.

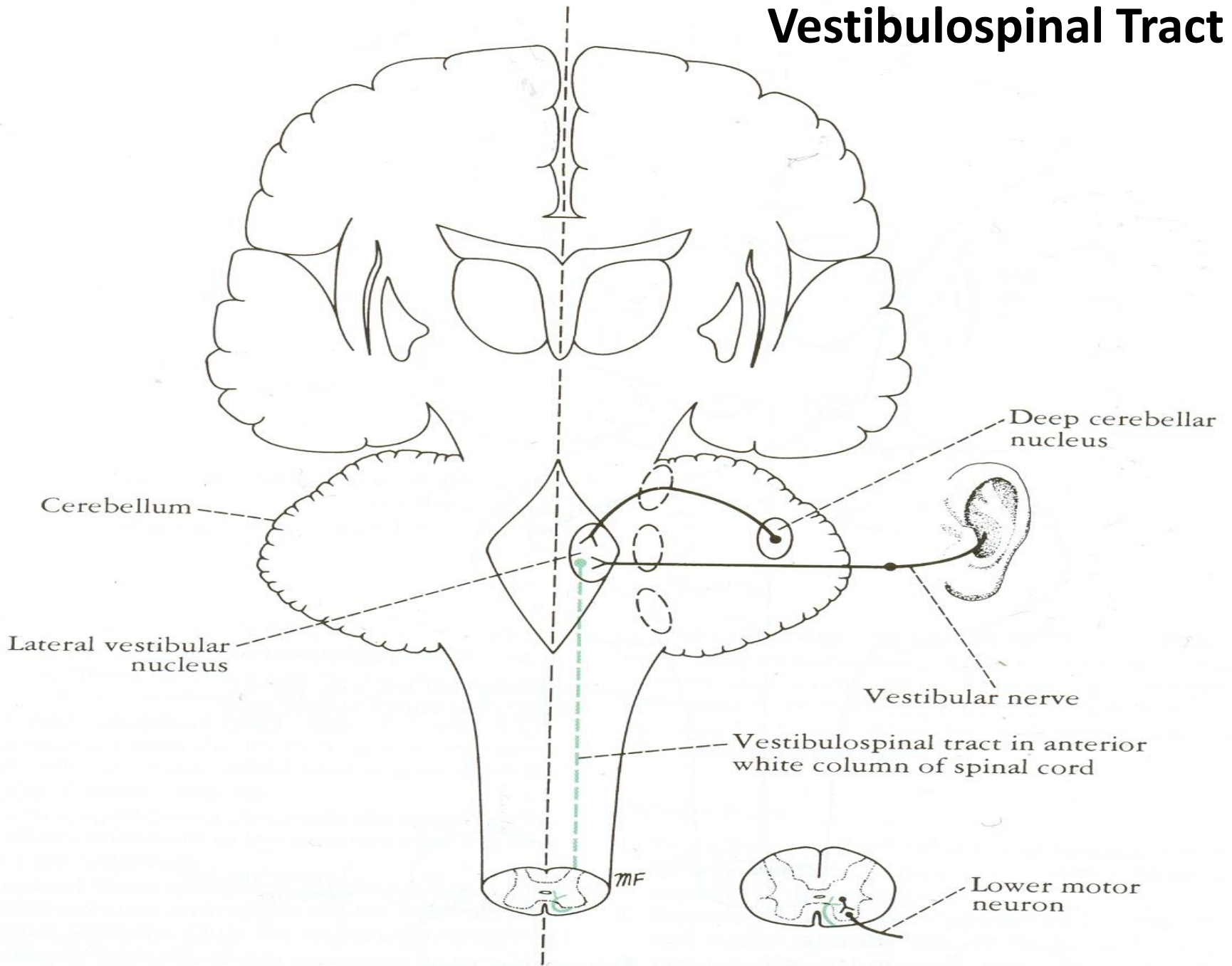
#### NORMAL TOE