



มหาวิทยาลัยราชภัฏนครปฐม



Mechanism and Illness of Human Body 2

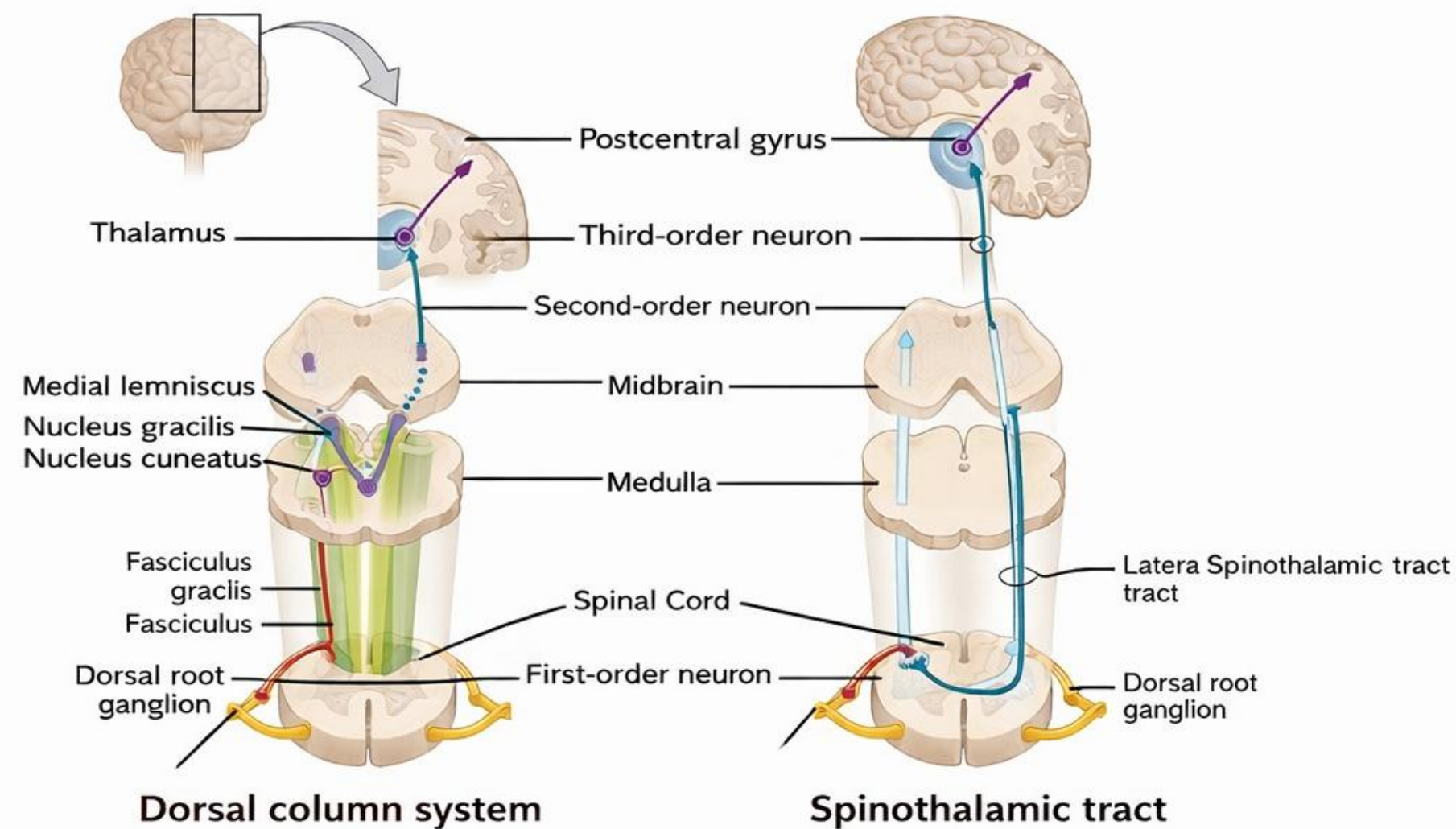
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Disorders of the Nervous System (part 2)



Pathways for Sensation



Posterior (dorsal) column or lemniscal system:

Fine touch and proprioception
sensations from right side of body

- Vibration and position senses
- Light touch and detailed discrimination

Anterior spinothalamic tract:

Crude touch

Lateral spinothalamic tract:

Pain and temperature

Medial spinoreticular system:

Spinal reticular tract conveys pain to the reticular formation

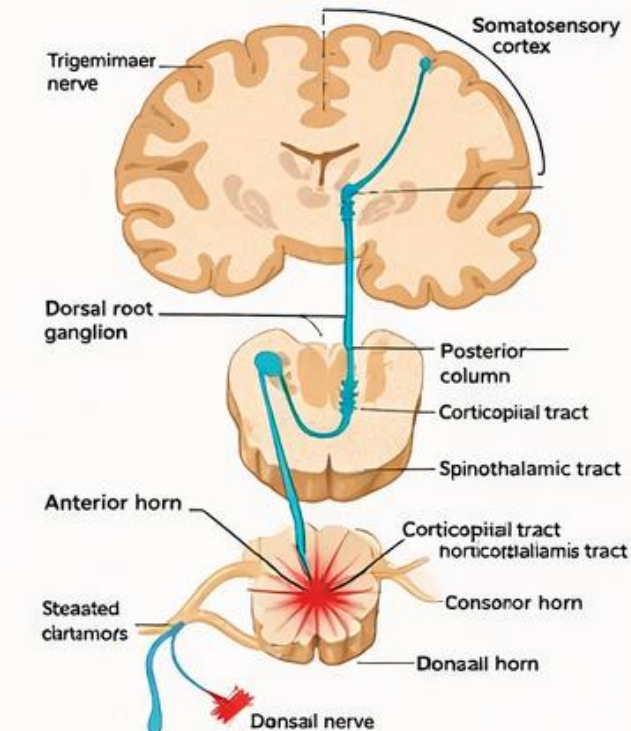
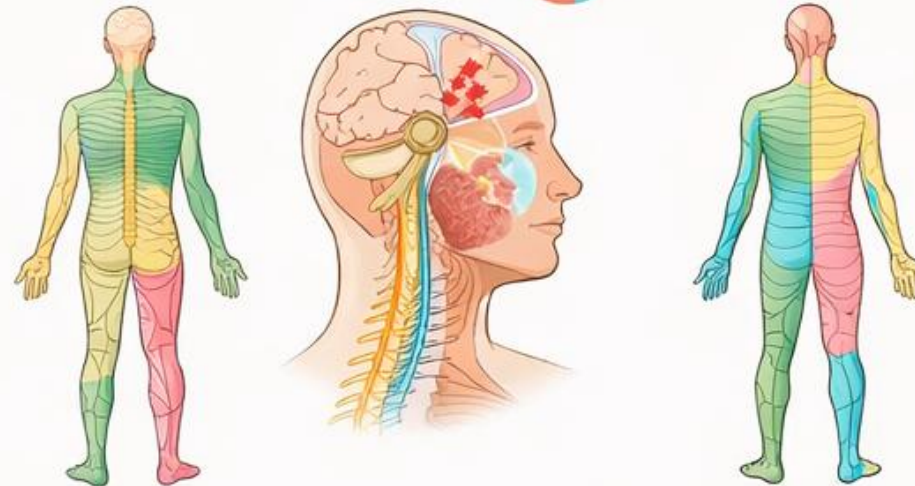
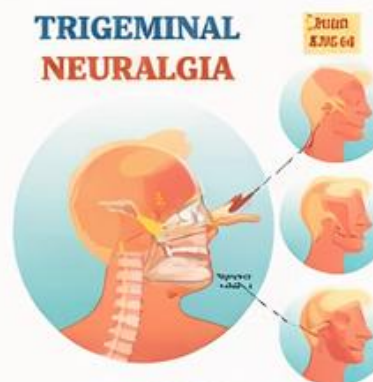
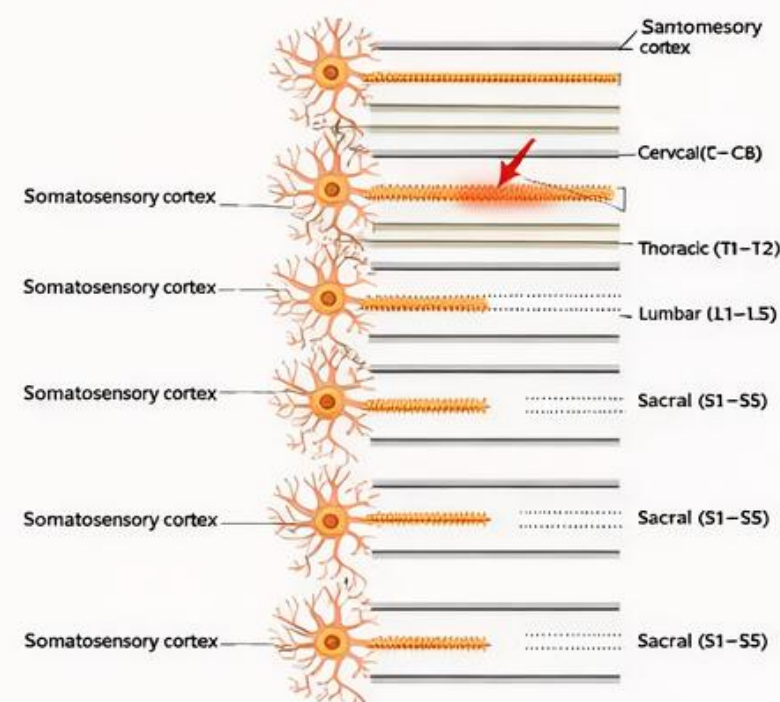
Disorders of the Nervous System (part 2)



Peripheral Nerve Disorders

Symptoms

- **Neuropathic pain:** Abnormal spontaneous pain that may feel burning, sharp, shooting, tingling, in nature due to irritation or damage to peripheral sensory nerves such as allergy nerves.
- **Paresthesia:** Abnormal sensation such as **numbness, tingling**, pins and needles due to irritation or damage to peripheral nerves.
- **Susceptibility to pressure:** Nerves are sensitive to compressive injuries.
- **Impaired transmission in the Posterior column:** Disruption of vibration senses, light and discriminative touch below the level of nerve injury.



