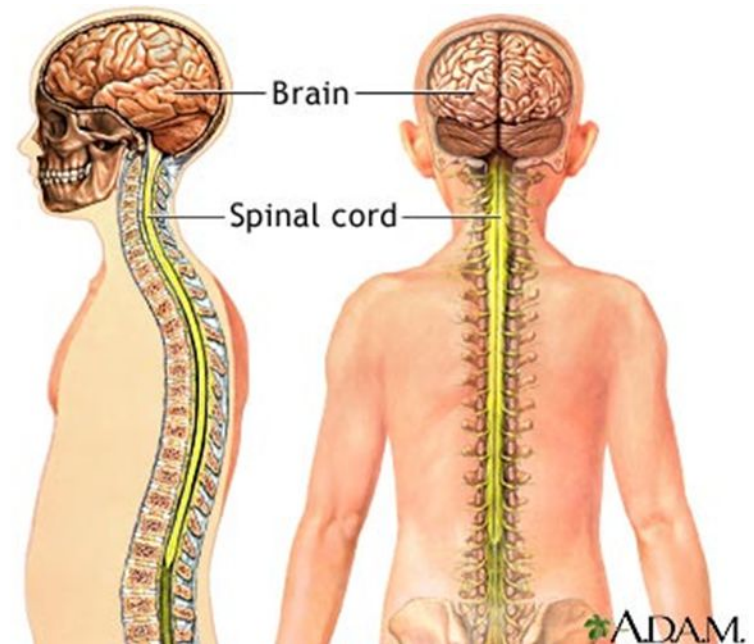
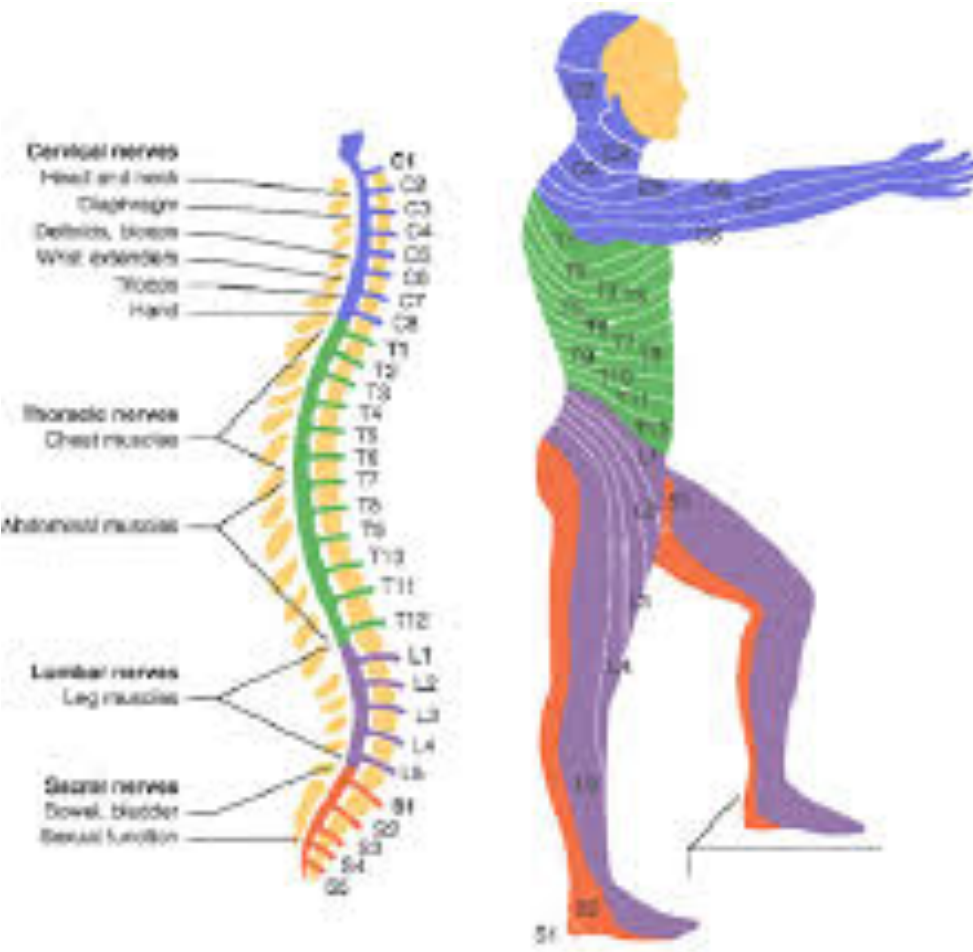


SPINAL CORD

Dr. Kifah Alubaidy

Relevant anatomy

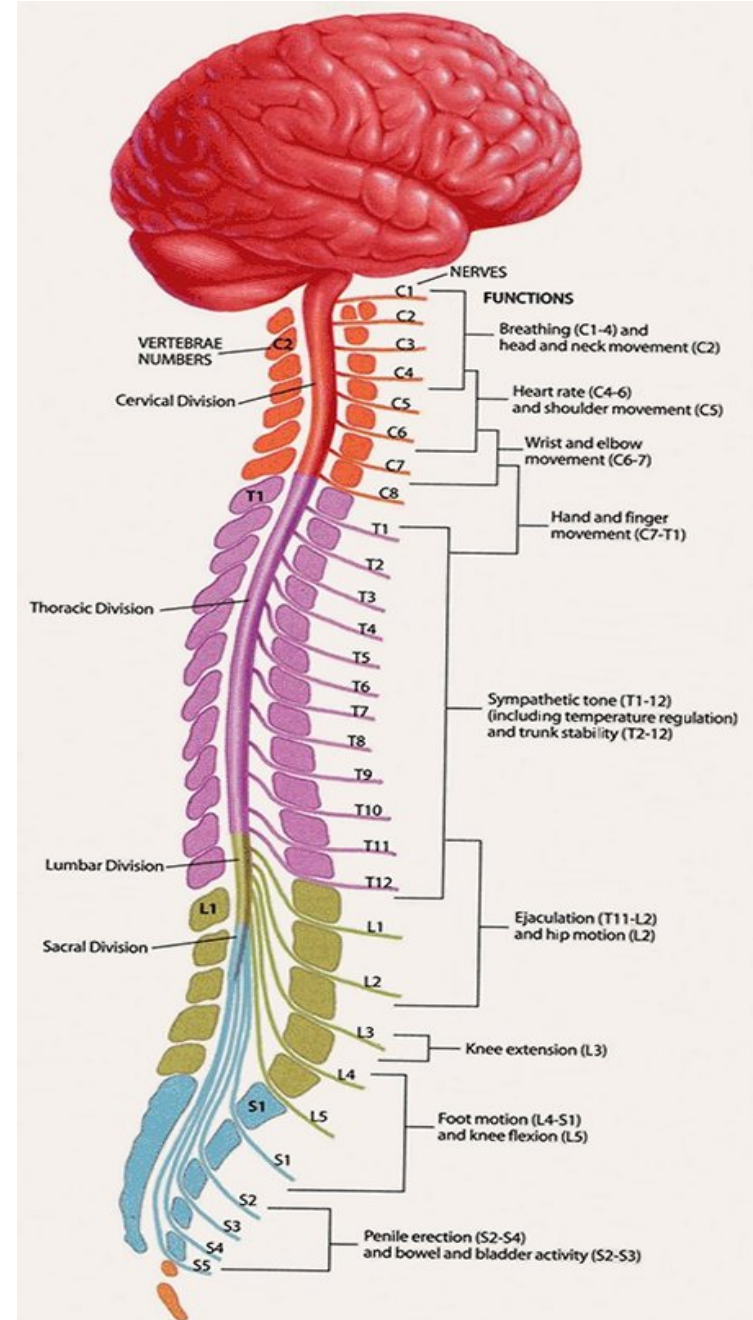
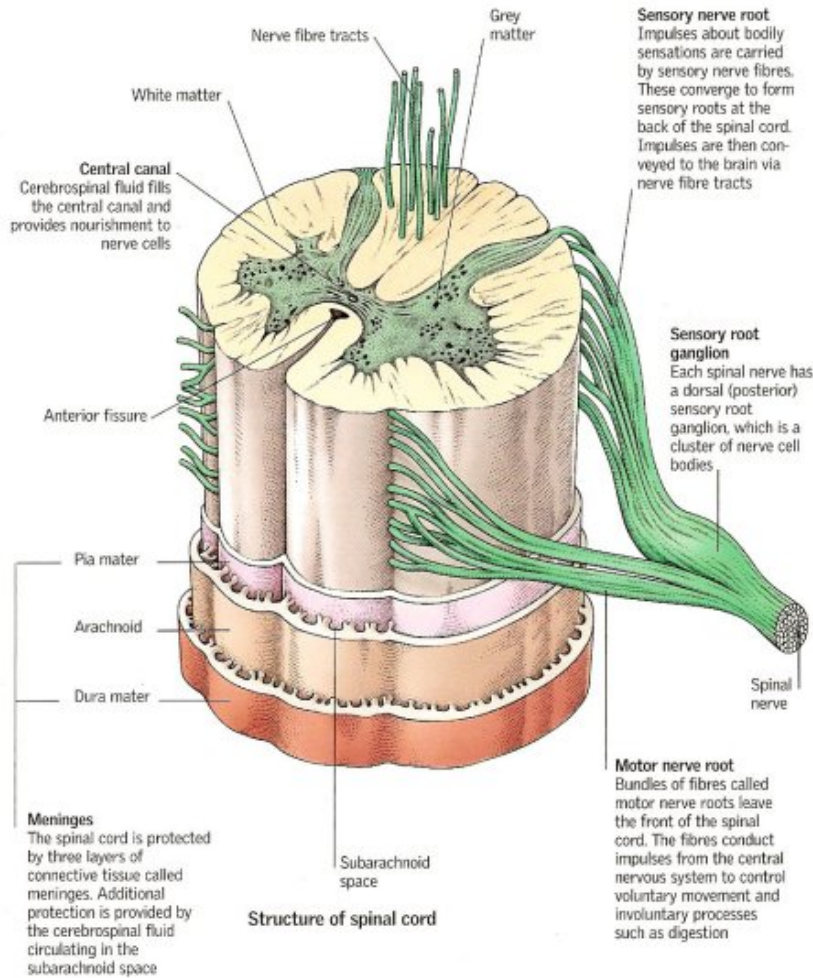