FLEXION



#### POSITIVE BABINSKI'S REFLEX

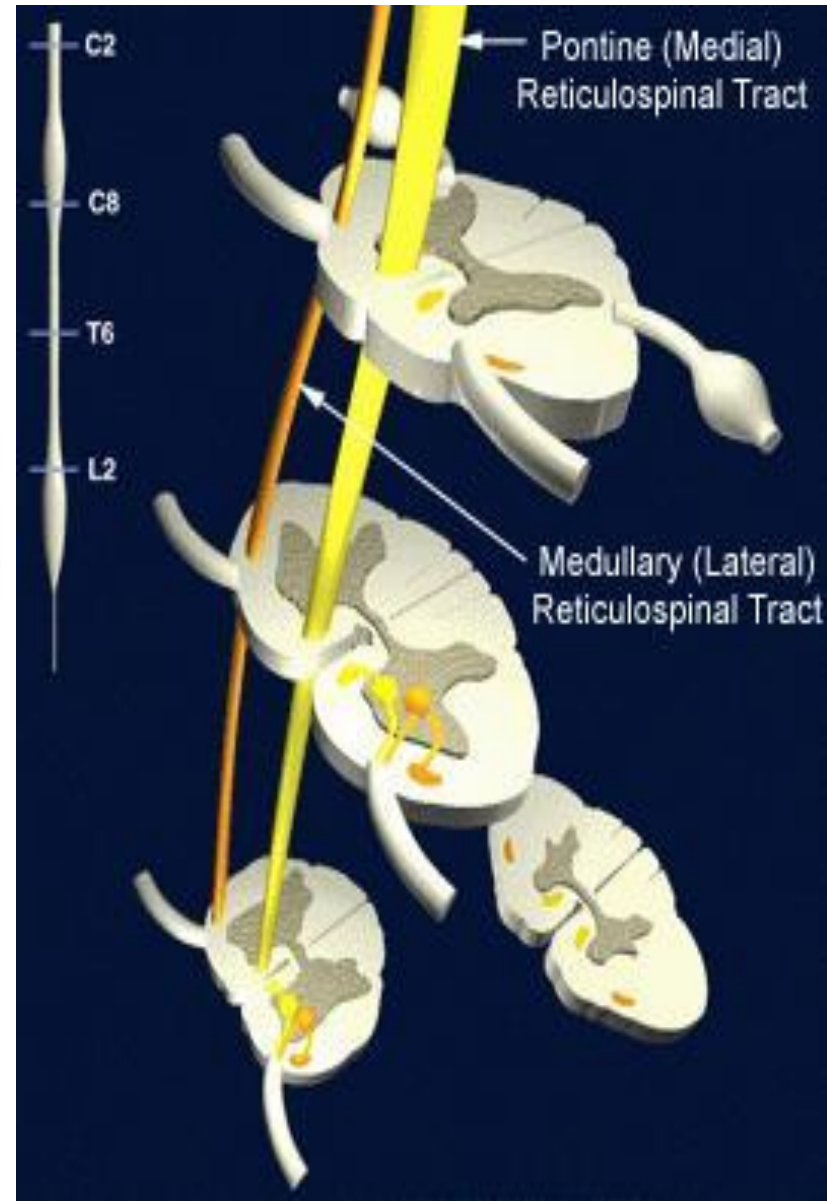