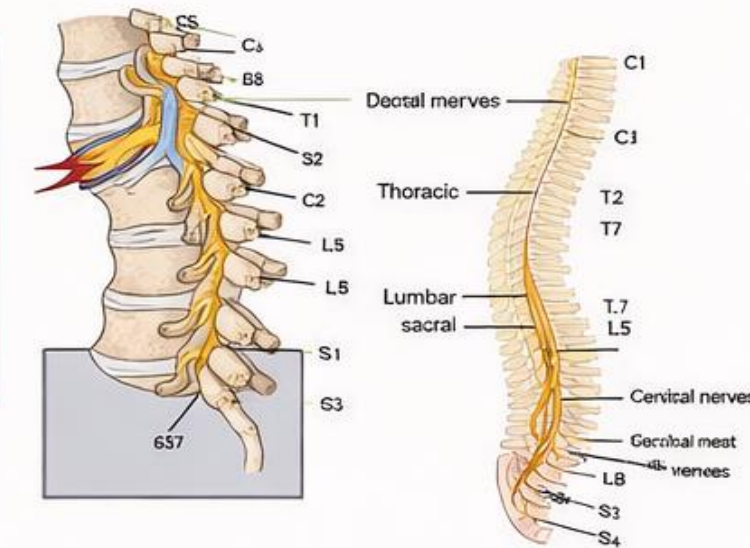
Disorders of the Nervous System (part 2)



Sensory Nerve Root Disorders

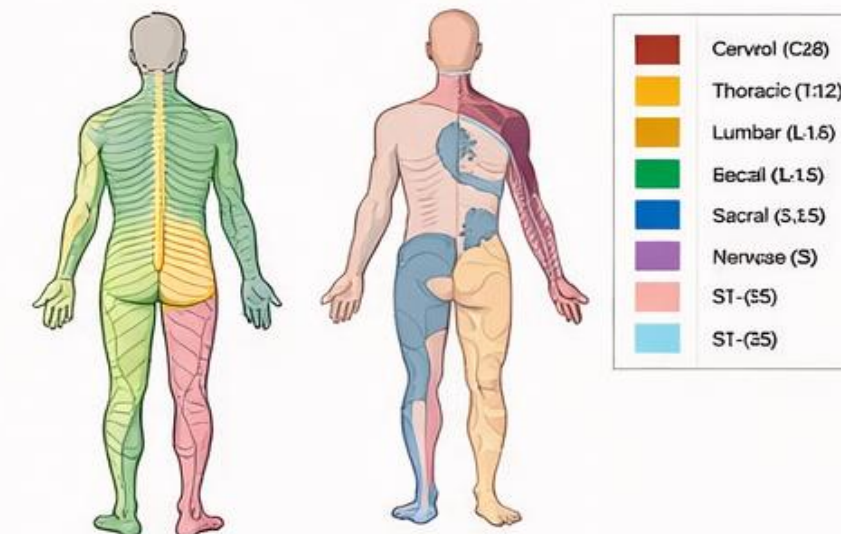
Causes

- Herniated intervertebral disc
- Post-herpetic neuralgia
- Nerve root impingement in various regions of the spine causing symptoms corresponding to a **Dermatomes** map



Symptoms

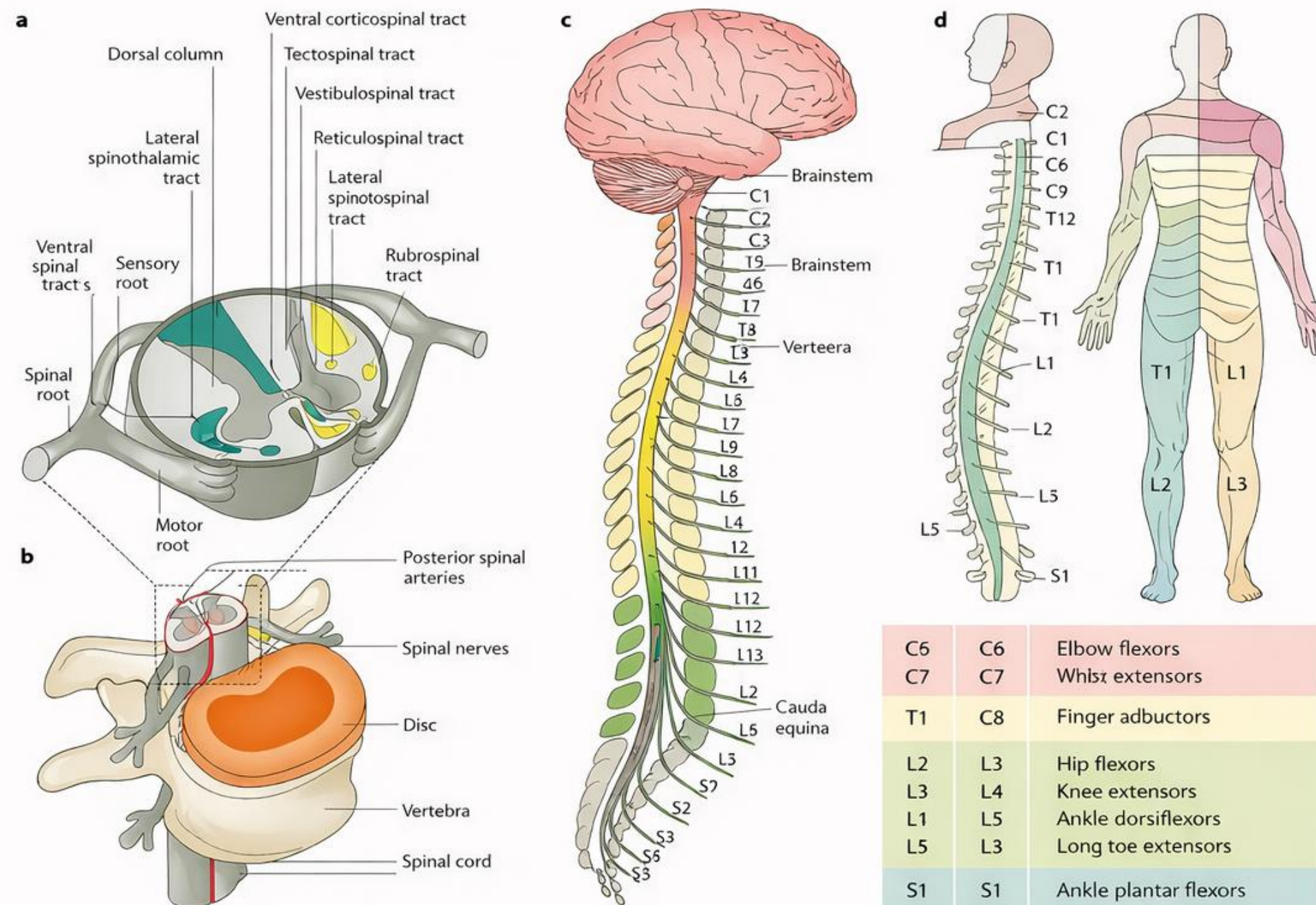
- **Referred pain:** Pain felt in areas other than the site of nerve root irritation. Typically perceived when a sensory nerve root is irritated, causing pain to be felt elsewhere along the same dermatome level.
- **Radiating pain:** Pain that moves or increases distance into the back or down the limbs.
- **Muscle weakness** in areas innervated by the affected nerve root: May appear in severe cases.



Disorders of the Nervous System (part 2)



Posterior Spinal Cord Pathways



Disorders of the Nervous System (part 2)



Posterior Spinal Cord Disorders

Causes

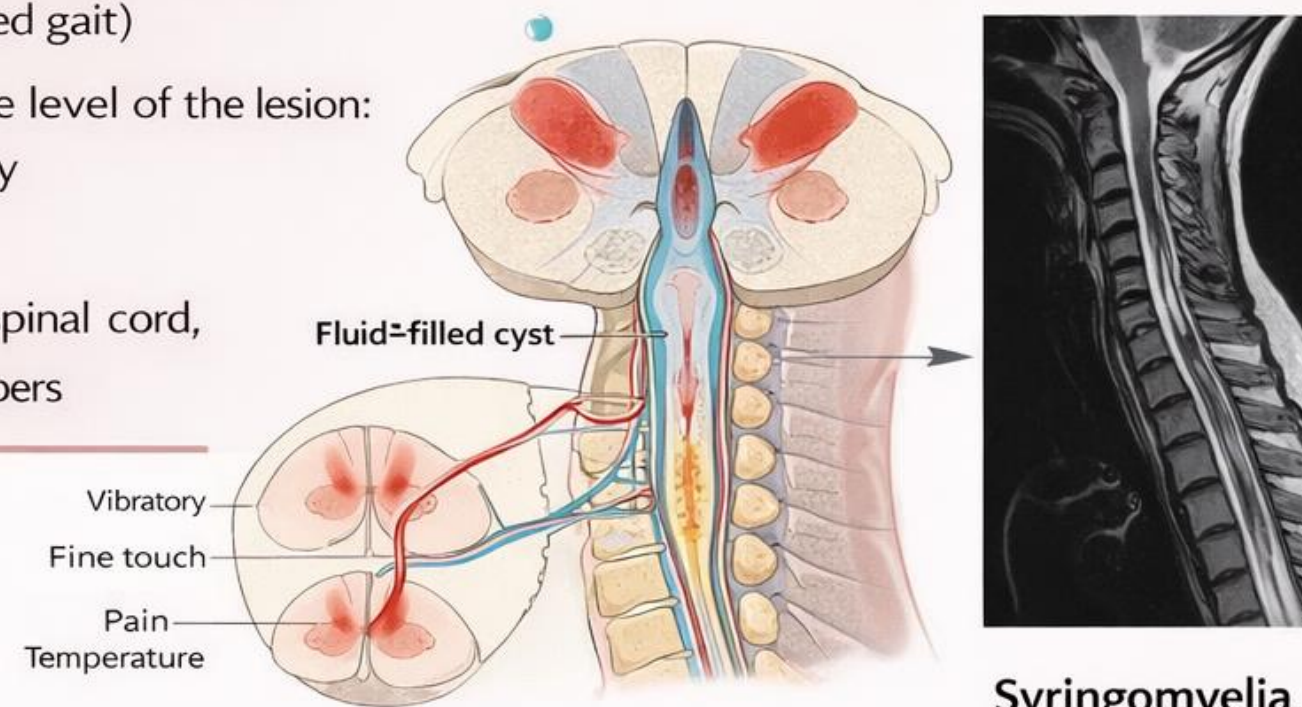
- Trauma to the spinal cord, infection, tumor, autoimmune diseases
- An expansion of the central canal within the spinal cord
- Degeneration or demyelination of ascending posterior tracts carrying sensory information
- Disorders affecting the **posterior column** transmitting fine touch and proprioception from the lower body



Sensory ataxia

Symptoms

- Impaired function of the posterior column:
Loss of proprioception which controls balance and position, leading to sensory ataxia (unsteady, wide-based gait)
- Tingling, numbness, and sensory loss below the level of the lesion:
Loss of pain and temperature sensation, difficulty discriminating fine touch and pressure
- **Syringomyelia**: fluid-filled cysts expand in the spinal cord, compressing and damaging surrounding nerve fibers