spinal cord level bodies

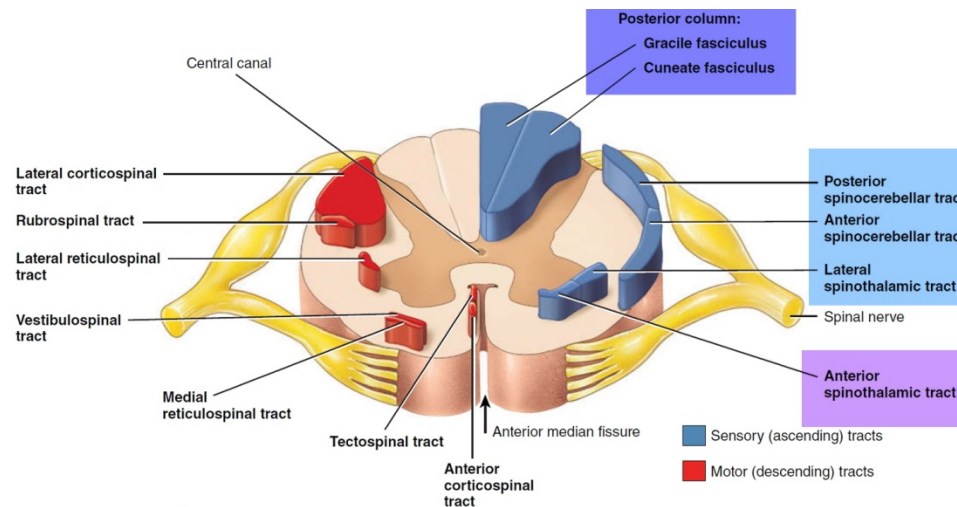
vertebral

Upper cervical	(C1-4)	same level
lower cervical	(C5-8)	1 level higher
Upper thoracic	(D1-6)	2 level higher
Lower thoracic	(D7-12)	3 level higher
Lumber	(L1-5)	T10 –T12
Sacral	(S1-5)	T12 – L1
Coccygeal	(C1)	L1