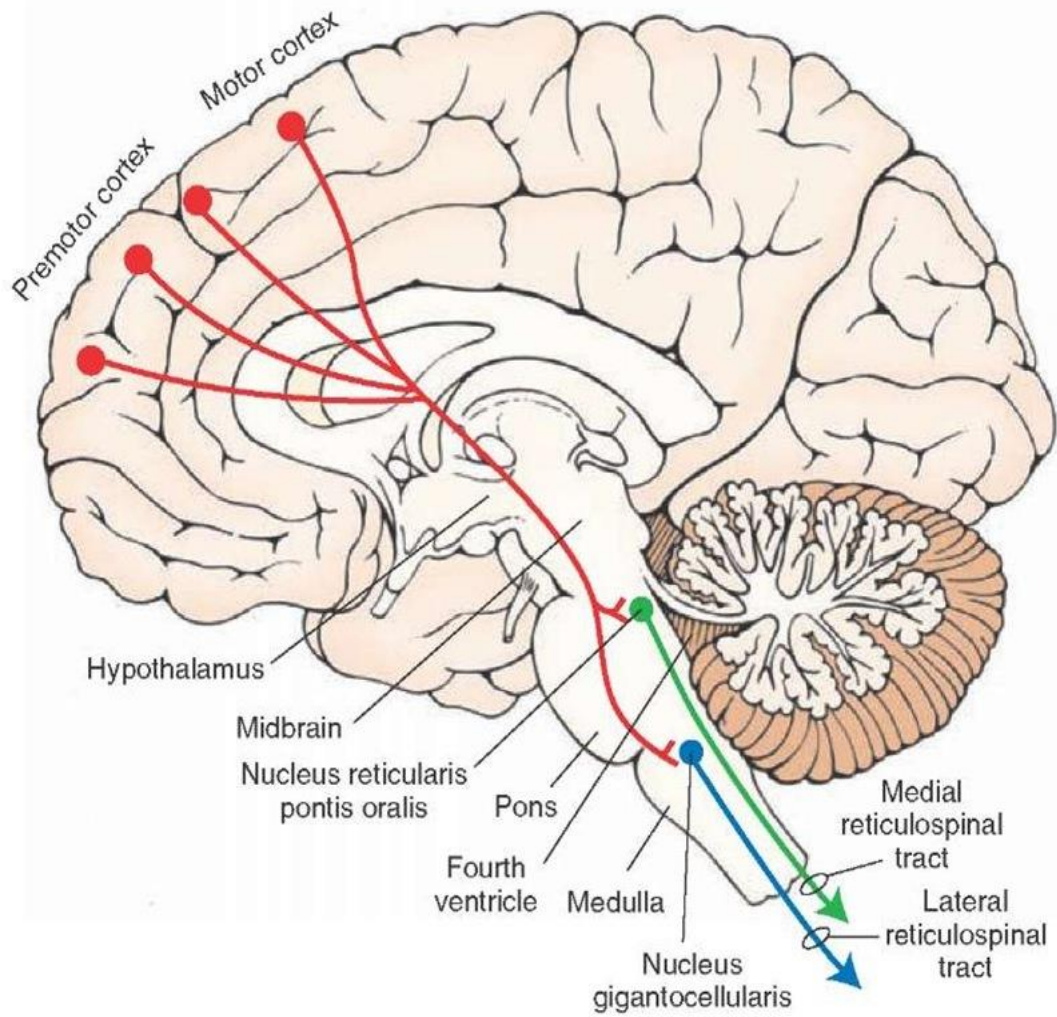