Syringomyelia

Disorders of the Nervous System (part 2)



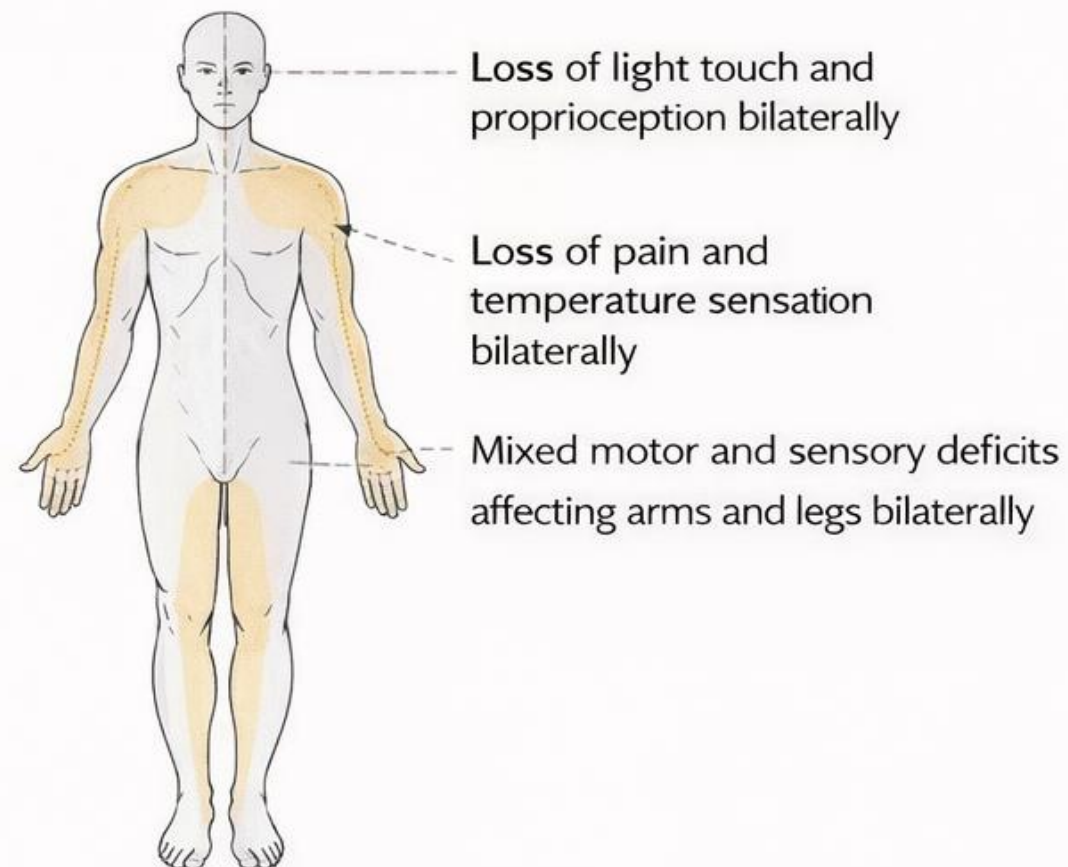
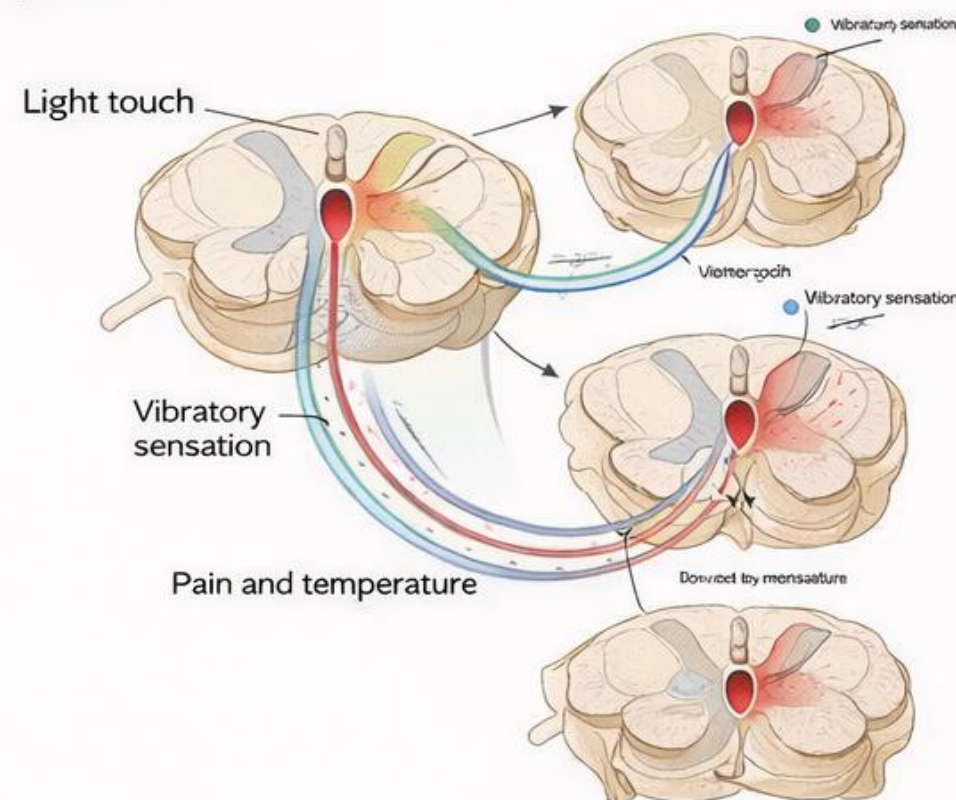
Central Spinal Cord Disorders

- **Central spinal cord:** Different sensory pathways converge in the central cord

Symptoms

- **Damage to the central spinal cord:** Impairs awareness of sensation on both sides of the body and at levels below the injury.
 - Typically see loss of pain and **temperature sensation**, loss of light touch, and proprioceptive impairment bilaterally
 - May include motor impairment and mixed pattern of motor and sensory deficits, affecting both arms and legs

Symptoms



Disorders of the Nervous System (part 2)



Somatosensory Cortex and Sensory Association Disorders

Symptoms

- **Agnosia** : Inability to recognize or identify objects through proper sensory input despite normal sensory function. The person is unable to identify or name objects by touch, shape, number, etc. and might mix things up, such as confusing a key with a coin
- Typically due to damage of the somatosensory cortex or sensory association areas in one or both hemispheres.
- Diagnosis often involves presenting two different objects' read simultaneously in each hand for 2-3 seconds, and the person is asked to identify each object by touch with their eyes closed.
- May be a result of stroke, brain injury, tumor, infection, or degenerative disease



- Typically due to damage of the somatosensory cortex



BACKGROUND

- Damage to sensory association areas can lead to impairments in tactile, spatial, and body perception.



RISKS

- **DAMAGE** : somatosensory association, might PRECOITECT + dissociation or such low repairments if fear more.
- Loss of proper association
- proprioception damage, anticipation.

SIGNS & SYMPTOMS

- Recognizing or naming objects by touch, identifying shapes in hand.
- Determining number of objects in hand.
- Differentiating between small objects of different sizes
- Loss of awareness of one's body parts (somatosensory neglect) Sometimes confuses left vs. right.

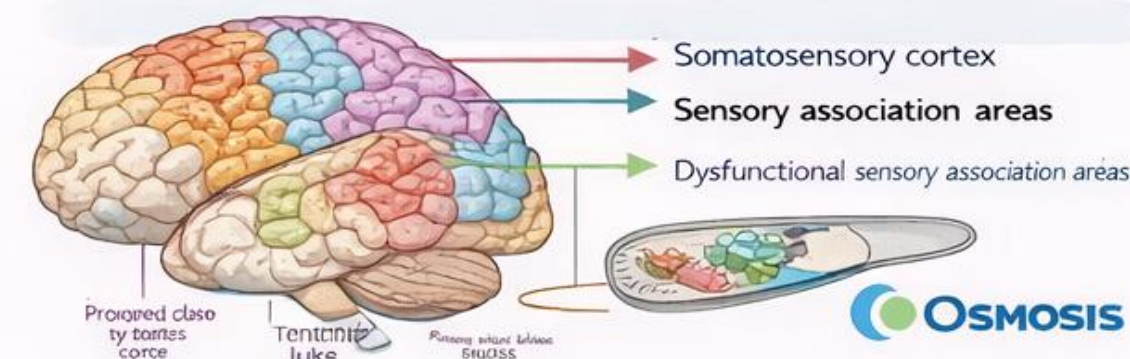


DIAGNOSIS

- Tactile object recognition
- Two-point discrimination
- Stereognosis (identify a familiar object by touch)

TREATMENT

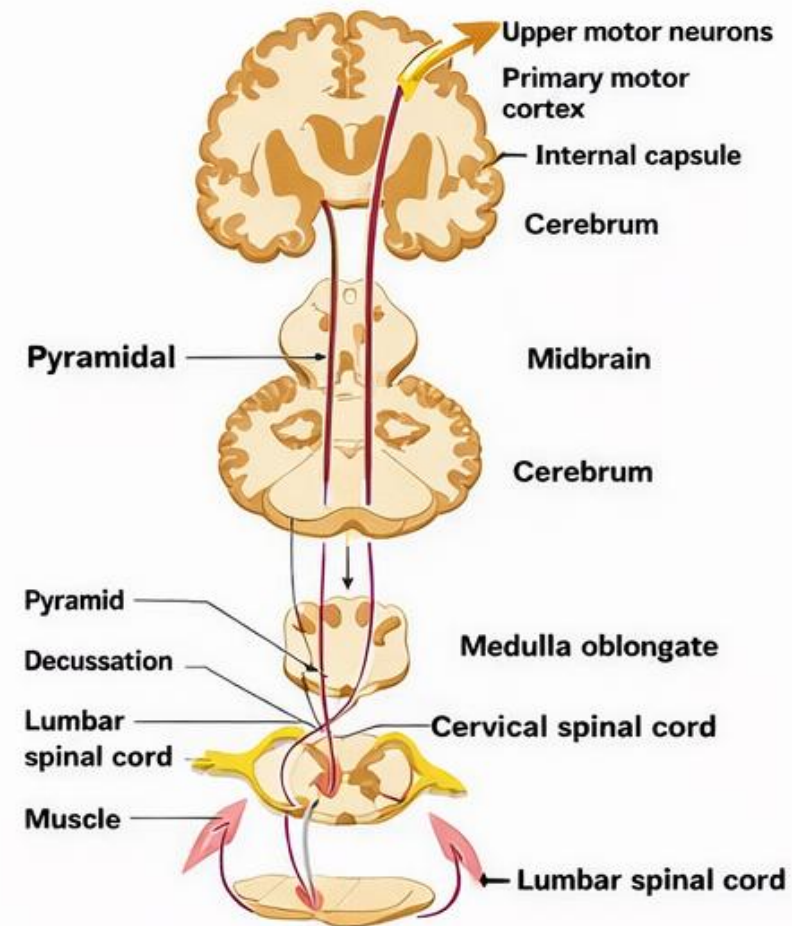
- Targeting underlying cause
- Occupational therapy: developing strategies to compensate for sensory deficits