Relevant anatomy



Relevant anatomy

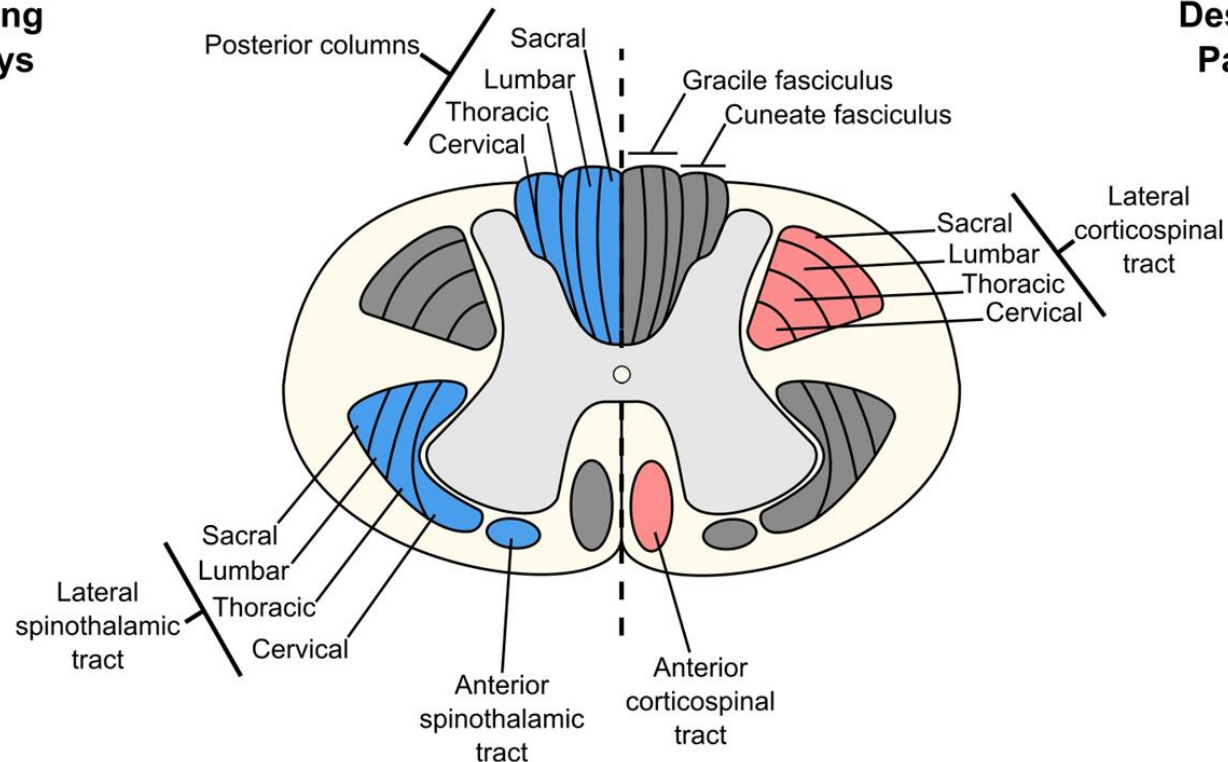


Relevant anatomy

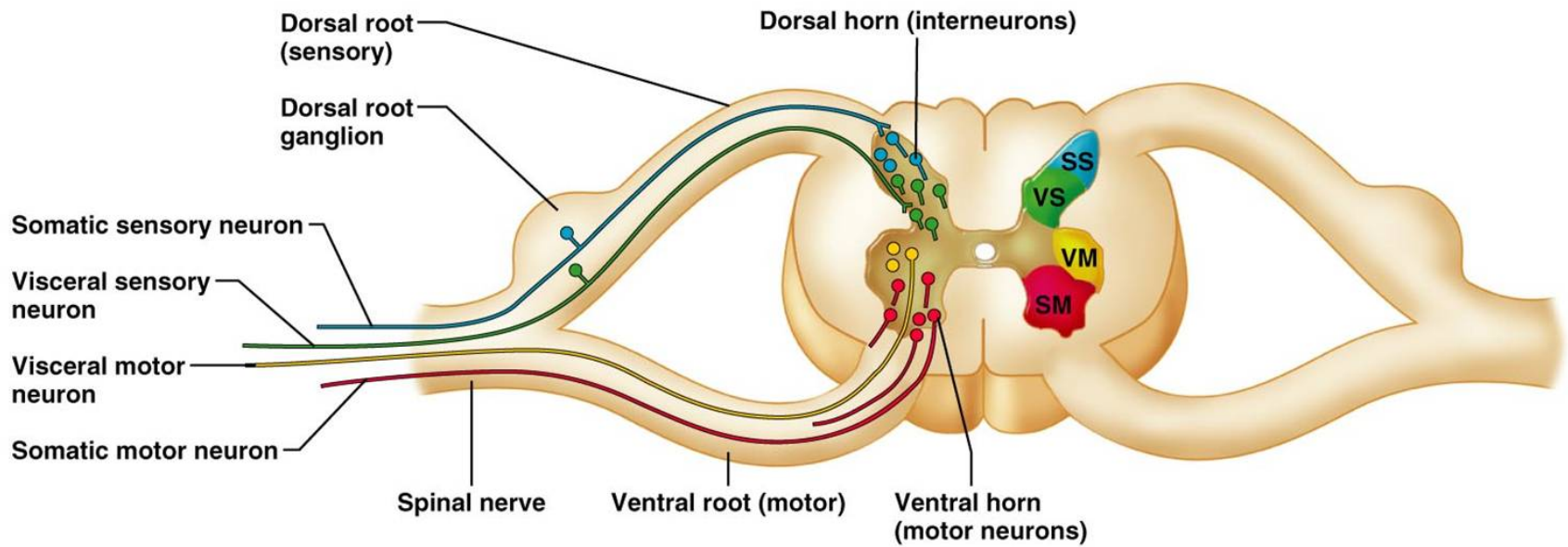
Spinal Cord Pathways

Ascending Pathways

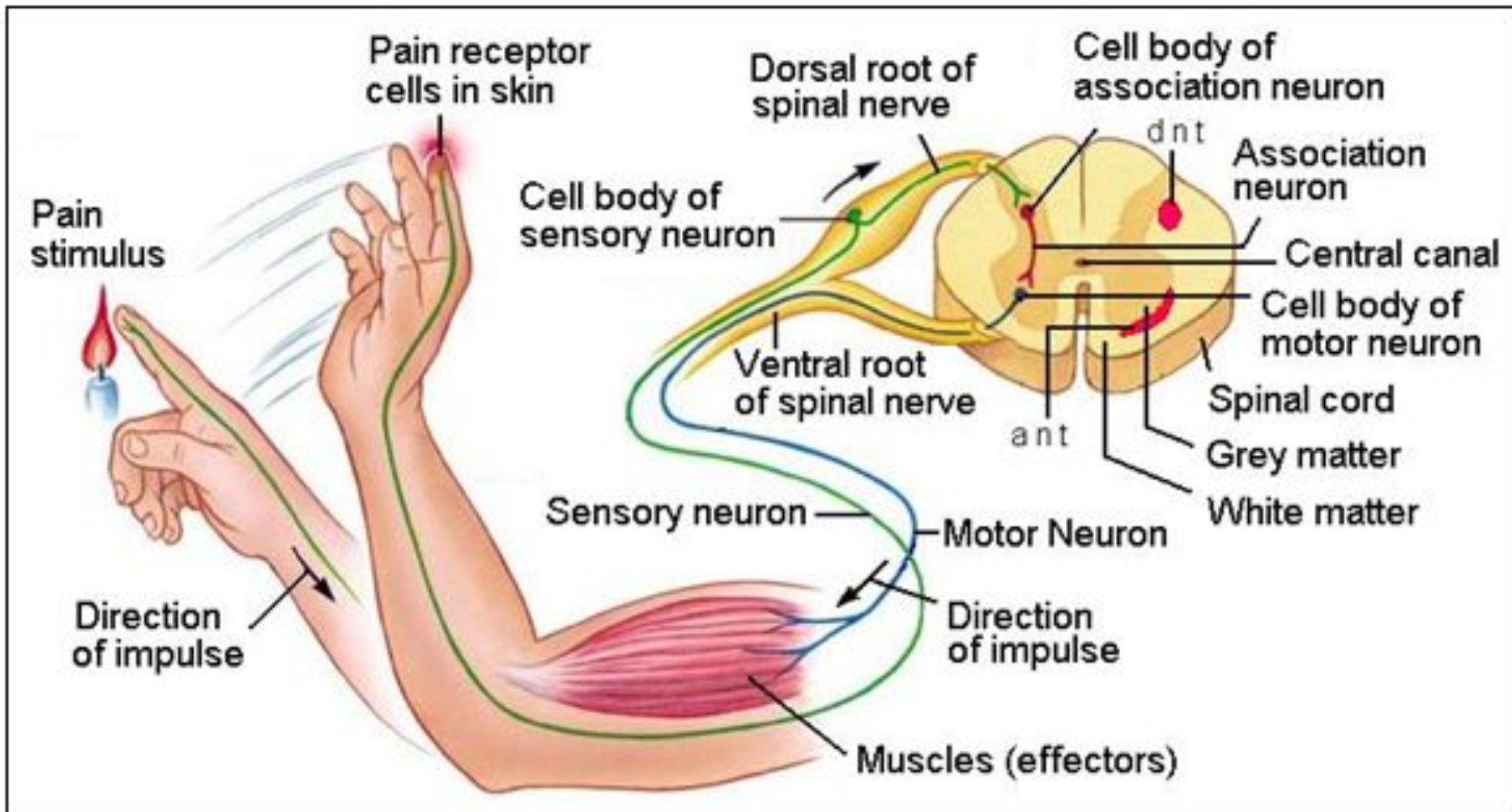
Descending Pathways



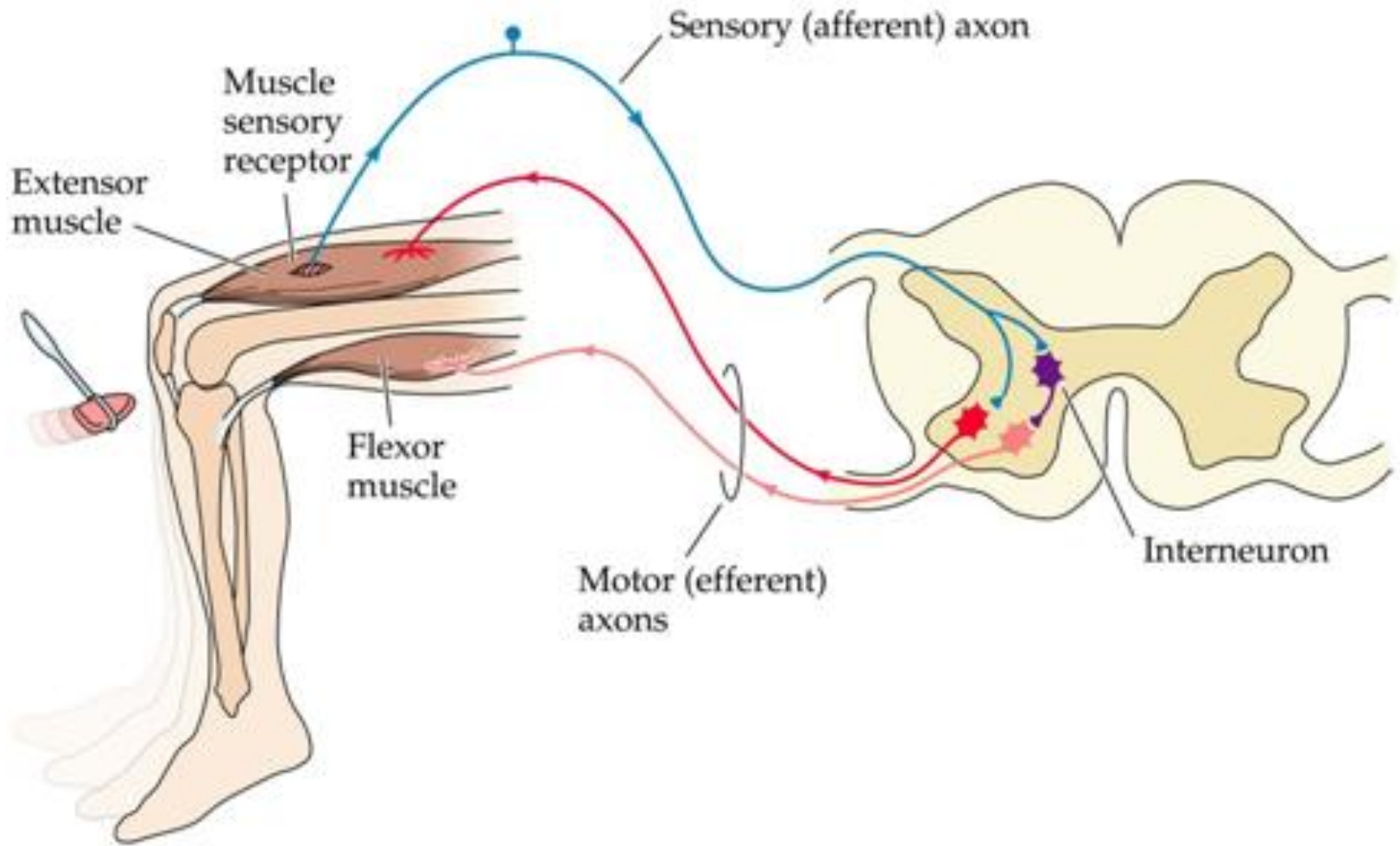
Relevant anatomy



Reflex arc



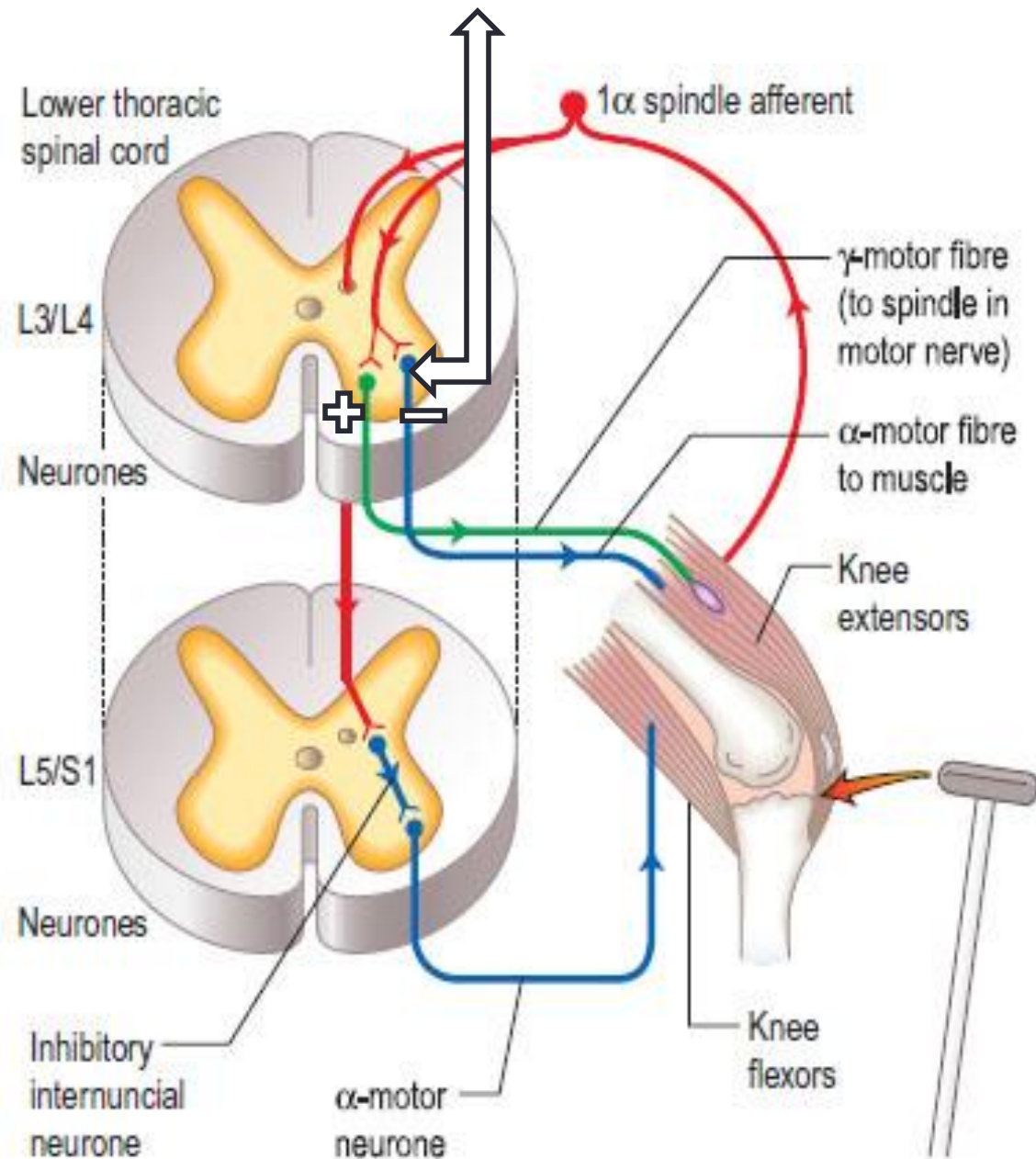