# Vestibulospinal Tract



**Figure 4-21** Vestibulospinal tract.

# Reticulospinal Tract



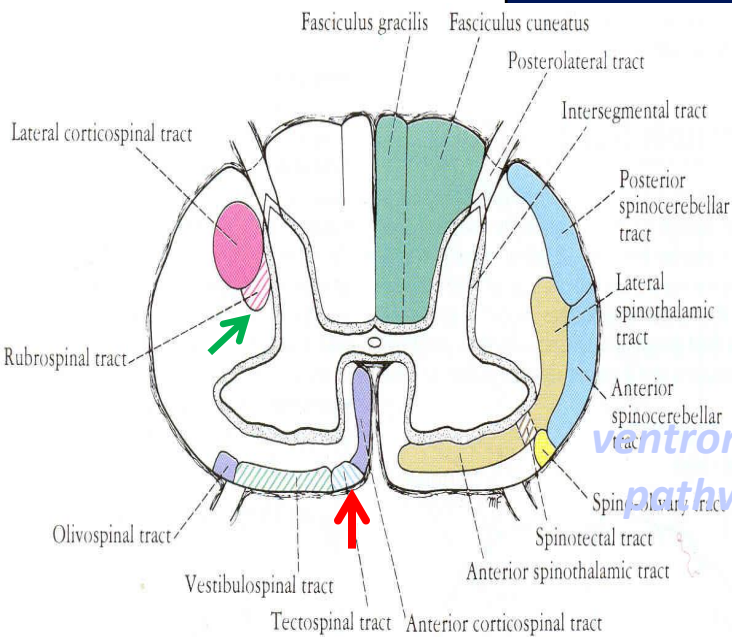


مسیر تکتواسپاینال

مسیر روبرواسپاینال

هسته های تکتال

هسته قرمز



ventromedial pathway

dorolateral pathway

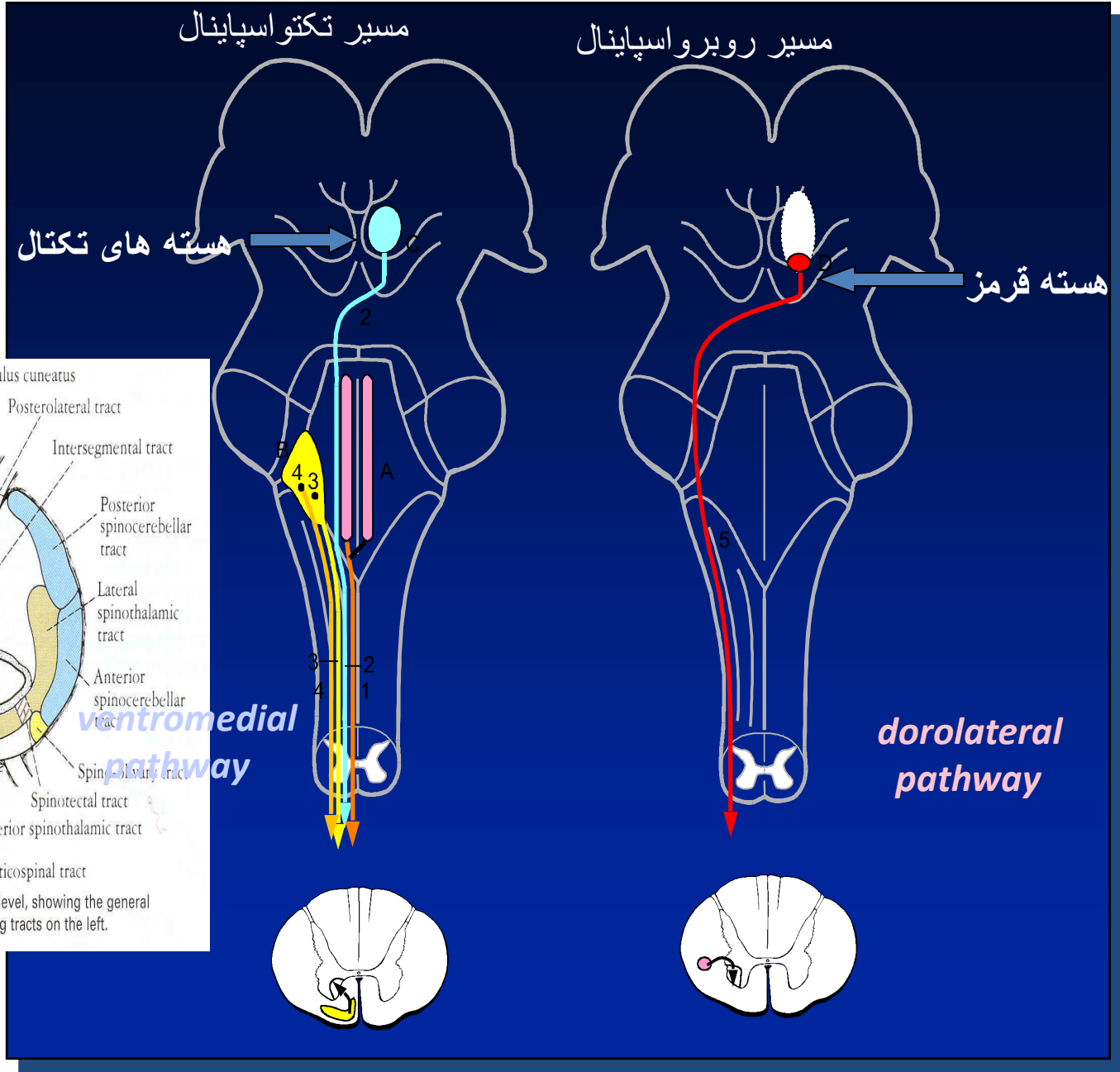