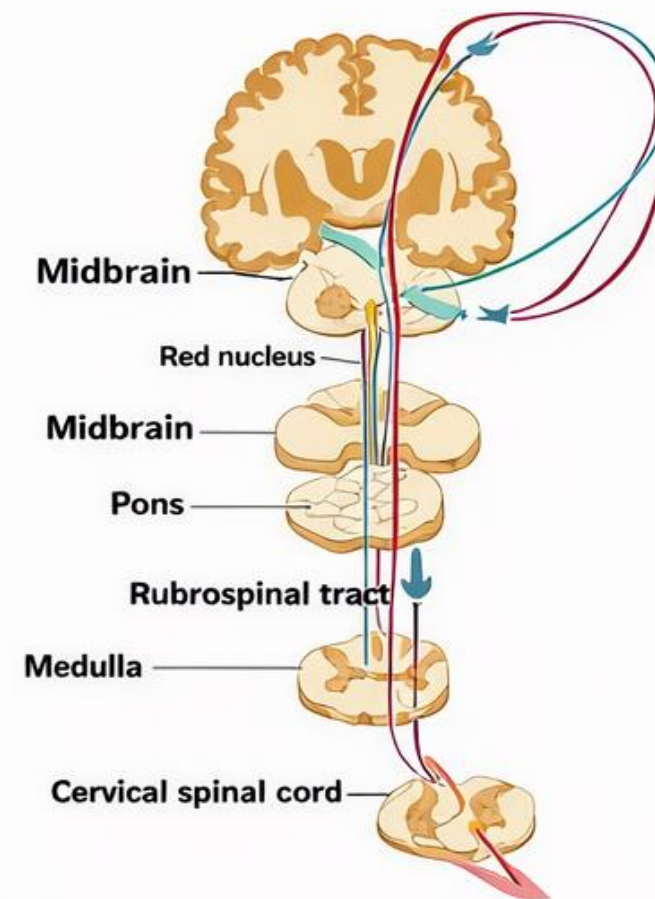
Disorders of the Nervous System (part 2)



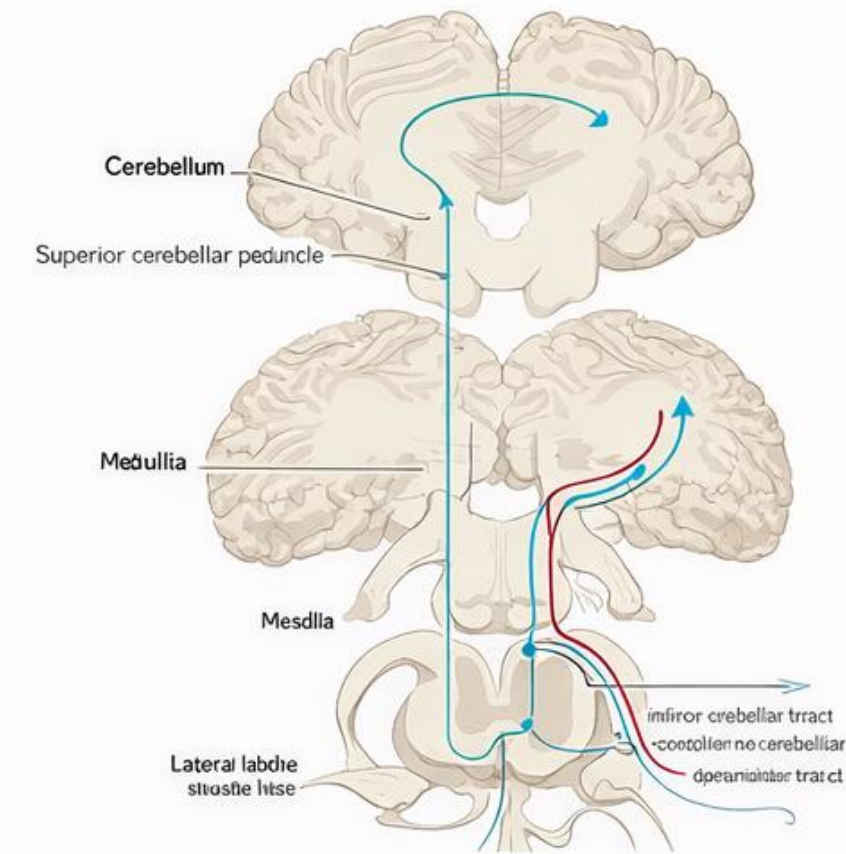
Movement Disorders



Pyramidal system



Extrapyramidal system



Cerebellum



1. Upper Motor Neuron Syndrome (Pyramidal)



2. Extrapyramidal Disorders



5. Neuromuscular Junction Disorders



3. Ataxia



4. Lower Motor Neuron Lesions



6. Myopathies

Disorders of the Nervous System (part 2)

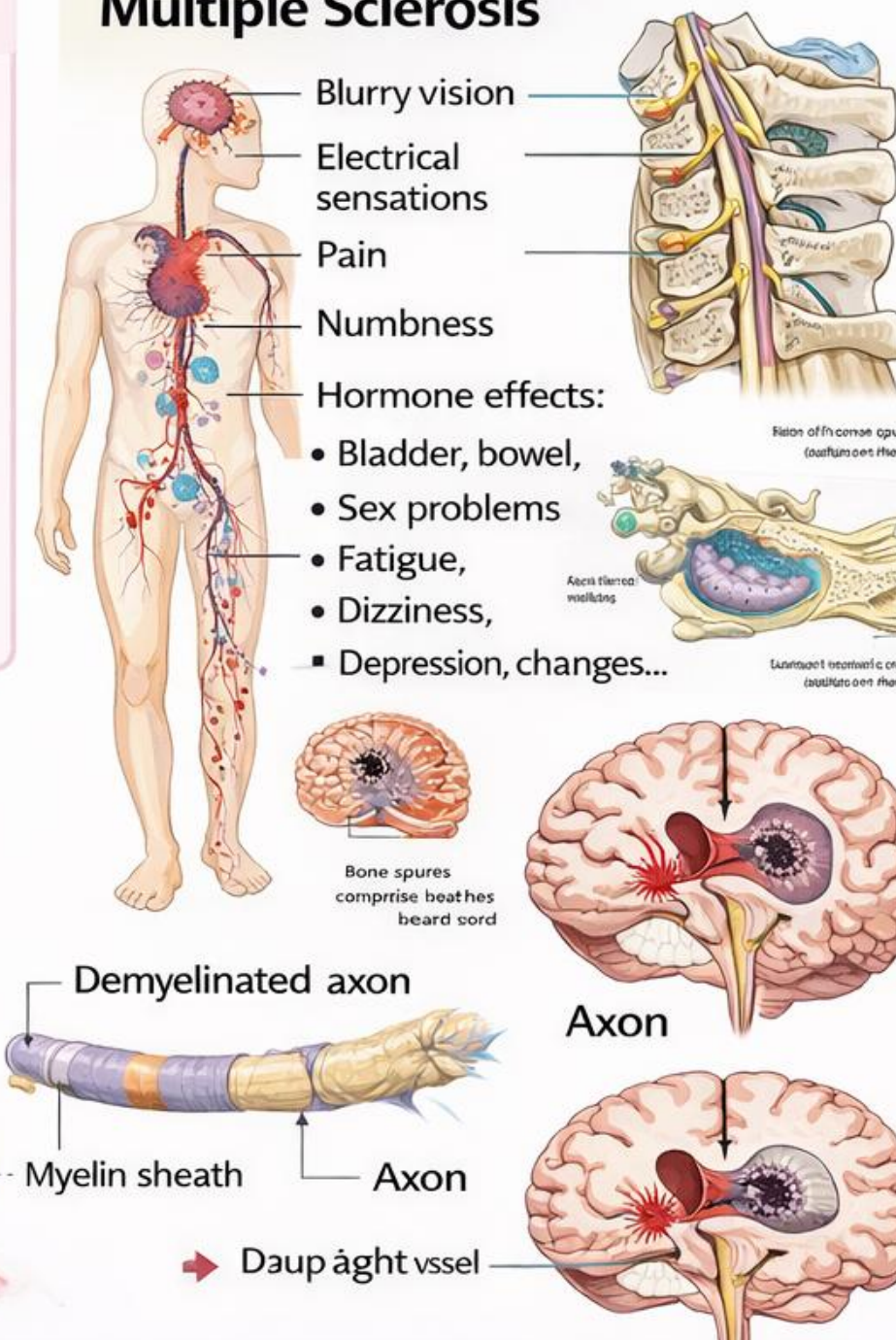


Upper Motor Neuron Syndrome (Pyramidal)

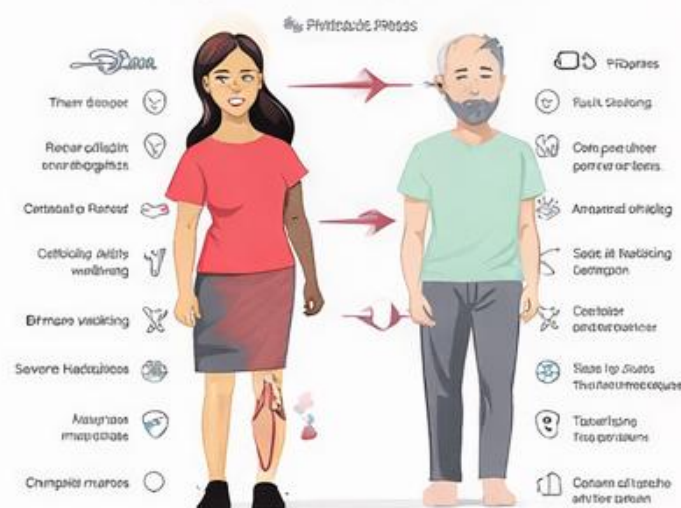
Causes

- Cerebrovascular disease (CVD) or Stroke
- Demyelination of **myelin**, such as in **Multiple Sclerosis** (Demyelination disease affecting Myelin in the CNS)
- Spinal cord injury or damage
- **Brain tumors**: Pressure or damage to the motor cortex, interfering with the signal output to the spinal cord
- Neurodegenerative diseases like brain or spinal cord atrophy due to aging

