

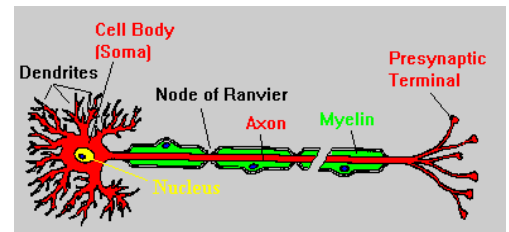
Peripheral nerve injury

◆ What is peripheral nerve?

- It is a nerve which connects between CNS (Spinal cord) & periphery, with EXCLUSION of cranial nerves.
- It is composed of: cell body, axon & nerve end.
- If the *Cell Body* is Motor: it is located in anterior Horn cell in spinal cord (motor end plate).
- If axon is sensory: it is located in posterior Horn cell.
- Always mixed (contain both sensory & motor fibers) No pure sensory or motor.
- It has the capability of regeneration unlike of CNS.
- Rehabilitation is very important in peripheral nerve injury.
- They have the ability to regenerate

◆ Definition of nerve injury:

- It is Partial OR Complete interruption of normal physiology of the nerves (nerve conduction is affected). → present as partial or complete loss of sensation OR paralysis OR both



◆ Types:

1-Neuropraxia:

- E.g.: when you set for long time you feel numbness. *مهمه*
 - Commonest & easiest in recovery
 - Reversible (temporary) failure propagation of electrical impulses across the affected nerve segment.
 - No anatomical change of the nerve structure (anatomy is intact).
 - Duration: usually: seconds – minutes.
Rare: hours - days.
- Some common terminologies : .:
- Saturday night palsy:alcoholics→radial nerve palsy
 - Honeymooner's syndrome.
 - Wheel chair bound persons. → So in these pt, the regular change of position is nessasiry

2-Axontemesis:

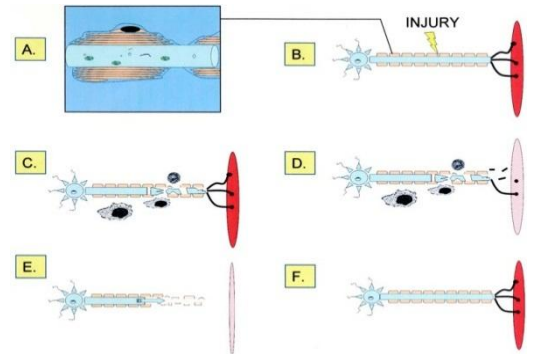
- Complete absence of sensory & motor activity of that nerve (**Loss of function BUT the Anatomy is intact**)
- Associated with accident & trauma:
 - ♦ Fracture of humeral shaft (**middle + lower third**) →radial nerve injury
 - ♦ Fracture of medial epicondyle → ulnar nerve injury.
 - ♦ Fracture of proximal fibula → peronealnerve injury.
 - ♦ Fracture of acetabulum & posteriordislocation of femoral head→sciatic nerve injury.
- No sensation or motion (loss of nerve function).
- Axon+myline sheath are damaged (histological changes). → **But the tube in general is intact**
- The cell body losses its continuity with nerve.
- Endo, epi, perineum are intact (fascia is intact).
- Anatomy is intact.
- There is wallerian degeneration.
- Good prognosis

3- Neurotmesis:

- Anatomical damaged in the nerve (nerve ends are not in continuity) → complete disturbance of activity of that nerve + loss of supporting tissues.
- There is wallerian degeneration.
- Prognosis is poor & worst without surgical repair. → active treatment is the cure

Wallerian degeneration (degeneration and regeneration) : الصورة توضح العملية

- It is a process of proximal part regeneration & distal part degeneration of the nerve regarding to the damage site.
 - Length of regeneration: **1mm/day**. e.g.: if the length of sciatic nerve injury is 50cm → it needs 500 days to recover.
 - During the period of regeneration, if the distal part is not stimulated from outside → lead to atrophy of motor end plate & loss its function. So, you have to stimulate motor end plate by rehab to prevent degeneration of it (**it is not reversible**).
 - If the anatomy is intact (axontmesis) → no need to repair.
 - If the anatomy is disturbed (neurotmesis) → you have to repair. Then wait for regeneration.
- N.B:** if the tunnel is not in continuity that is mean there is no stimulus for regeneration which may cause neuroma (group of N. tissue which doesn't have any function).



NB : in this process the muscle will become atrophic (this is irreversible) So to prevent that we apply external stimuli of the muscles

Rehabilitation: (What we do to control and direct the previous phenomena)

- Pain control by simple analgesia. + Splint (dynamic type (اللي تسمح بالحركة))
- Nerve & muscle stimulation. **to avoid muscle atrophy Or end plate degeneration**
- Dynamic splints to avoid stiffness. (We have to prevent pressure sores).
- Nearby joints range of motion by doing passive movement to prevent muscle stiffness.
- It takes months-years (long time) to recover.

Remember: - MCQ

- Pressure sores develops due to the pressure of splint in case of complete loss of sensation of the splinted limb.
- You can prevent pressure sores by padding the splint with cotton between splint & limb.