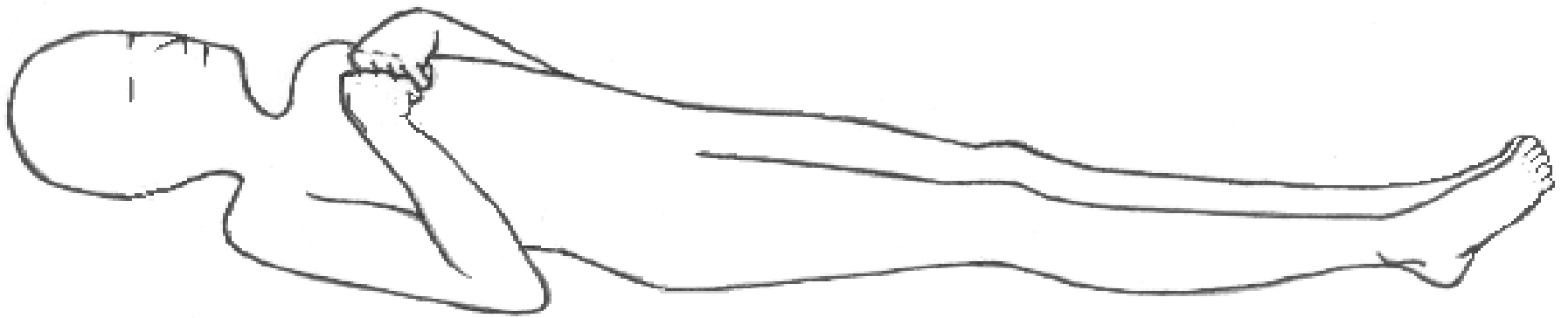
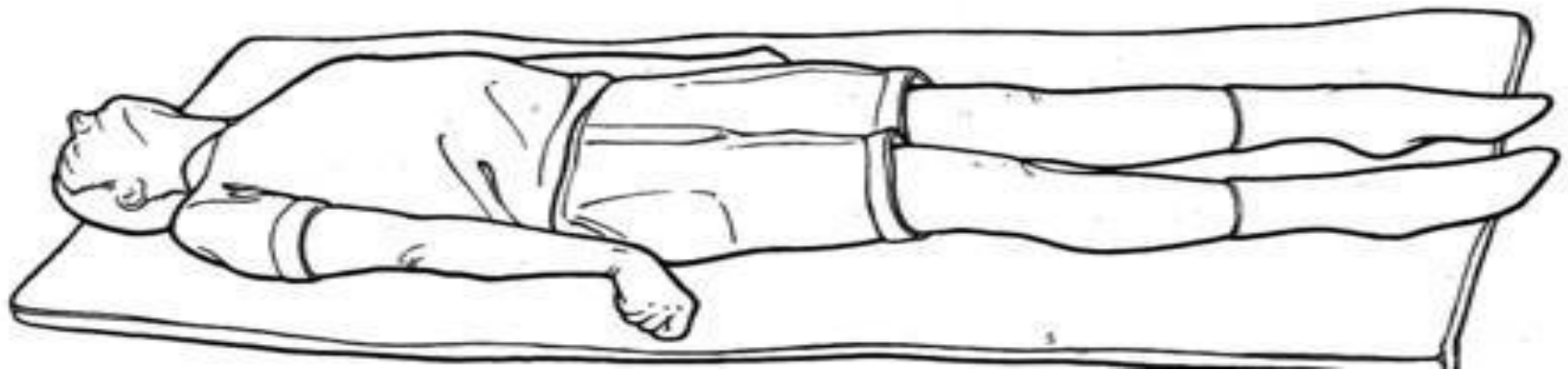


Figure 4-7 Transverse section of the spinal cord at the midcervical level, showing the general arrangement of the ascending tracts on the right and the descending tracts on the left.