Multiple Sclerosis

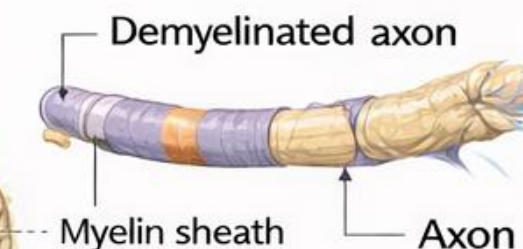
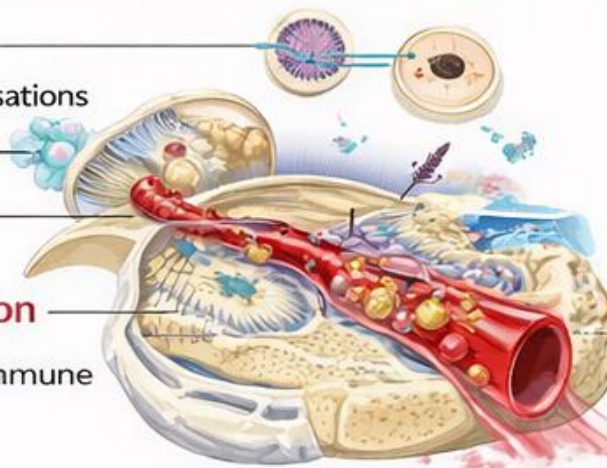


STROKE SYMPTOMS: WOMEN VS. MEN



Multiple Sclerosis

- Blurry vision
- Electrical sensations
- Pain
- Numbness
- Inflammation**
- Myelin and immune



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Disorders of the Nervous System (part 2)



Spinal Shock

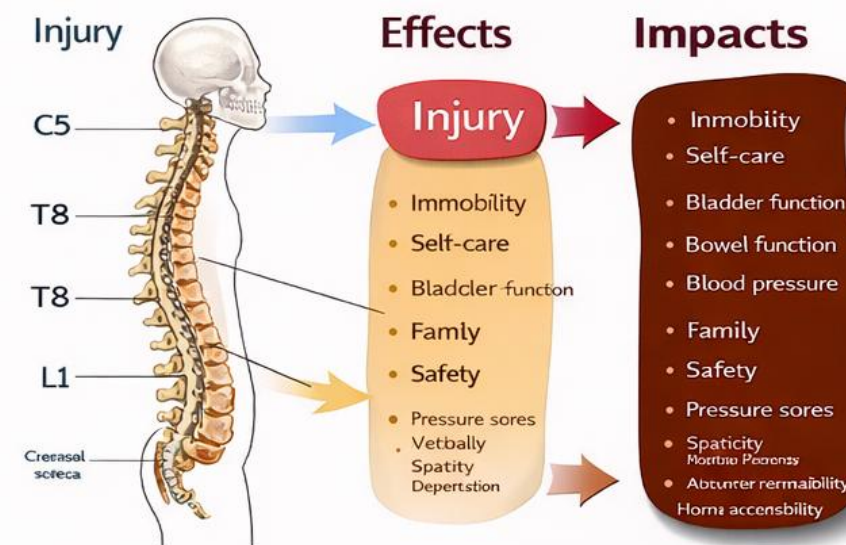
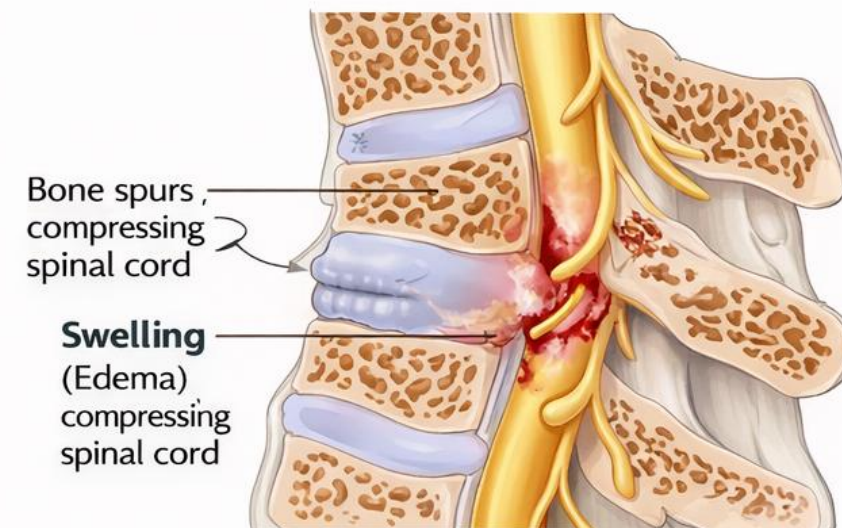
in Upper Motor Neuron Syndrome (**Pyramidal**)

Spinal shock

- Interrupts the **pyramidal system** in early stages
- Initially reduces all motor and reflex activities

Symptoms

- Flaccid paralysis (no movement)
- Loss of **Sensory** and Stretch reflexes
 - No Superficial reflexes (e.g., abdominal reflex)
 - Loss of Stretch reflex (no knee jerk)
- Absent Anal sphincter reflex
- Loss of autonomic functions ↓
 - Urinary retention and bowel dysfunction
- Decreased blood pressure
- Lack of sweating (hypothermia)

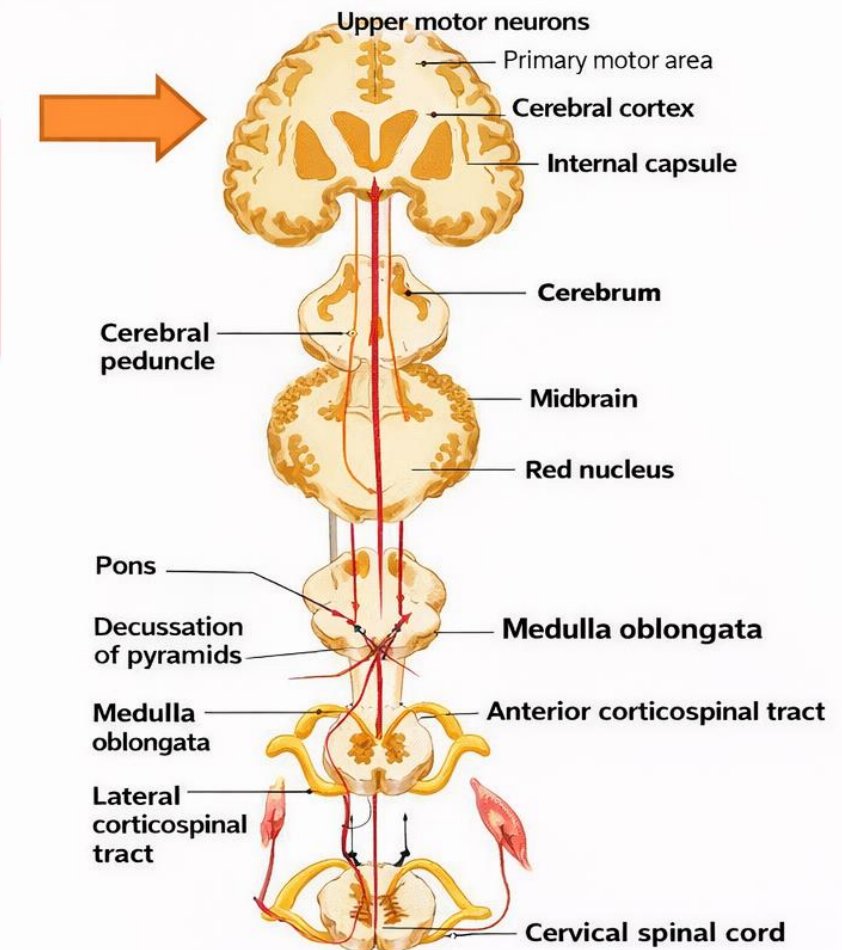


Cerebral Shock

in Upper Motor Neuron Syndrome (**Pyramidal**)

Cerebral shock

- Disrupts the **pyramidal system** in the cerebrum
- Causes confusion
- Weakness in all limbs
- Presents similarly to early-stage Spinal shock



Disorders of the Nervous System (part 2)



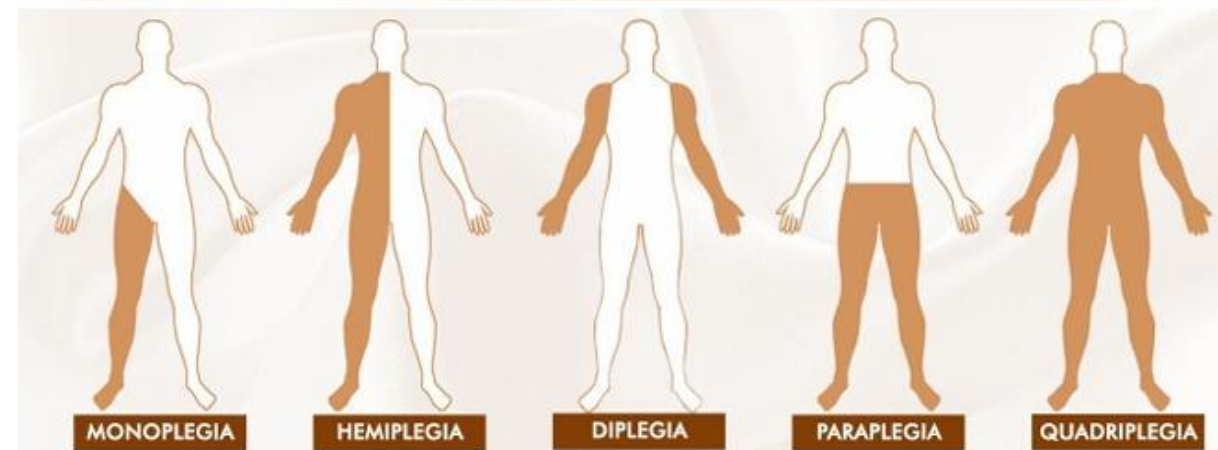
Upper Motor Neuron Syndrome or Pyramidal System Dysfunction

Cerebral Shock

- Lesions in the Pyramidal system in the brain
- Hypertonia
- Weakness in the opposite side of the body
- Spinal shock-like symptoms present after cerebral shock