Reflex arc



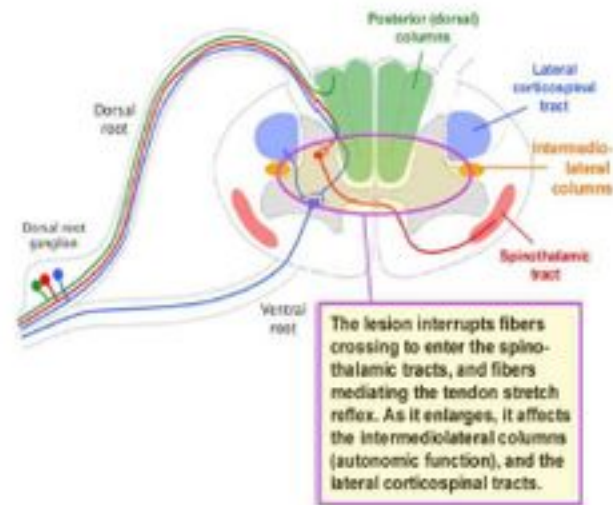
Reflex arc

Corticospinal tract

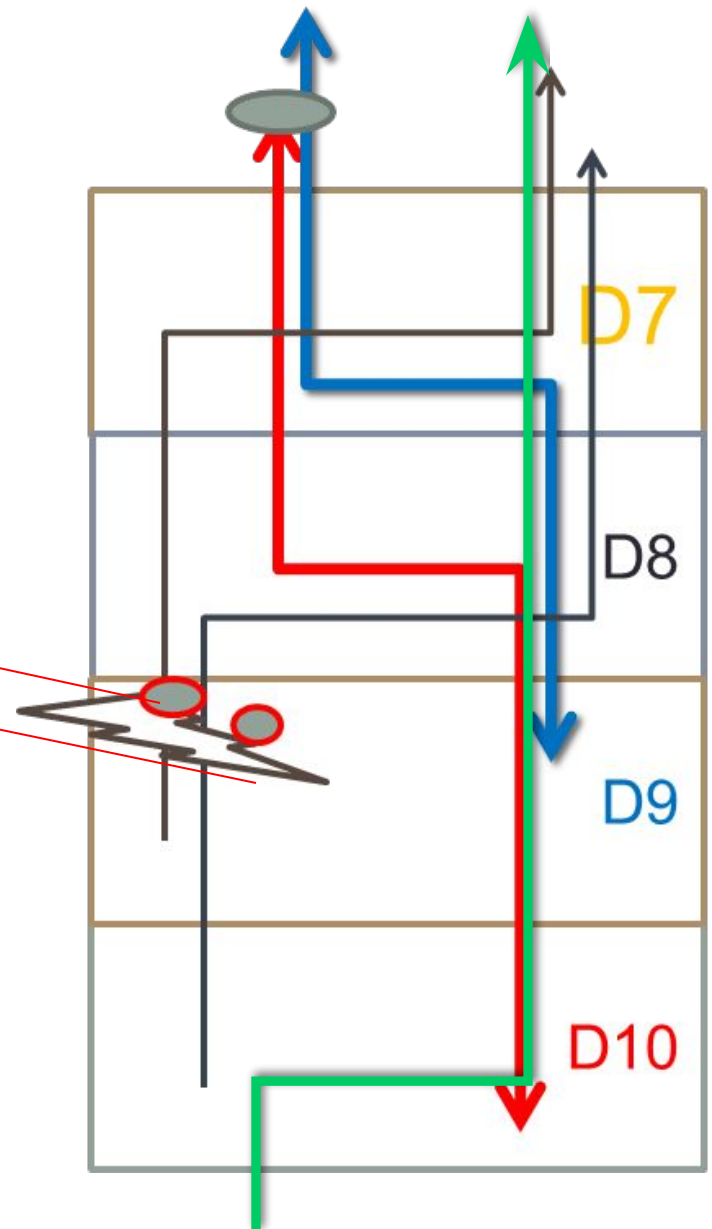
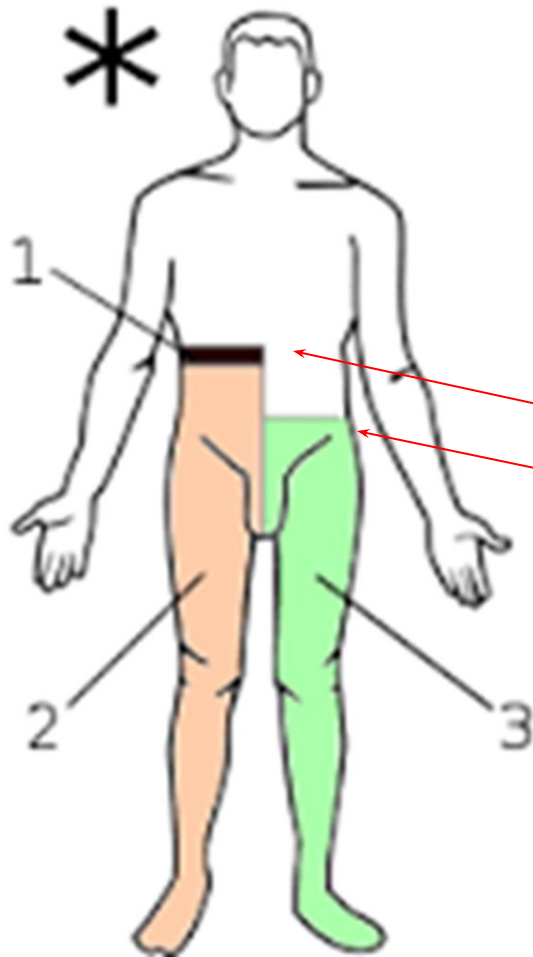
- Stimulate α -motor fiber
- Inhibit γ -motor fiber



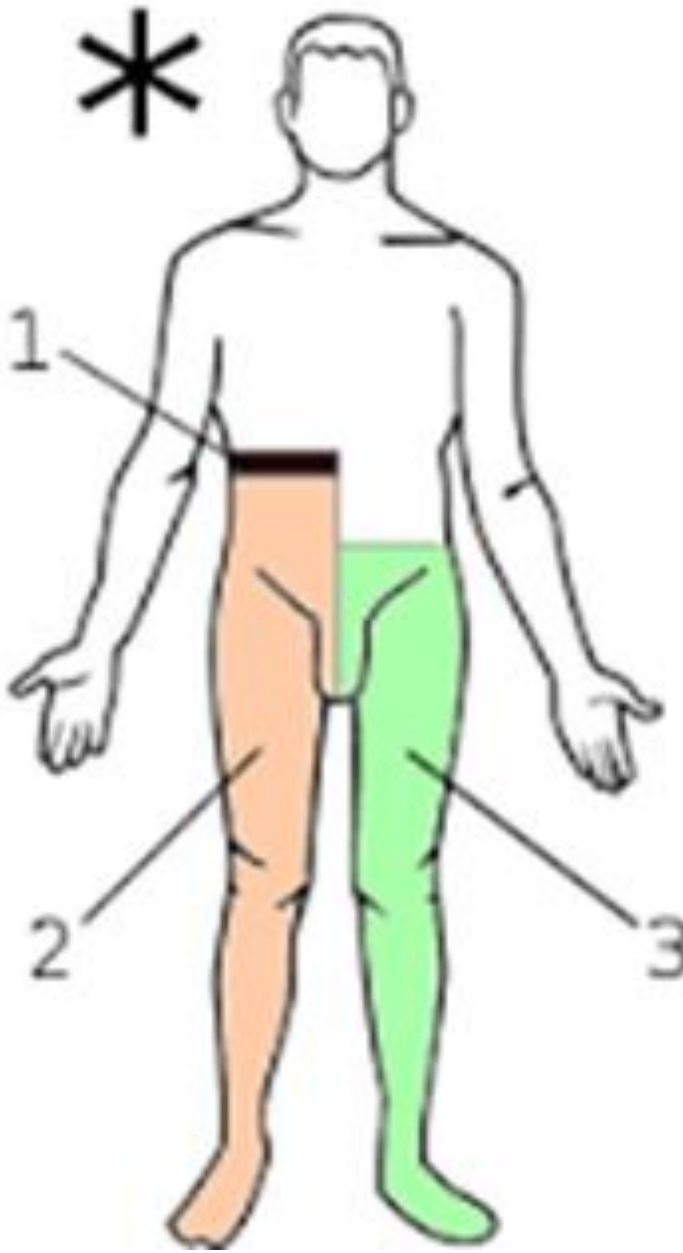
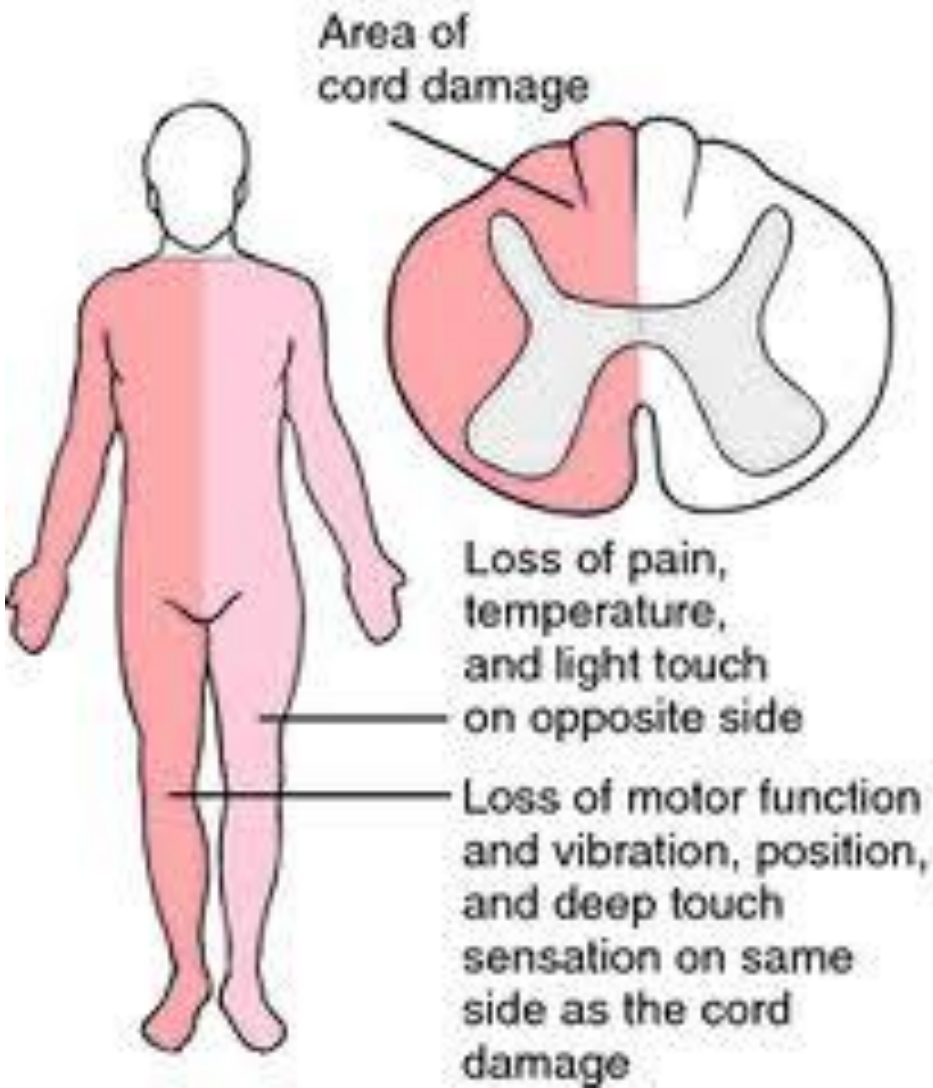
Relevant anatomy



