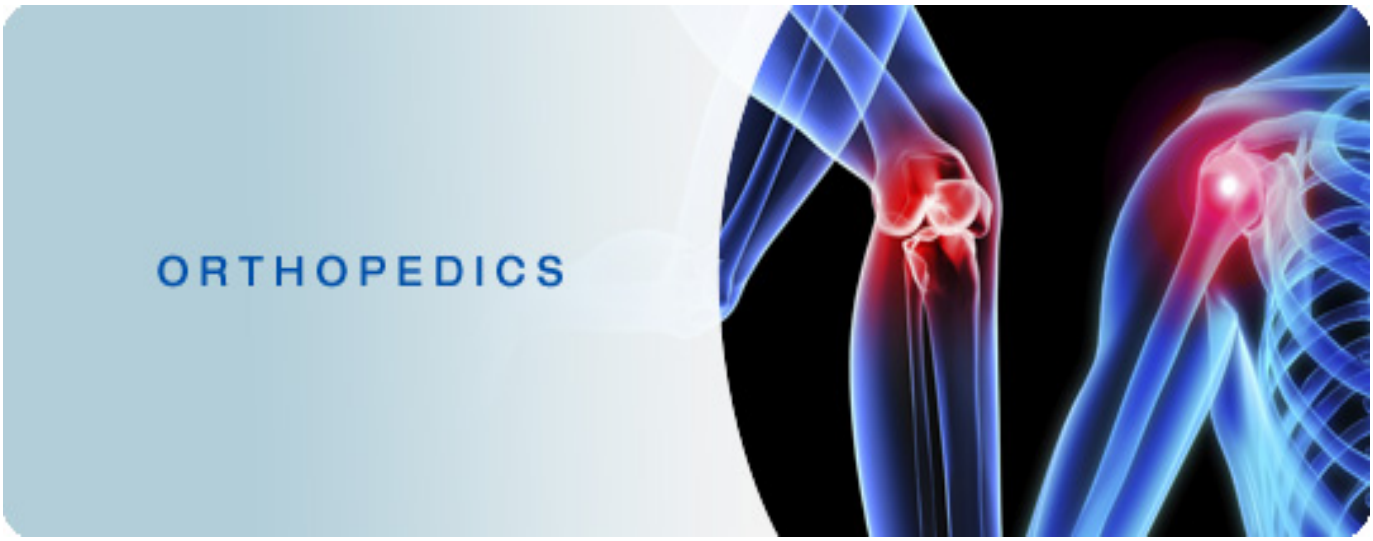
*Isn't it funny how someone can say "I believe in Allah " but still follow the Satan who by the way also, " believes " in Allah…*

# 430 ORTHOPEDICS TEAM




## Lecture: Peripheral Nerve Injury.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| | | |
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### Team Leader:

Ayedah Al-Ruhaimi


-The slides were provided by the doctor.

-429 team group A-1.

-Important notes in **Red**.

-Copied slides in **Black**.

-Doctor's notes in **green**.

**OUTLINE**

- DEFINITION.
- TYPES OF NERVE INJURIES.
- FATE (pathophysiology) AND REHABILITATION.
- ETIOLOGY.
- PRESENTATION.
- DIAGNOSIS.
- CLINICAL EXAMPLES:
  - ✓ (ERB' S,CARPAL TUNNEL,RADIAL,ULNAR,SCIATIC AND PERONEAL)

## What is peripheral nerve?

It is a nerve which connects between CNS & 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.

## WHAT ARE THE FEATURES OF A PERIPHERAL NERVE?

- RELATES PERIPHERY AND SPINAL CORD.
- MIXED (SENSORY AND MOTOR).
- REGENERATES.

## Definition of nerve injury:

It is Partial OR Complete interruption of normal physiology of the nerves (nerve conduction is affected).

## Types:

1. **Neuropraxia:**

E.g.: when you set for long time you feel numbness.

- Commonest & easiest in recovery
- Reversible 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.

e.g.:

- Saturday night palsy:alcoholics→radial nerve palsy
- Honeymooner's syndrome.
- Wheel chair bound persons.

**2. Axontemesis:**

- Complete absence of sensory & motor activity of that nerve
- Associated with accident & trauma:
  - ✓ Fracture of humeral shaft →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).
- 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.

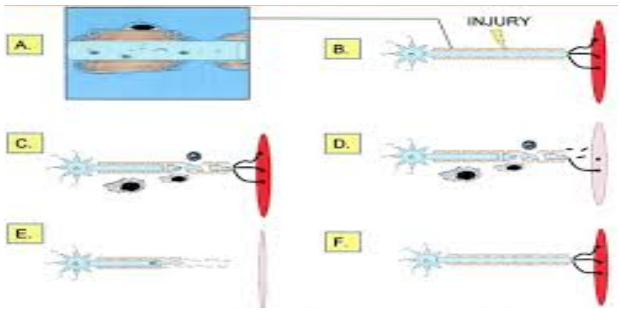
**3. Neurotemesis:**

- 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.

## ❖ Wallerian degeneration:

- 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 (axontemesis) → no need to repair.
- If the anatomy is disturbed (neurotemesis) → 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).




## Rehabilitation:

- Pain control by simple analgesia.
- Nerve& muscle stimulation.
- Dynamic splints to avoid stiffness. (We have to prevent pressure sores).*NECROSIS STARTS AFTER 20 MINS
- Nearby joints range of motion by doing passive movement to prevent muscle stiffness.
- It takes months-years (long time) to recover.

Remember:

- 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) because it damages everything.USUALLY IRREVERSABLE

■ 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…..).

## 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.IT IS VERY IMPORTANT TO COMPARE THE PROGRESS FROM ONE VISIT TO ANOTHER AND TO DECIDE WHAT TO DO NEXT
- 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.
- Upper limb in extension + internal rotation ← waiter phenomena.

- Mother notices no motion in the affected limb.
- 90% good recovery.
- Remember: rehab. Is important.
- Role of surgery after 3 months of life: explore & repair.ASSESSING BY NCS
- 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 3⅕ fingers
- Thenar area is wasting.
- Female > male: ↑ with pregnancy & hypothyroidism → no explanation.
- ↑in manual workers.

**Diagnosis:**

- Clinical.
- Needs NCS to confirm the diagnisis.

**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:

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

**Presentation:**

- Wrist drop (cannot extend).
- Loss of sensation in snuff box area (numbness).
- Rarely disturbed anatomically.

**Rx:**

- Conservative (dynamic splint).
- Do NCS, if no improvement within 3 months → surgical intervention.
- N.B: dynamic splint= splint with joint movement but static splint= splint with no joint movement.

✓ **Ulnar N. injury:**

Associated with elbow injury + tight compartment.

Usually in children with supracondylar fracture.

**Presentation:**

- Numbness in medial 1⅕ fingers.
- Hypothener muscle wasting.
- In late stage: CLAW hand (extension of MCP +flexion of IPJ) 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.
- 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:**

1) Axon degeneration occurs from mild compression injury. X
2) The prognosis for Neuropraxia is poor. X
3) Axonotmesis is generally caused from separation of the cell body from the neuron. XWallerian Degeneration typically does not occur in Neuropraxic injury. √
4) Surgical reconstruction is necessary in Neurotmesis. √
5) Wallerian Degeneration does not occur in Neurotmesis. X
6) A ligamentous structure can cause Neuropraxia. √