Resulting Effects

- No or decreased superficial reflexes



Babinski reflex



Normal plantar response

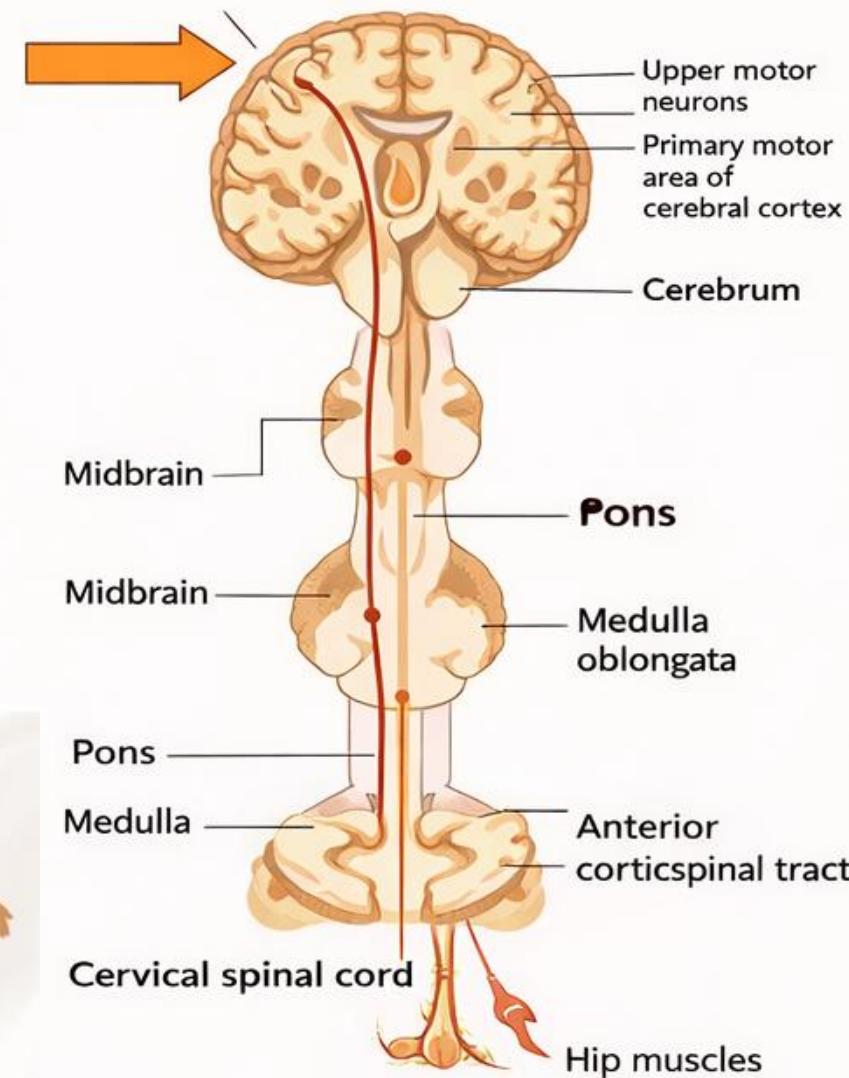


Plantar response, flex

Abnormal Reflexes



Extensor plantar response (Babinski sign)



Abnormal Reflexes

Stretch/Deep tendon reflex



Stretch/Deep tendon reflex



Clonus



Clasp knife phenomenon

Disorders of the Nervous System (part 2)



Parkinson's disease

Symptoms

Decreased voluntary muscle control, especially fine motor movements

Slowness in initiation of movement and muscle weakness

Difficulty maintaining posture in a single position for a long time

Mask-like facial expression, dull eyes, slow changes in facial expression

Difficulty swallowing, slow and difficult speech, monotone voice (loss of pitch variation)

Short-stepped gait with poor balance, leading to difficulty or slowness in walking (**Bradykinesia**)

Increased muscle tone causing rigidity of the limbs, with uniform resistance throughout the range of motion (**Cogwheel phenomenon**)

Forward-leaning posture due to anterior displacement of the center of gravity

Tremor at rest (**static tremor**), usually in the hands, which worsens with initiation of movement

Fatigue, emotional instability, anxiety, fearfulness, sadness, or stress

Autonomic nervous system dysfunction: excessive sweating, incomplete urination and defecation, numbness, dizziness, and flushing sensations

Abnormalities in Movement

2. Extrapyraxidal System Disorders

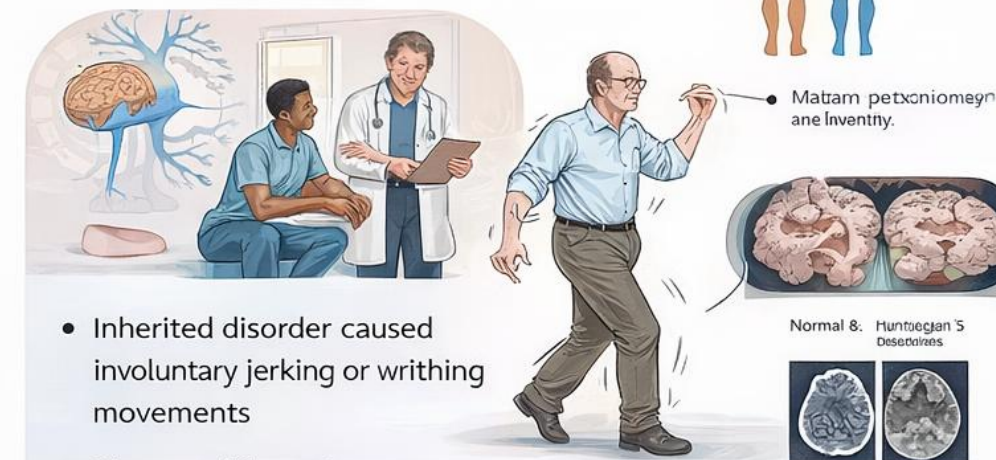
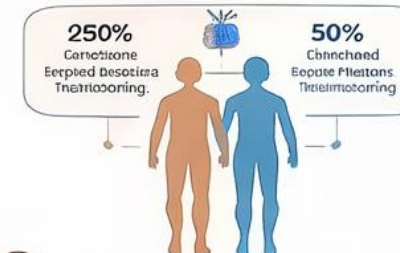
Huntington's disease

- Inherited disorder caused by a mutation in the HTT gene on chromosome 4
- There is up to 50% chance of passing the faulty gene to each child of an affected parent



Signs and symptoms:

- Uncontrolled movements
- Emotional and cognitive problems
- Difficulty with speech and swallowing

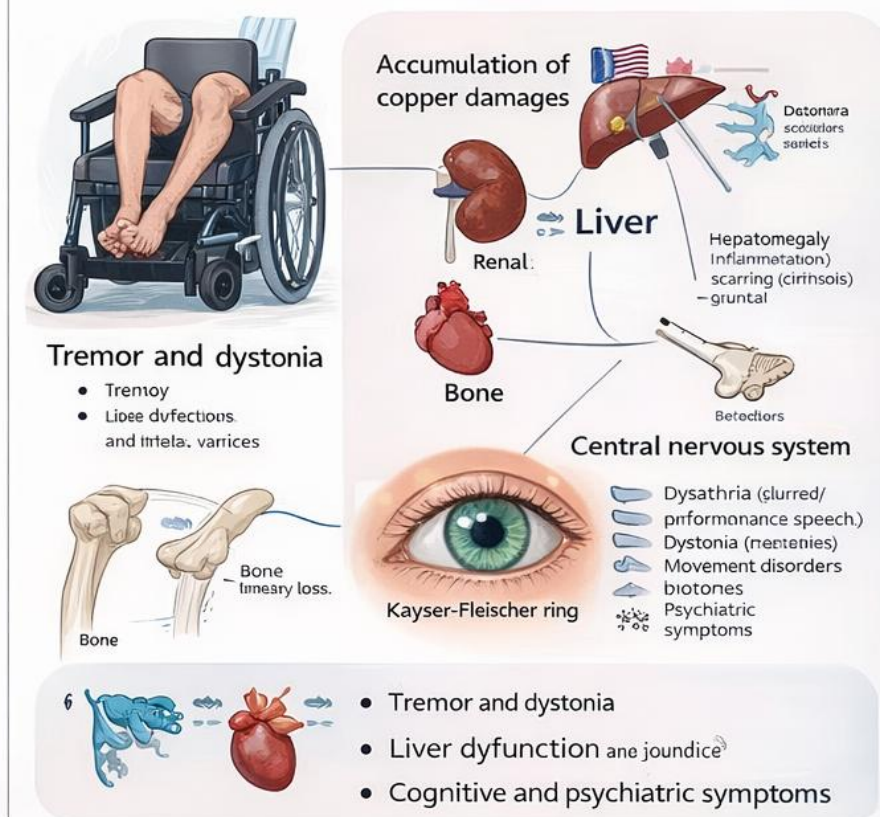


- Inherited disorder caused involuntary jerking or writhing movements
- Signs and Symptoms:
 - Tremor and dystonia
 - Liver dysfunction and jaundice

Wilson's disease

Wilson's disease

- Genetic disorder causing copper to accumulate in body tissues
- Inherited in an autosomal recessive pattern
- Defective copper metabolism results in damage to the liver, brain, and other organs



Disorders of the Nervous System (part 2)

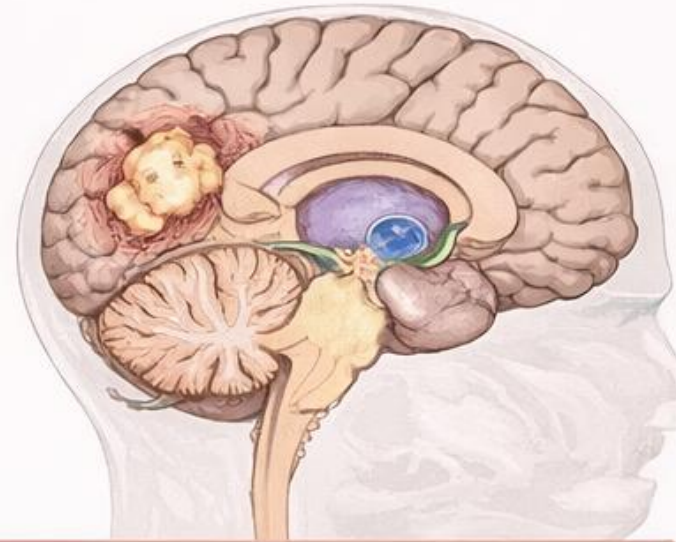


Cerebellar Dysfunction

Causes

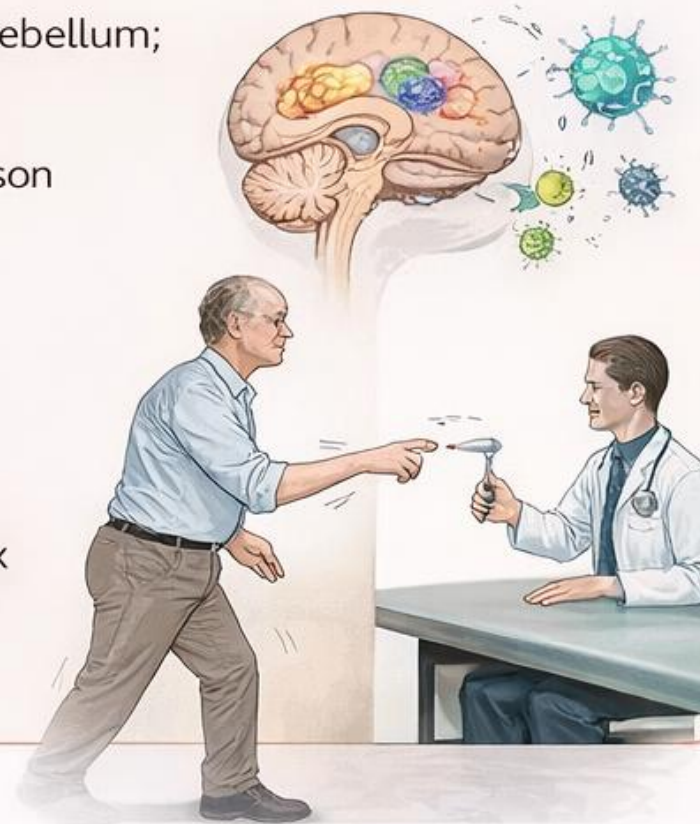
- Tumors such as Astrocytoma
- Multiple sclerosis affecting the cerebellum
- Infections

Damage to the cerebellum impairs balance and coordination.