Relevant anatomy



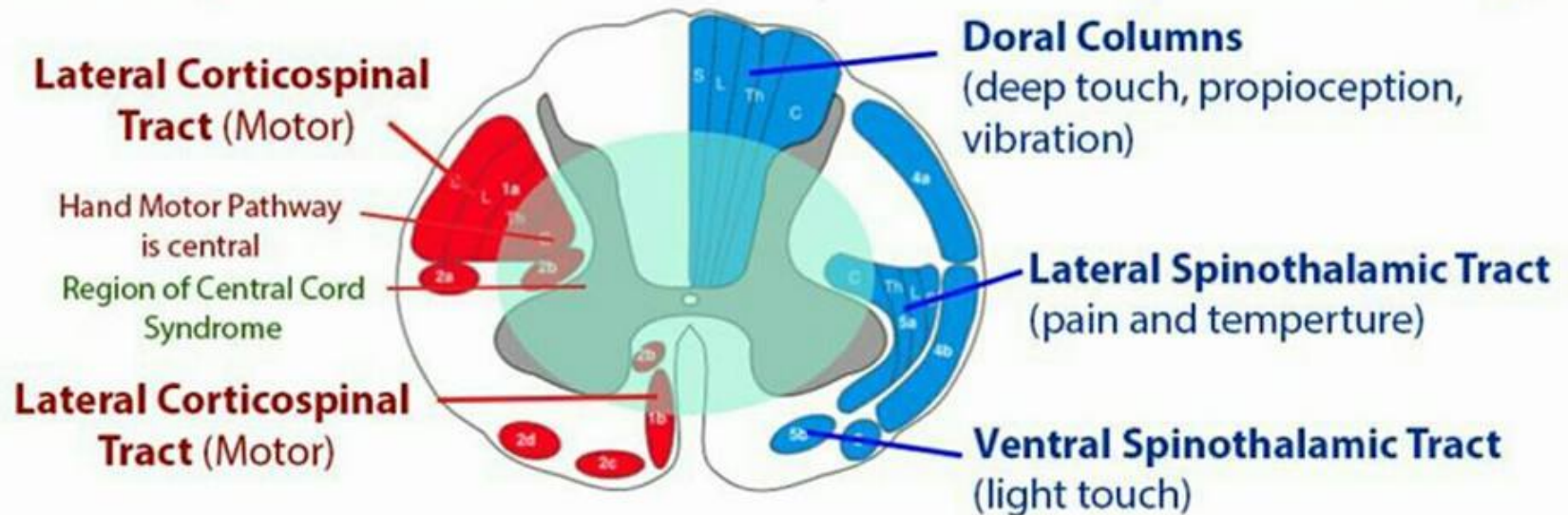
Brown- Squared hemi-cord syndrora



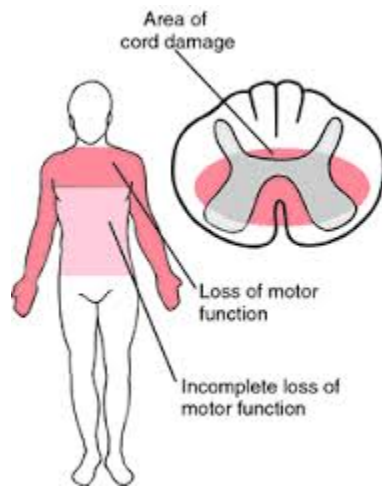
Intramedullary syndrome

Descending Tracts (Motor)

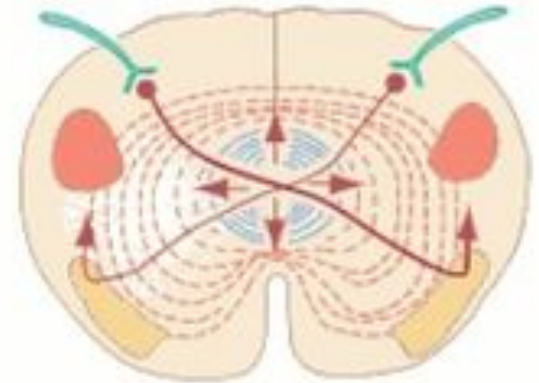
Ascending Tracts (Sensory)



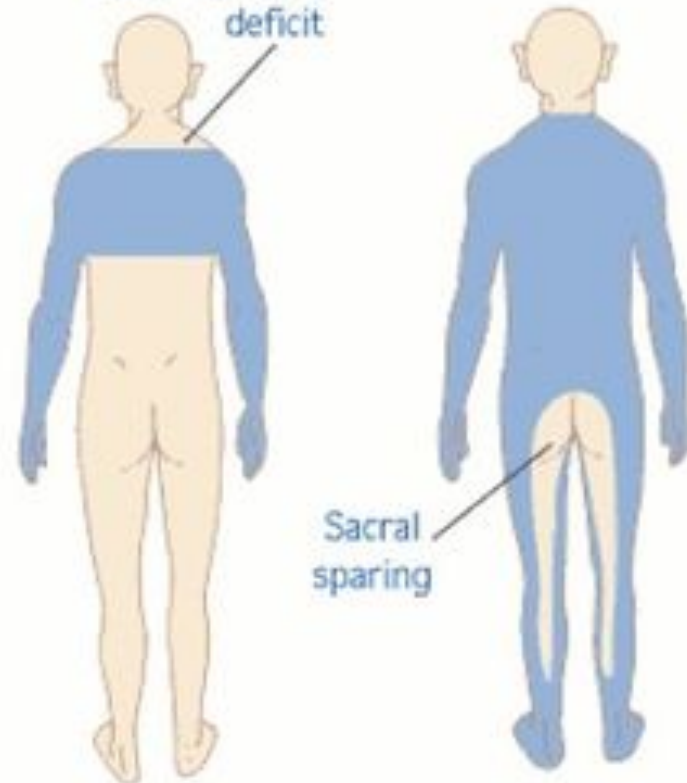
Intramedullary syndromes

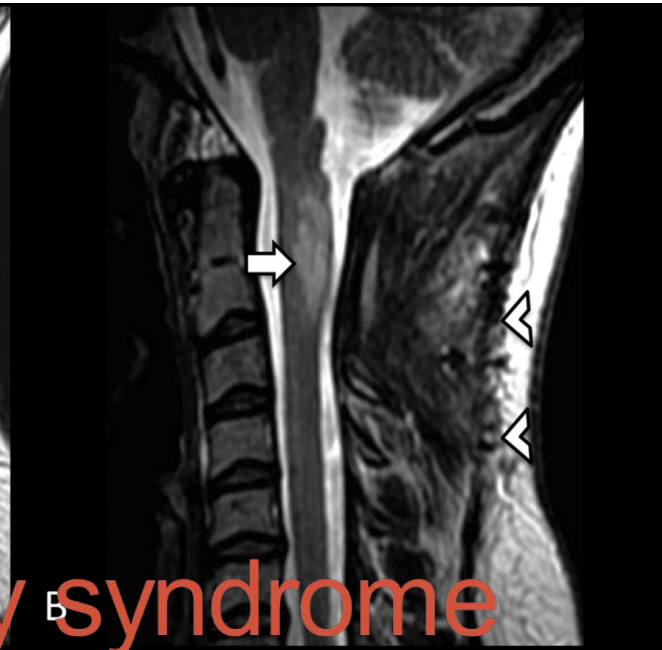
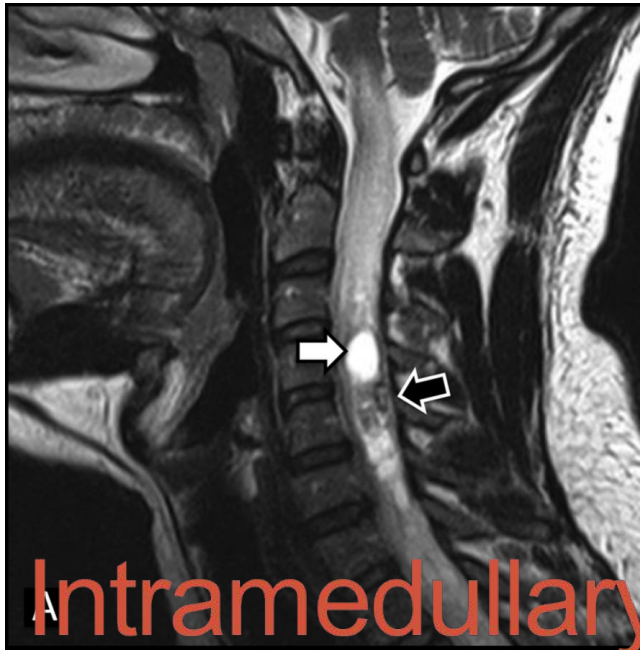