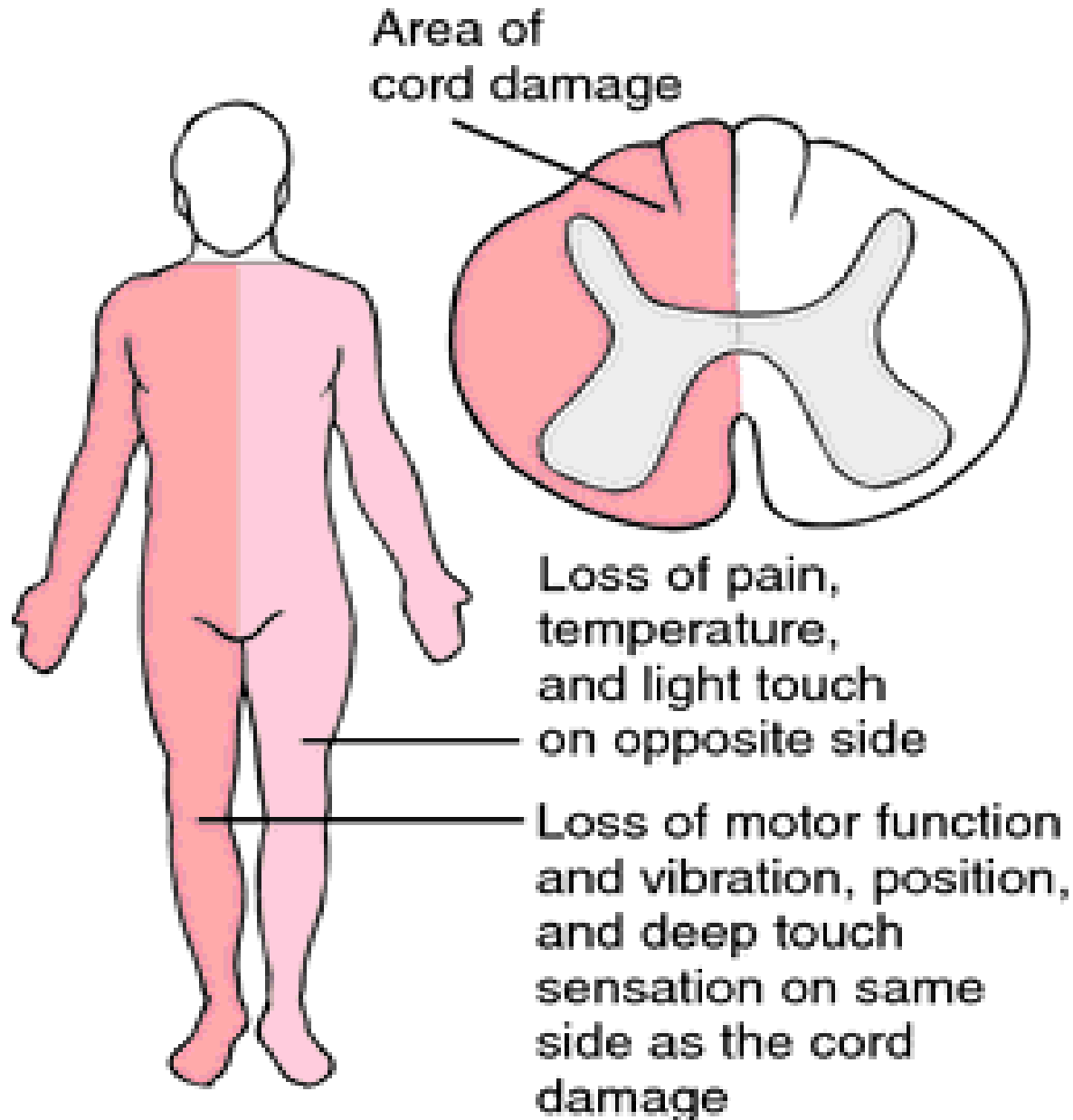
Decorticate sign



Decerebrate sign



# Brown-Séquard syndrome



## ***Brown-Sequard syndrome (spinal cord hemisection)***

### ***Major Symptoms***

- 1. ipsilateral UMN syndrome below the level of lesion***
- 2. ipsilateral LMN syndrome at the level of lesion***
- 3. ipsilateral loss of discriminative touch sensation and conscious proprioception below the level of lesion (posterior white column lesion)***
- 4. contralateral loss of pain and temperature sensation below the level of lesion (spinothalamic tract lesion)***