Symptoms

- ✓ **Ataxia:** Unsteady, uncoordinated movements
- ✓ **Cerebellar ataxia:** Specific to damage to the cerebellum; clumsy, uncoordinated movements
- ✓ **Intention tremor:** Tremor that worsens as a person attempts to move their limb closer to a target
- ✓ **Dysmetria:** Inability to judge distance or scale
- ✓ **Dysarthria:** Slurred, slow, or scanning speech
- ✓ **Nystagmus:** Involuntary jerking movements in the patellar tendon often seen during a knee reflex test, due to the leg swinging back and forth multiple times



Ataxia: Unsteady, uncoordinated movements



Pendular knee reflex: Slow, pendular movement in the patellar tendon often seen during a knee reflex test, due to the leg swinging back and forth multiple times.

Disorders of the Nervous System (part 2)



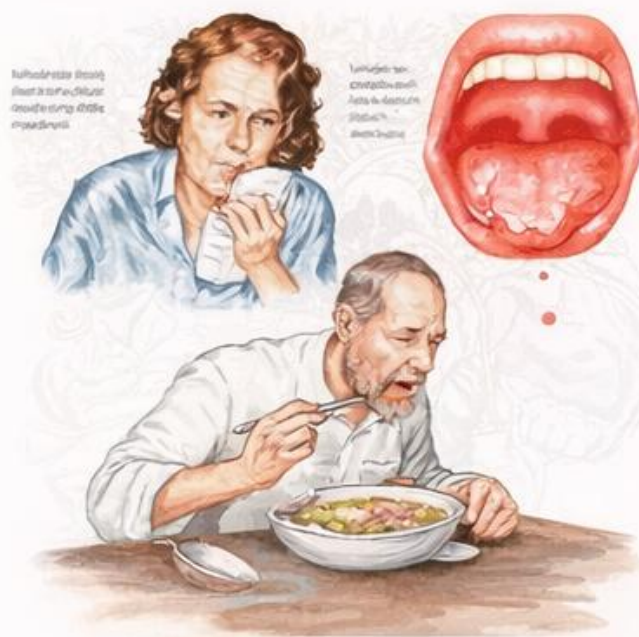
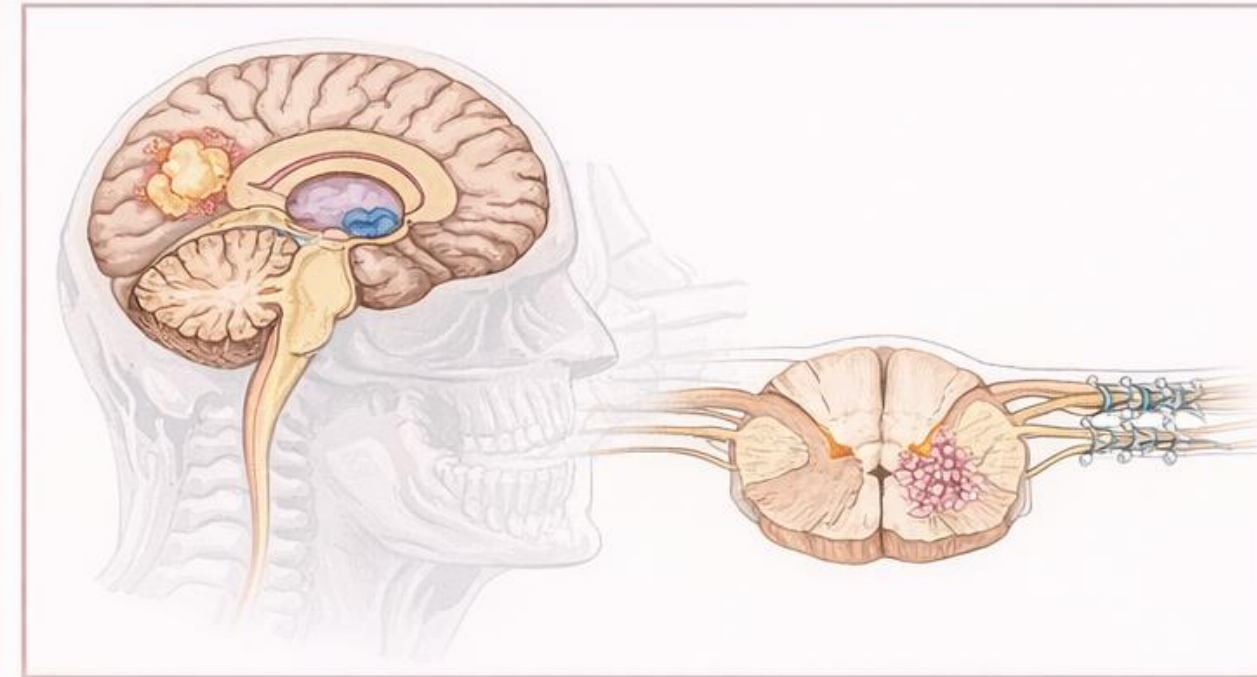
Lower Motor Neuron Lesions

Causes

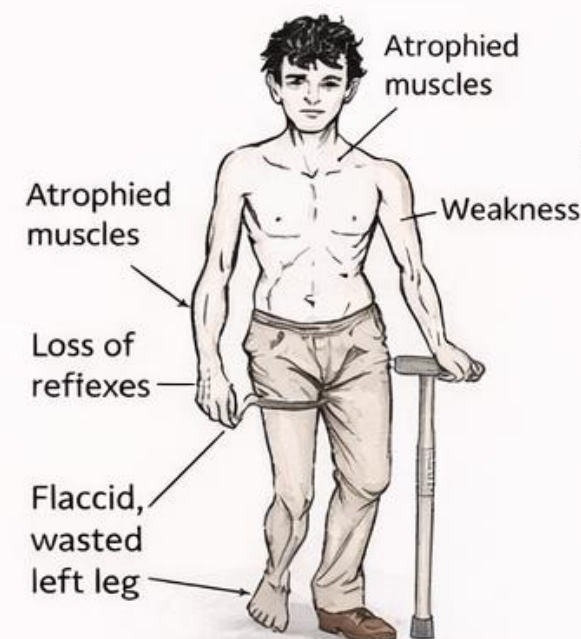
- Damage to Motor nuclei in the brainstem
- Damage to Anterior horn cell in the spinal cord

Damage to Anterior horn cell in the spinal cord or Motor nuclei in the brainstem leads to:

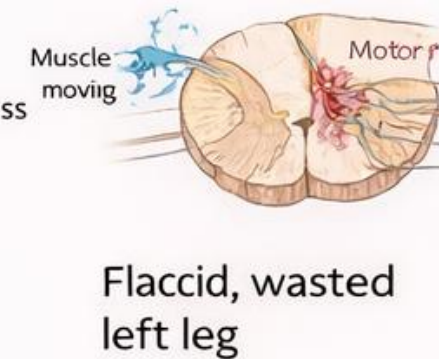
- ✓ Bulbar palsy
- ✓ Paralytic poliomyelitis
- ✓ Amyotrophic lateral sclerosis (ALS)



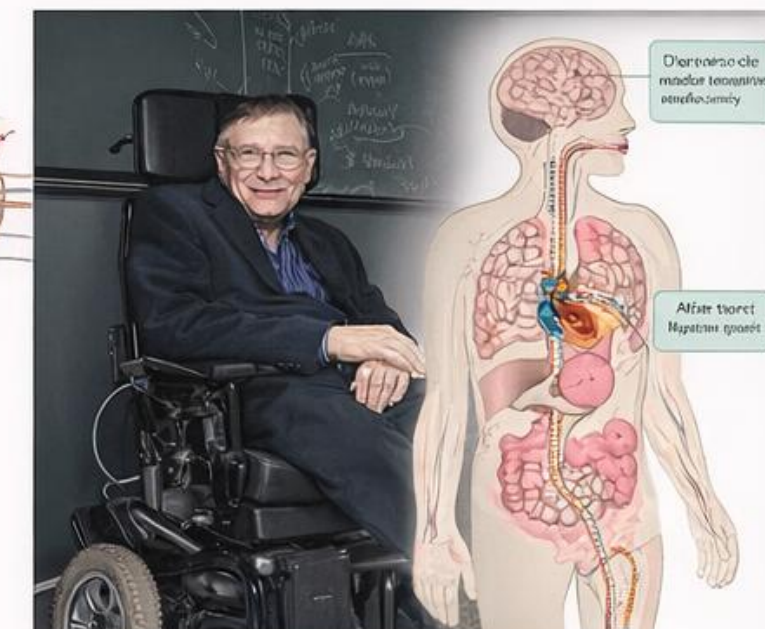
Bulbar palsy



Paralytic poliomyelitis



Flaccid, wasted left leg



Amyotrophic lateral sclerosis (ALS)

Disorders of the Nervous System (part 2)



Neuromuscular Junction Disorders

Causes

- Impaired release of Ach from the motor neuron to the muscle
- Botulism caused by eating *Clostridium botulinum* in contaminated food