◆ Etiology:**■ Acute:**

- Fractures (the commonest) → axontmesis.
- Wrong position (Saturday night syndrome, handicap) {neuropraxia}.
- Surgery. {neurotmesis}
- Electrical burn (the worst (مهمه) because it damages everything.

■ Chronic:

- Tight N. passage (e.g.: carpal tunnel syndrome, tarsal tunnel syndrome).
- Tumors which compress the nerve.

◆ Presentation: Pain

- History of trauma.
- Loss of sensation.
- Loss of motion

- Loss of power.
- Loss of reflexes.
- Muscle wasting.
- Contractures (deformity).
- Tropic changes: loss of normal well-being of limb due to disuse (shiny skin, hair disturbance.....).
- Difficult labor مهمه

Diagnosis: Confirmed by:

- X-ray: in trauma.
- EMG: study of muscle electrical activity.
- NCS (neural conduction study): study of activity of electricity in the N. itself. → to establish the baseline
- MRI. (Like in brachial plexus injury so, we use it in special cases).

◆ Erb's palsy:

- Birth injury (difficult labor e.g.: shoulder dystocia & breech presentation).
- Traction often on N. roots C5-C6 but may occur on C4-C7-C8.
- Stretch or rupture or avulsion ← the worst. – **MCQ**
- Upper limb in extension + internal rotation + adduct ← waiter phenomena .
- Mother notices no motion in the affected limb.
- 90% good recovery.
- Remember: rehab. Is important. --> it is the role play in management – **MCQ**
- Role of surgery after 3 months of life: explore & repair.
- **Fracture of clavicle does not cause Erb,s palsy.**

◆ Carpal Tunnel Syndrome:

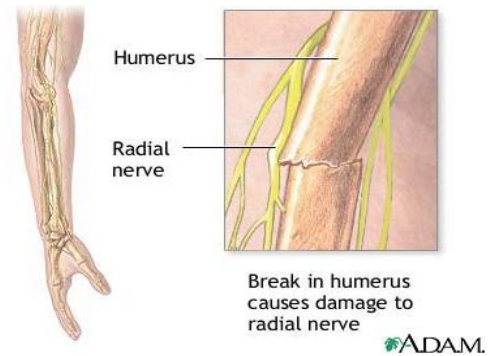
- Median N. entrapment due to thickening of flexor retinaculum.
- **Presentation:**
 - Pain, numbness, worse at night & wakes pt. from sleep.
 - Weakness + burning sensation: ↑with bending the wrist forward.
 - It affects:
 - lateral 3½ fingers
 - Thenar area is wasting.
- Female > male: ↑ with pregnancy & hypothyroidism → no explanation.
- ↑in manual workers.
- **Diagnosis:**
 - Clinical.
 - Needs NCS to confirm the diagnosis.
- **Rx:**
 - Conservative (not helpful).
 - No role of medical Rx.
 - Surgical (main procedure for this condition) just open the flexor retinaculum.
 - Immediate recovery post-operatively.

◆ Radial nerve injury: (Wrist drop)

- The common cause: humeral shaft fracture at the junction between middle & lower third.

NB : the injury occur at the time of the trauma (NOT trapped)

NB : the injury usually Axontemesis مهمه



- Presentation:**
 - Wrist drop (cannot extend).
 - Loss of sensation in snuff box area (numbness).
- Rarely disturbed anatomically مهمه.
- Rx:**
 - Conservative (dynamic splint).
 - Do NCS, if no improvement within 3 months → surgical intervention (1st fix the fracture then connect the nerve).

N.B: dynamic splint= splint with joint movement **but** static splint= splint with no joint movement.



◆ Ulnar N. injury: (Has bad prognosis)

- Associated with elbow injury + tight compartment.
- Usually in children with supracondylar fracture.
- Presentation:**
 - Numbness in medial 1½ fingers.
 - Hypothener muscle wasting.
 - In late stage: CLAW hand (extension of MCP (metacarpophalanges) +flexion of IPJ (interphalangeal joints)) due to loss of lumbrical&interosseous action.
- Rx:** as in radial nerve.

◆ Sciatic nerve injury: (no loss of hip flexion + Knee Extension)

- With trauma or posterior dislocation of the hip + distal injury to its branches (posterior Tibial + common peroneal).
- Presentation:**
 - Loss of sensation & motion below the knee level. (Risk of Ulcer)
 - Loss of all activities (flexion, extension ...) below the knee level.
 - Extension of the knee is not lost.
- Long period of recovery.

◆ Peroneal nerve injury:

- Presentation:**
 - foot drop → no heel strike= inability to extend the foot.
 - Loss of sensation.
 - Leg weakness.
- Causes:**
 - Direct injury **is rare**.
 - Tight splint without proper cotton padding.
 - Skeletal traction.
- Rx:** -skeletal traction.
 - Dynamic splint.

◆ Quiz:

- Axon degeneration (**Nuoparxia**) occurs from mild compression injury. X
- The prognosis for Neuropraxia is poor. X
- Axonotmesis is generally caused from separation of the cell body from the neuron. X
- Wallerian Degeneration typically does not occur in Neuropraxic injury. ✓
- Surgical reconstruction is necessary in Neurotmesis. ✓
- Wallerian Degeneration does not occur in Neurotmesis. X – **MCQ**
- A ligamentous structure can cause Neuropraxia. ✓