CENTRAL CORD LESION



'CAPE' sensory deficit





Intramedullary syndrome



Extra-medullary syndrome

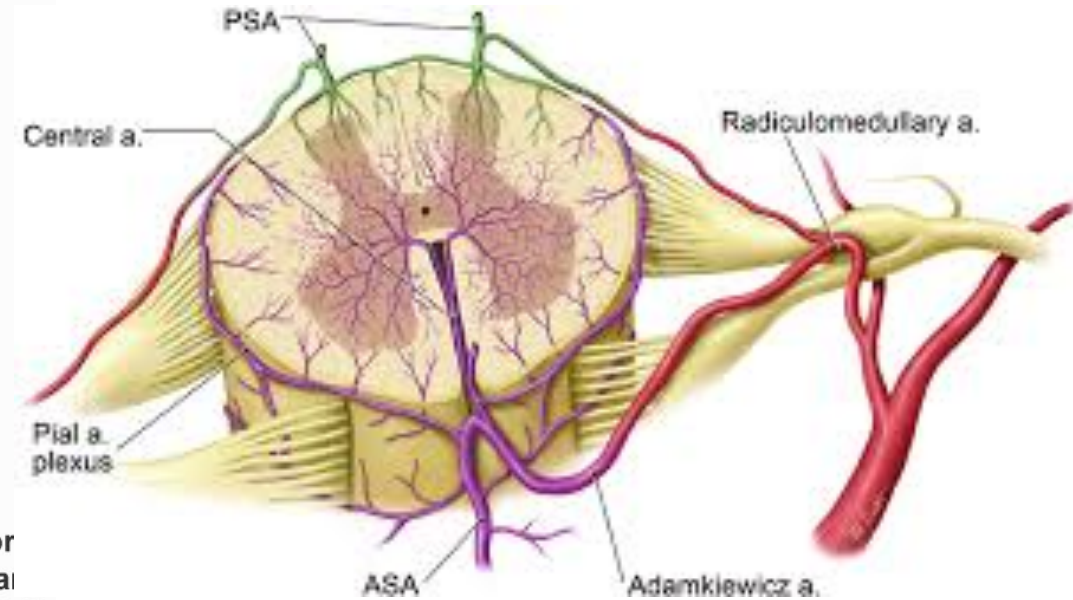
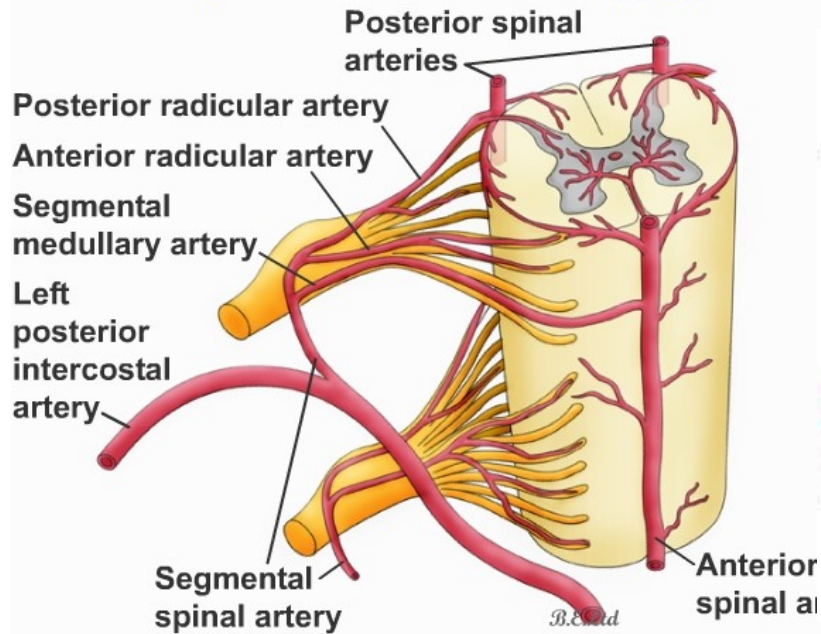


Extra-medullary syndrome

FINDING	INTRAMEDULLARY LESION	EXTRAMEDULLARY LESION
RADICULAR PAIN	Uncommon	Common
VERTEBRAL PAIN	Uncommon	Common
FUNICULAR PAIN	Common	Less common
UMN SIGNS	Late	Early
LMN SIGNS	Prominent and diffuse	Unusual, if present are segmental
SENSORY INVOLVEMENT	Disassociated sensory loss	Contralateral loss of pain and temperature with ipsilateral loss of proprioception

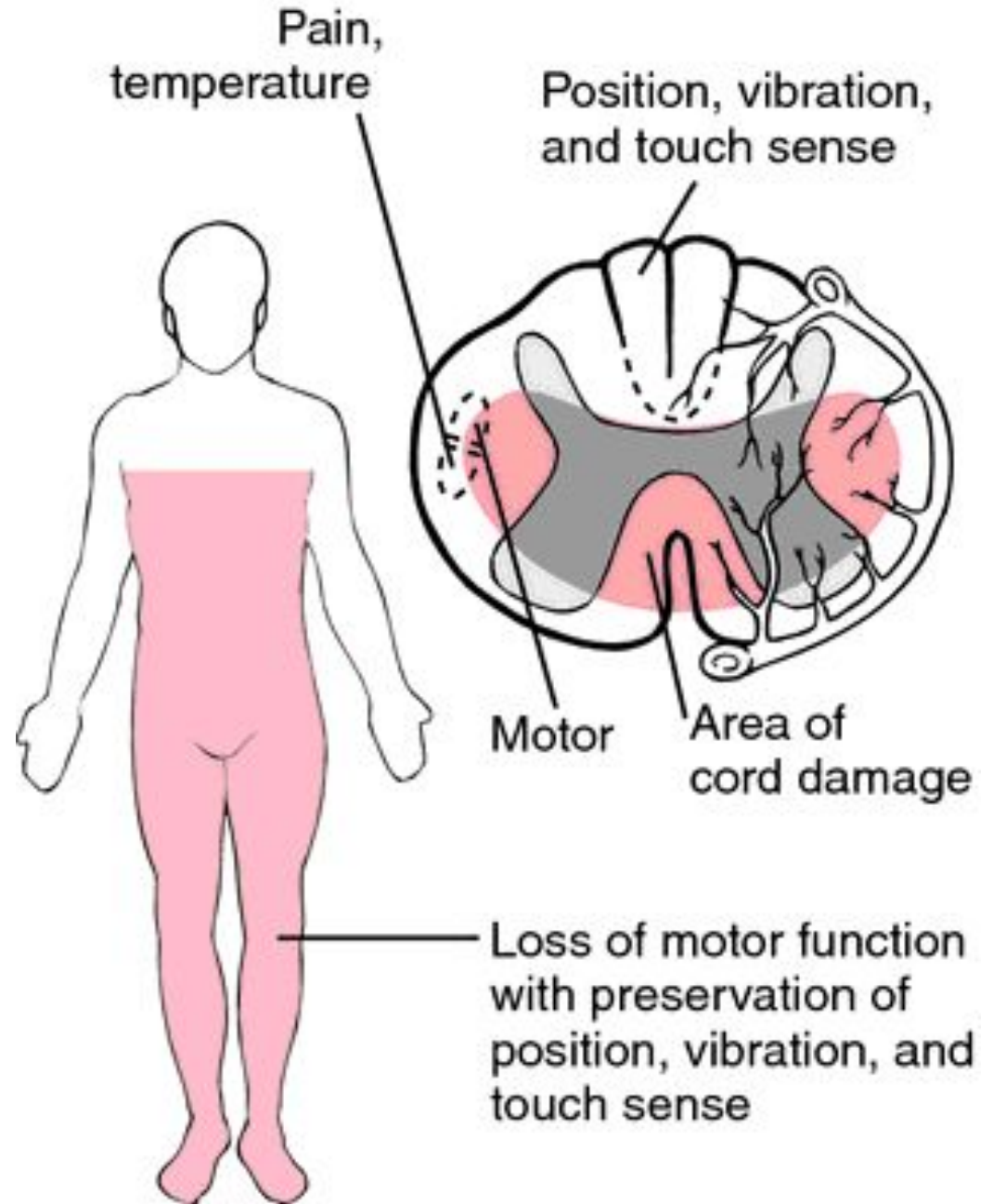
Blood supply

Spinal cord blood supply



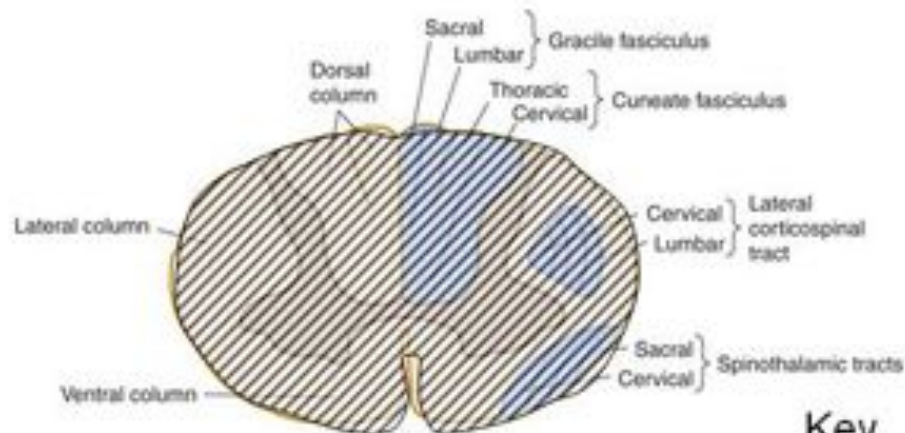
Anterior
two-third
syndrome

Preserve
position
vibration
touch



Transverse Cord Lesion

- All motor and sensory pathways are either partially or completely interrupted



Key

- Motor loss
- Vibration & proprioception loss
- Pain and temperature loss

Figure 5-15 & 26. Somatotopic organization (segmental arrangement in the spinal cord. In: Waxman SG. *Clinical Neuroanatomy*, 26th ed. <http://www.accessphysiotherapy.com>. Accessed January 03, 2010.

Relevant anatomy

Patterns of spinal cord disease

- Brown- Sequard hemicord syndrome
- Central cord syndrome
- Anterior two-third syndrome
- Intramedullary and extramedullary syndrome

Spinal cord lesion

A level below which the sensory, motor, and autonomic function were disturbed

The upper most level is localized by segmental signs

Sensory

- Hyperalgesia
- hyperpathia

Lower motor neuron sign

- Fasciculation & atrophy
- weakness of the muscle innervated by the segment
- diminished or absent deep tendon reflex

Signs below the lesion

Upper motor neuron sign

- Weakness (Hemiplegia, paraplegia and tetraplegia)
- Spasticity (increase tone)
- Hyperreflexia
- Babinski reflex : planter extension

Sensory

- lack of sensation at a certain level
- hemisensory loss

Autonomic

- urinary retention, constipation, ileus,
- hypothermia, hypotension, bradycardia

Level of the lesion

Localizing lesions by UMN vs. LMN		
Lesion location	Thoracic limbs	Pelvic limbs
C1-C5	UMN	UMN
C6-T2	LMN*	UMN
T3-L3	Normal	UMN
L4-S3	Normal	LMN

- At any cervical level
- Ipsilateral Horner`s syndrome & Lhermitte sign

Specific segmental signs

Near junction with medulla oblongata

- Involvement of medullary centers
- Extensive : Quadriplegia + Vasomotor and respiratory collapse
- partial : Crural paresis
- Compression near the foramen magnum clockwise or anti – clockwise paresis of limbs



Specific segmental signs

Higher cervical C3-4

- Quadriplegia
- Respiratory paralysis
- Sensory level: Cervical
- Autonomic



Specific segmental signs

C5

- Wasting of shoulder muscle
- Quadriplegia and sensory level
- Normal respiratory function