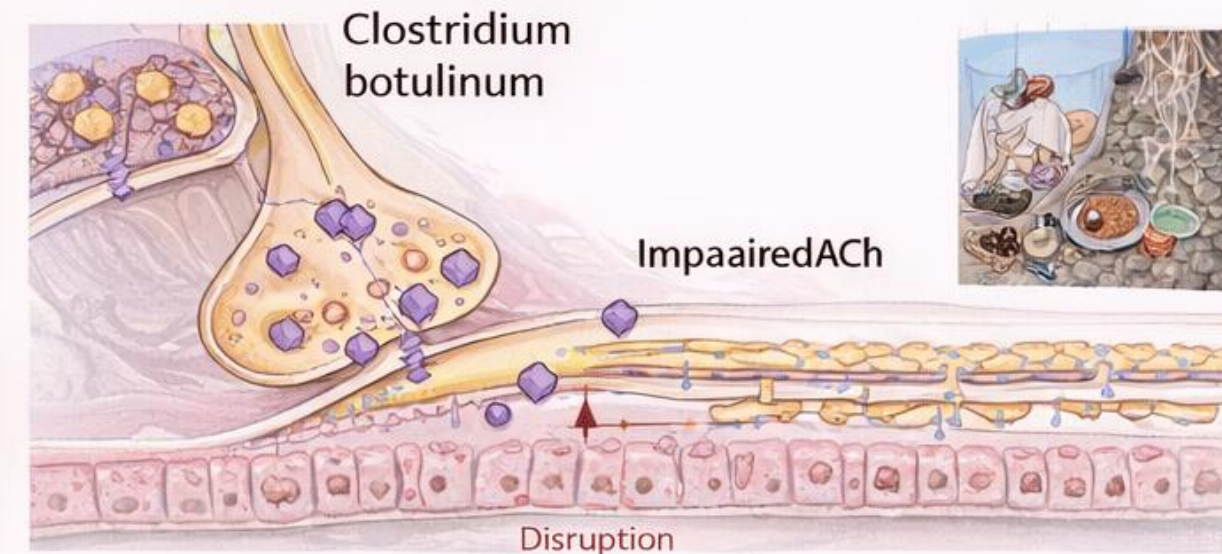
Effects

- Muscle becomes weak or paralyzed without loss of sensation
- Drooping eyelids & double vision
- Hoarse voice, weak, slurred speech
- Difficulty swallowing; excessive saliva production
- Respiratory problems; difficulty breathing; shortness of breath or even respiratory failure in severe cases
- Flaccid paralysis: muscle weakness due to body's inability to contract muscles

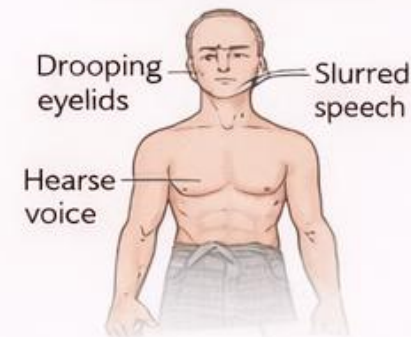
Preserved
foods linked
to Botulism



Preserved foods linked to Botulism



Adult botulism

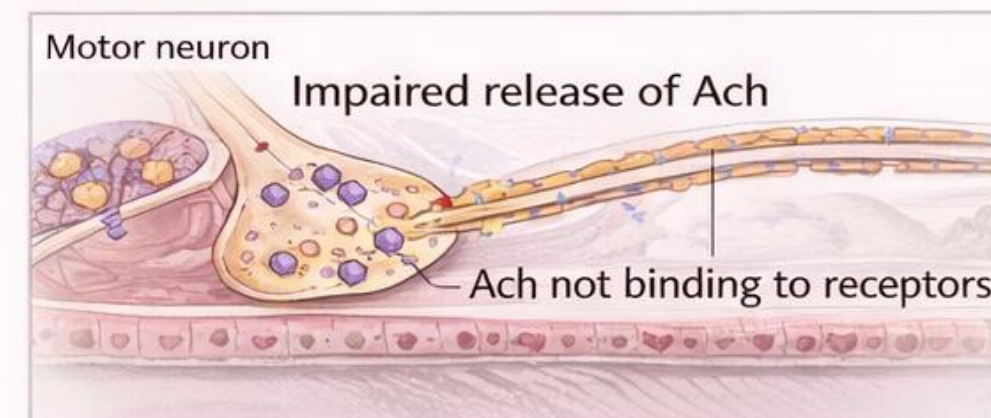


Motor neuron

Infant botulism



Weakened contractions



Disorders of the Nervous System (part 2)



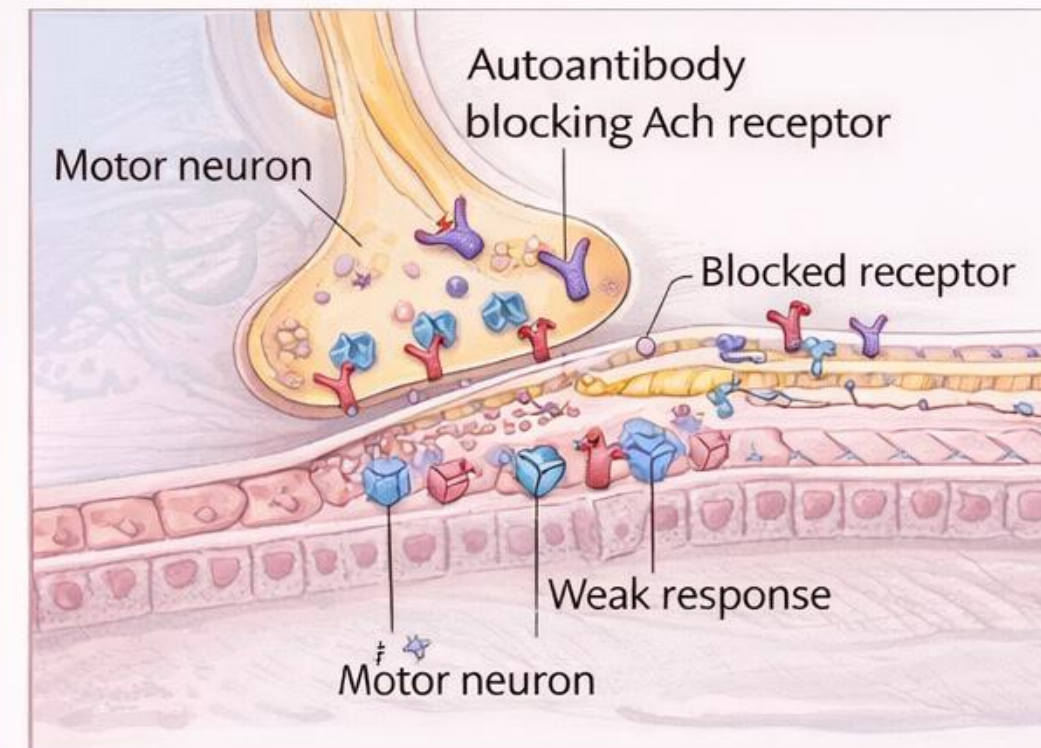
Myasthenia Gravis

Causes

- Antibodies block the motor neuron from stimulating the muscle
- Autoantibodies against Ach receptors on the neuromuscular junction

Damage to Ant: of the motor neuron from stimulating the muscle

- Drooping eyelids
- Muscle weakness worsens after activity and improves after rest, especially muscles used often like those controlling the eyelids, eye movement, chewing, speaking, or swallowing



Effects

- Drooping eyelids
- Muscle weakness worsens after activity and improves after rest especially muscles used often like those controlling the eyelids, eye movement, chewing, speaking, or swallowing
- Blurred or double vision
- Weakness of facial muscles, difficulty managing expressions
- Difficulty swallowing, choking or drooling due to weakness of tongue and throat muscles
- Shortness of breath in severe cases



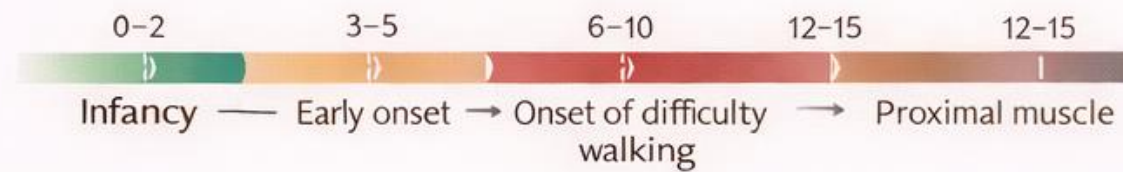
Disorders of the Nervous System (part 2)



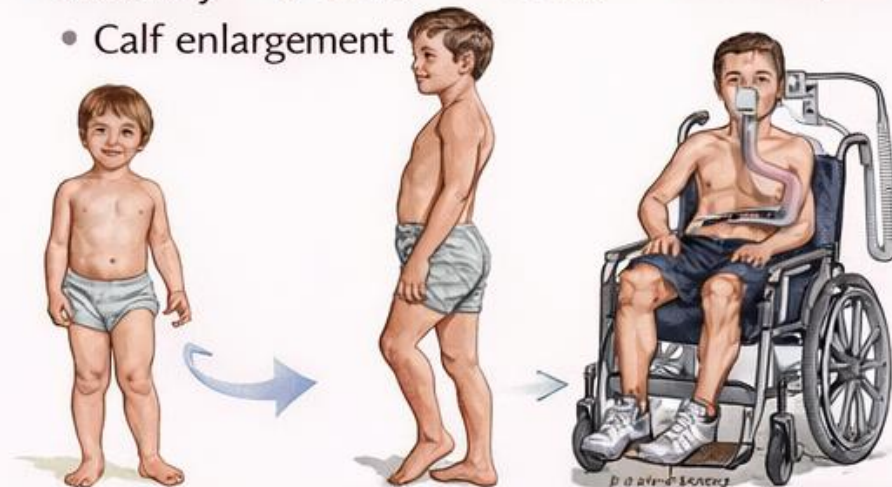
Muscle Disorders

- ✓ Progressive muscle weakness affecting both sides of the body
- ✓ Absent or reduced deep tendon reflexes (Fasciculation)
- ✓ Proximal muscle (near the trunk) cause involvement
- ✓ Legal diagnosis at **DTR** and reduced or absent Dep tendon reflexes

Duchenne Muscular Dystrophy



- Infancy → • *Gower's* maneuver → Ventilatory assistance
- Calf enlargement



- Calf enlargement (Pseudohypertrophy)

Duchenne Muscular Dystrophy

Polymyositis and Dermatomyositis

Polymyositis

- Antisynthetase syndrome
- Fever
- Fatigue
- Muscle inflammation (myopathy)
- Proximal muscle predominance

Dermatomyositis

- Skin involvement:
 - Heliotrope rash (purple eyelid discoloration)
 - Gottron's papules
 - Shawl sign (rash covering upper back and V sign)



- Inflamed muscle (myopathy)
 - Proximal muscle predominance
- Diagnostic criteria:
 - Muscle biopsy
 - Elevated CK



Heliotrope rash



Gottron's papules

Polymyositis and Dermatomyositis



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