## *Upper Motor Neuron (UMN) vs Lower Motor Neuron (LMN) Syndrome*

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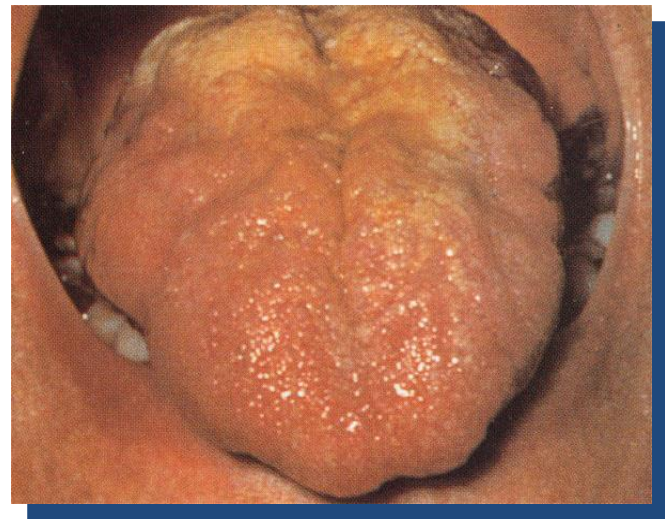
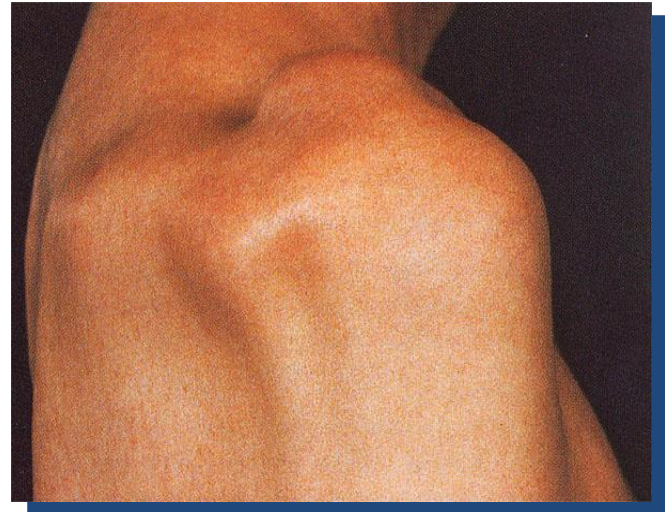
	<i>UMN syndrome</i>	<i>LMN Syndrome</i>
<b>Type of Paralysis</b>	<i>Spastic Paresis</i>	<i>Flaccid Paralysis</i>
<b>Atrophy</b>	<i>No (Disuse) Atrophy</i>	<i>Severe Atrophy</i>
<b>Deep Tendon Reflex</b>	<i>Increase</i>	<i>Absent DTR</i>
<b>Pathological Reflex</b>	<i>Positive Babinski Sign</i>	<i>Absent</i>
<b>Superficial Reflex</b>	<i>Absent</i>	<i>Present</i>

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# Locked-in syndrome



# *LMN Syndrome - Muscular Atrophy*







**Guilan, Eshkevar**