Specific segmental signs

C6

- ▣ Relative sparing of shoulder movements
- ▣ Wasting Biceps and Brachioradialis
- ▣ Loss of Biceps and Brachioradialis reflexes
- ▣ Lower limbs weakness (paraplegia) Sensory level



Specific segmental signs

C7

- ❖ Wasting & weakness of the finger and wrist extensors
- ❖ Absent Triceps reflex
- ❖ Lower limbs weakness (paraplegia)
- ❖ Sensory level



Specific segmental signs

C8

- wasting hand muscles
- Weakness of the finger and wrist flexion and loss of finger flexor reflex
- Paraplegia and Sensory level



Specific segmental signs

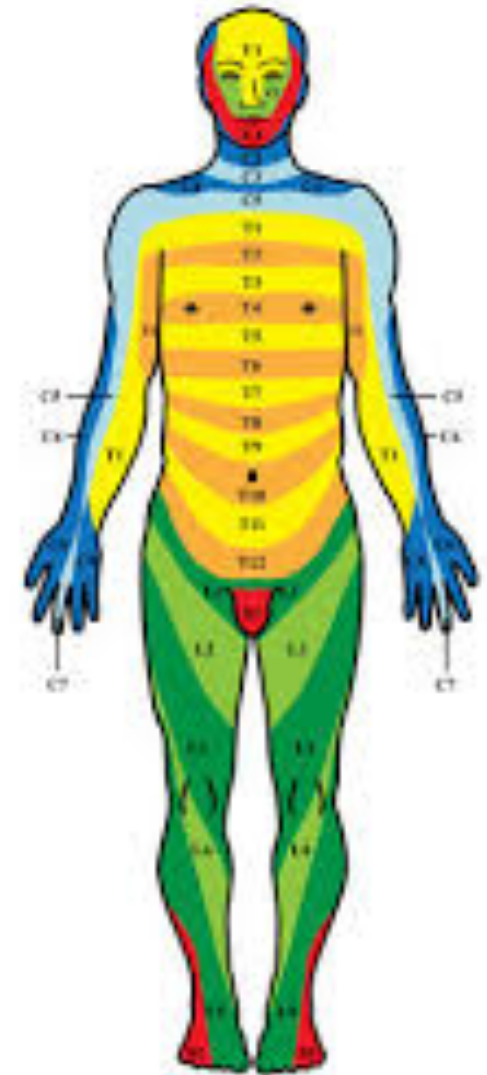
- **Thoracic cord**

Sensory level

Beevor`s sign (Loss of only lower abdominal reflex)

Medline back pain

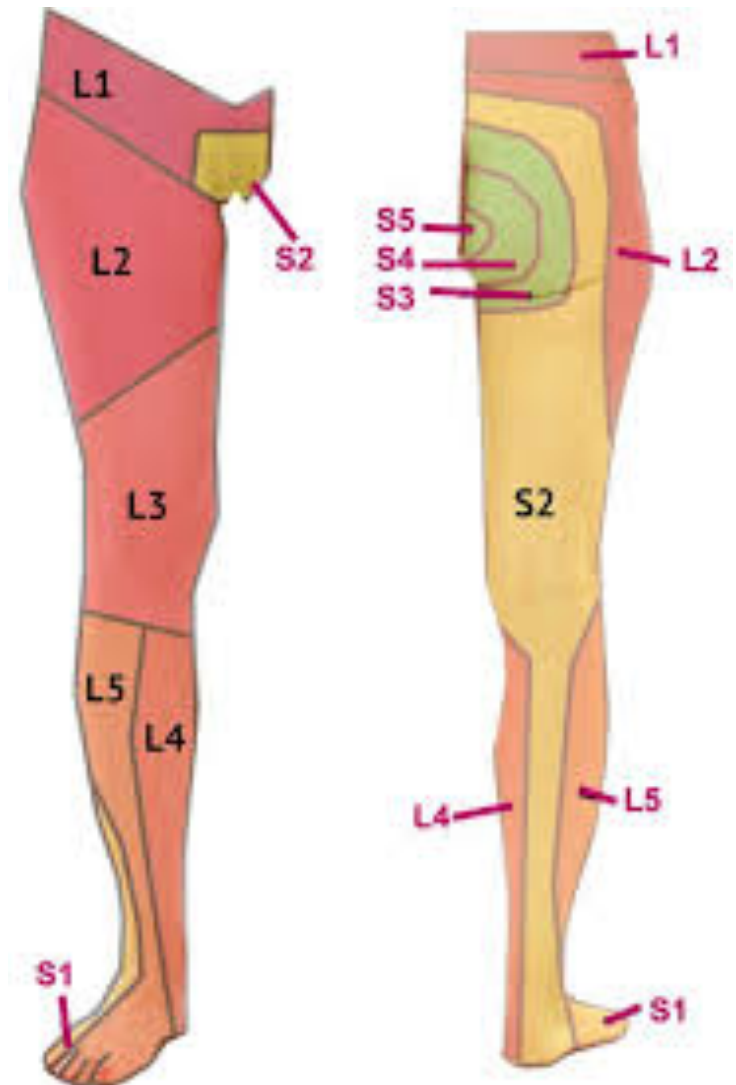
Paraplegia



Specific segmental signs

L2-L4

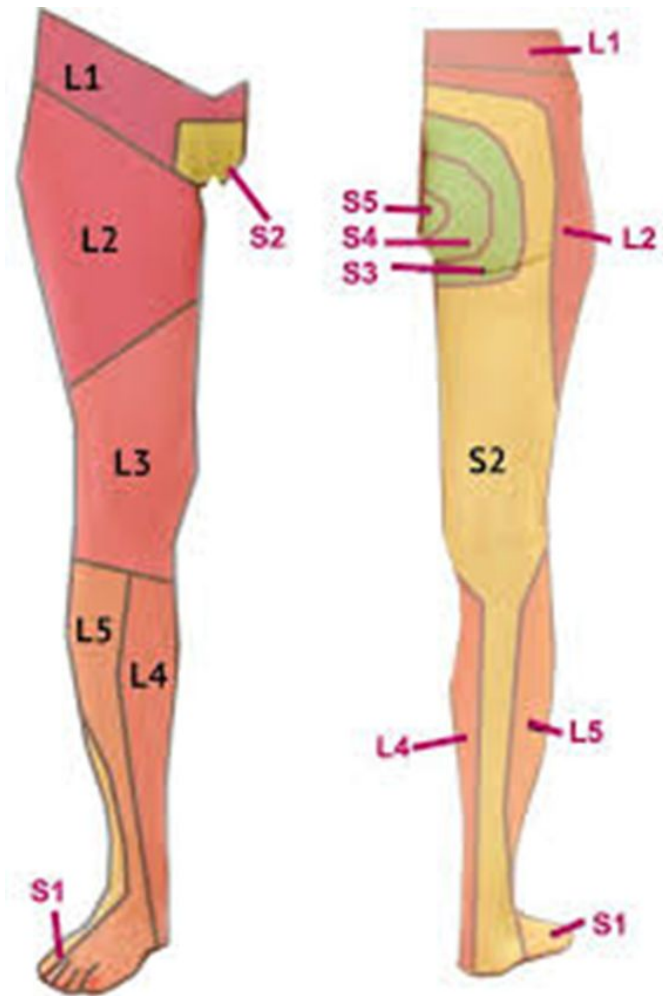
- Weakness of flexion and adduction of the thigh and knee extension wasting of anterior thigh
- Absent patellar reflex
- Absent cremastic reflex (L1-L2)
- Babnisky extensor planter



Specific segmental signs

L5-S1

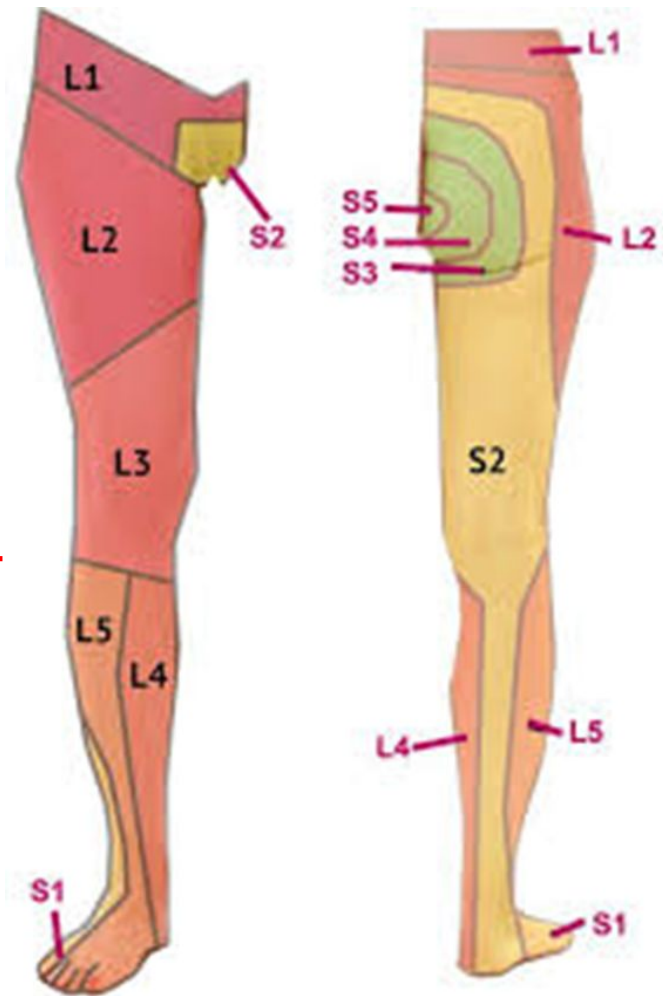
- Weakness of thigh extension and paralyze foot & ankle
- Absent ankle reflex
- Sensory loss L5-S1



Specific segmental signs

Sacral cord & conus medullaris

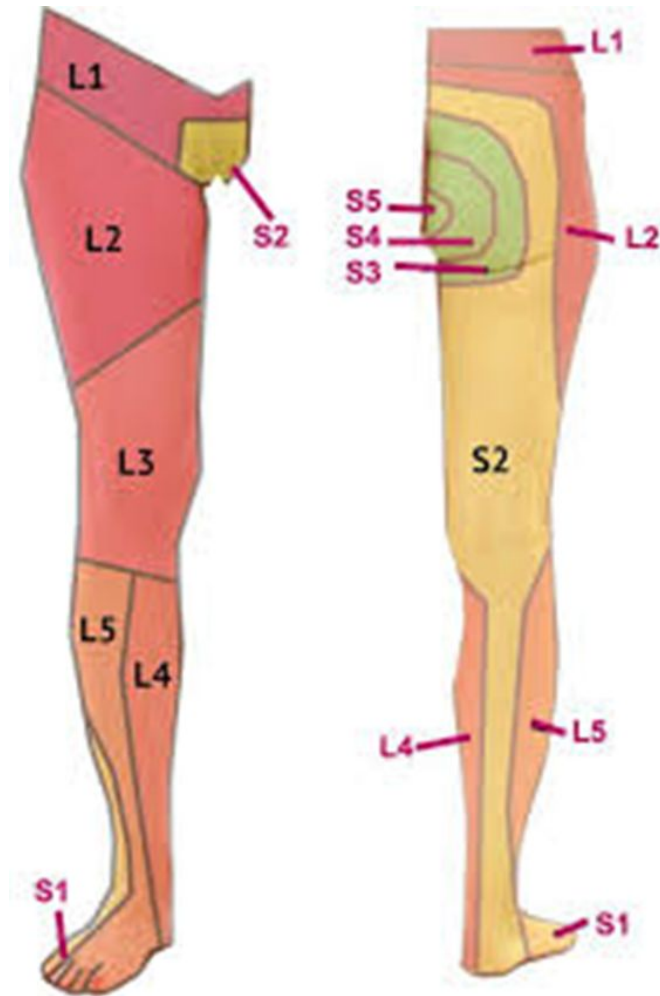
- Bladder & bowel dysfunction
- impotence
- Saddle anesthesia
- Absent bulbocavernosus(S2-S4)
- Absent anal(S4-S5) reflexes



Specific segmental signs

Cauda equina

- Severe low back or radicular pain
- Asymmetric leg weakness & sensory loss
- Variable areflexia
- Relative sparing of Bladder & bowel function



Causes

Compressive

- Epidural, intradural, or intramedullary neoplasm
- Epidural abscess
- Epidural hemorrhage
- Cervical spondylosis
- Herniated disc
- Trauma

Causes

Vascular

- Ischemia
- AVM

Inflammatory

- Transverse myelitis
- Multiple sclerosis
- vasculitis

Causes

Infections

- H simplex 2
- Bacterial
- Parasitic

Developmental

- Syringomyelia

Causes

Metabolic

- Subacute combined degeneration

Degenerative

Investigations

- Spine x-ray & CXR
- MRI
- CSF

Investigations Spine x-ray



Investigations MRI



Investigations MRI



Compression of the spinal cord

- Commonest spinal cord emergency
- It is reversible in the early stage
- Clinically presented as a acute – chronic extramedullary or Brown – sequard syndrome

Compression of the spinal cord

Vertebral (80%)

- Trauma
- Intervertebral disc metastasis
(breast, prostate, bronchus)
- Myeloma
- TB

Compression of the spinal cord

Meninges (15%)

- Tumor
(Meningioma, neurofibroma
ependymoma, metastasis, lymphoma
leukemia)
- Epidural abscess

Compression of the spinal cord

spinal cord (5%)

- Tumours

(Glioma, ependymoma, metastasis)

Compression of the spinal cord



Compression of the spinal cord

- Management

Surgical decompression

Radiotherapy

Transverse myelitis

- Acute or subacute monophasic inflammation of the spinal cord
- 40% antecedent infection or vaccination
- No causative microorganism

An autoimmune reaction

1. Demyelination (Multiple sclerosis)
2. vasculitis

Transverse myelitis

Clinical features

- local neck or back pain
 - Asymmetric
1. parasthesia
 2. Sensory loss
 3. Motor weakness

Transverse myelitis

- MRI



Transverse myelitis

CSF

- Lymphocytic pleocytosis several hundred / MicroL
- Protein normal or elevated
- Oligoclonal band (Multiple sclerosis)

Transverse myelitis

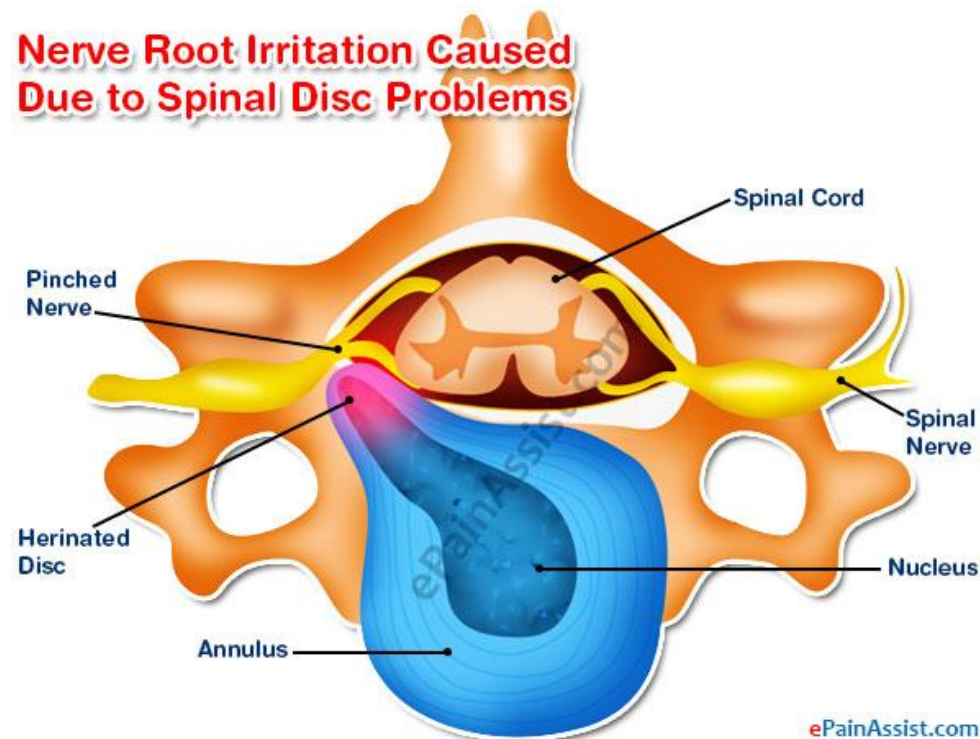
Treatment

- Methylprednisolone
- prednisolone

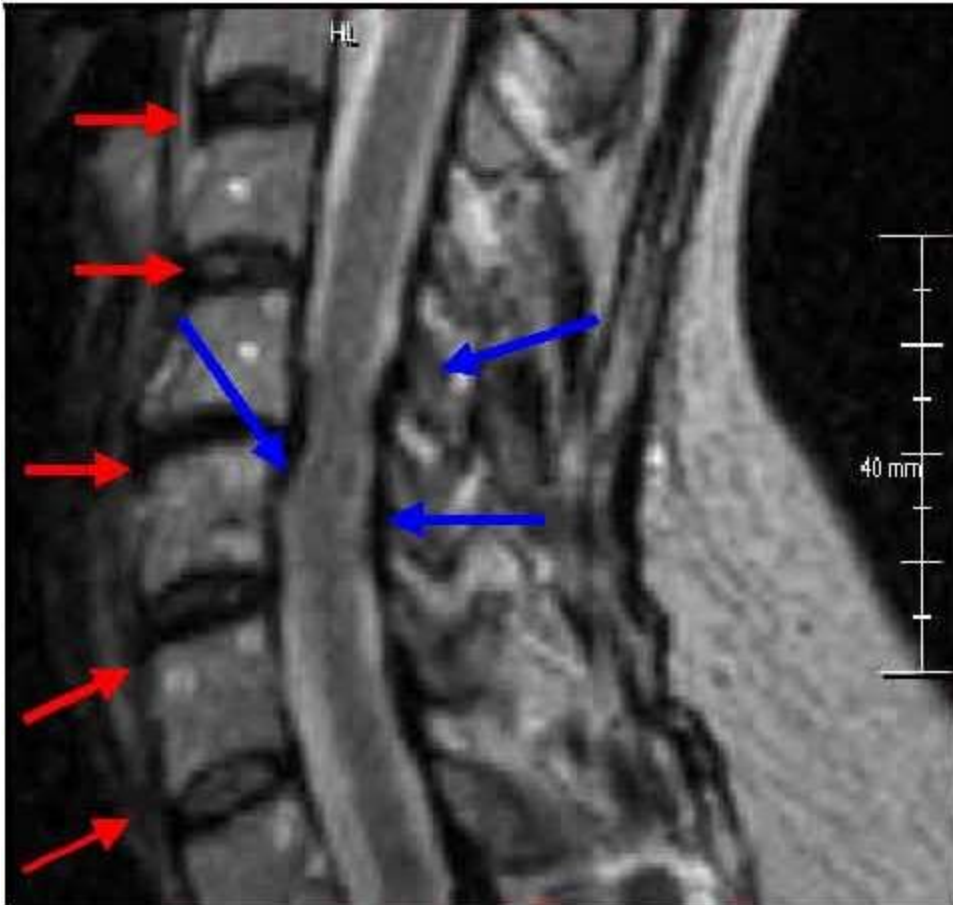
spondylosis

Cervical

- Degeneration of the Intervertebral disc & secondary osteoarthritis
- Mainly C6, C7, & C5 radiculopathy
- Myelopathy (compression or ant. spinal artery occlusion)



spondylosis Cervical Myelopathy



spondylosis

Lumber

- Lumbago (recurrent low back pain)
- Mainly S1, L5, & L4 radiculopathy



spondylosis

Management

- Bed rest
- Back strengthening exercises
- Local anesthesia or steroid injection

spondylosis

Management

- **Surgical decompression**
 1. conservative failure
 2. progressive
 3. central disc prolepsis
 4. sphincter disturbance

syringomyelia

Fluid –filled cavity
near the center
of spinal cord
due to CSF flow
obstruction

- Congenital (Chiari type I malformation)
- Basal arachnoiditis
- trauma



syringomyelia

- Age 20 – 40
 - Slowly progressive neck & shoulder pain
 - Central cord syndrome
1. Pain & temperature sensory loss in the upper limbs as hemicape
 2. Atrophic lesions (painless ulcers) in the UL
 3. LMN signs in the UL & UMN in the LL

syringomyelia

Associated anomalies

- Kyphoscoliosis
- Pes cavus
- Spina bifida
- syringobulbia

Management Surgical decompression