PERIPHERAL NEUROPATHY

- **Peripheral neuropathy** is the term for damage to nerves of the peripheral nervous system.
- Numerous inherited and acquired pathological processes may affect peripheral nerves, targeting either the nerve roots (radiculopathy), the nerve plexuses (plexopathy) and/or the individual nerves themselves (neuropathy).

❖ CLASSIFICATIONS:

A) Anatomical classification:

1- focal (affecting a single nerve = mononeuropathy).
2- multifocal (several nerves = mononeuropathy multiplex).
3- generalized (polyneuropathy).

B) Pathological classification:

1- Axonal degeneration

- **Axonal neuropathies (Dying back).**

- Diabetic neuropathy is of this type.

- Dying back phenomenon = start distally and gradually goes proximally and gets more severe.

- **Metabolic, Toxic, Vasculitic.**

2- Segmental demyelination

- **Demyelinating neuropathies** (Either total block or slowed conduction).

- **Immune-inflammatory** (guillain-Barre syndrome "sensory + motor function fail"), Toxic, Genetic.

C) Etiological classification:

1- Acquired (VITAMIN D):

Vascuilities: SLE,PAN,…

Infection: HIV,CMV,EBV,leprosy.

Truma.

Autimmune.

Metabolic:DM,vit B12 defciency,hypothyrodism,renal hepatic,porphyria.

Infiltrative: sarcidosis, amylodosis.

Neoplasm: paraneoplastic.

Demyelinating: GBS(Guillian barre syndrome or Drugs.

2- Hereditary.

❖ SIGNS AND SYMPTOMS

1- motor symptoms

Weakness: Lower motor-neuron type (Anterior horn cell + axons):

- Distal distribution (except radiculopathy).
- Hypotonia & hyporeflexia.
- Fasiculations.
- Wasting & deformity(chronic) hallmark of chronicity.

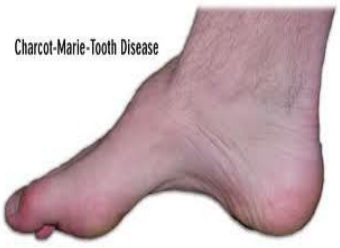
Examples :

1- Carpel Tunnel Syndrome:

- Most common mononeuropathy.
- Affects median nerve.
- Affects females more than males.
- ***Precipitated by***: Pregnancy, Hypothyroidism and Diabetes.

2- Charcot-Marie-Tooth :

- Common form of inherited neuropathy in an autosomal dominant fashion.
- Affect the lower limbs mostly (high arch).



2- Sensory symptoms

Sensory Changes & Pain:

- Hyposthesia (↓ sensation,numbness).
- Parastheasia (abnormal sensation).
- Dysthesia (painful sensation).
- Allodynia (painless sensory stimuli will cause pain e.g. touching)

Distribution of sensory changes:

- gloves & stocking (e.g. DM).
- root or nerve distribution.

3- Autonomic symptoms (poor prognosis)

- Meiosis.
- Anhidrosis. (very imp. sign)
- Postural Hypotension. (Decrease pressure up to 20 mmHg upon standing)
- Bladder Atonia ; overflow incontinence.
- Gut Atonia; diarrhea. (because of stasis of bacteria)
- Impotence. (may be the first diabetic neuropathic complication)

❖ Clinical patterns:

- Mononeuropathy: (one nerve involved) e.g. carpal tunnel syndrome.
- Poly-neuropathy *: (commonest , symmetrical involvement , all nerves involved but usually somatic) e.g. DM.
- Radiculopathy: (one root involved) e.g. sciatica.
- Poly-radiuclopathy: (roots are affected) e.g. Guillan-barre Syndrome.
- Mononeuritis Multiplex:

- Involving multiple mononeuropathies (e.g. Median + ulnar + common peroneal)
- Commonest cause: Vasculitis (like polyarthritis nodosa) , SLE , RA.
- Not very common in diabetic patients

- Plexopathy:

- Brachial plexus.
- Lumbar plexus.

- Sacral plexus(mainly as obstetrics manifestations).

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*Classification of Polyneuropathy

1. Clinical patterns	2. Etiology
▪ Features ▪ Onset	▪ Hereditary (Charcot-Marie-Tooth) ▪ Metabolic (Diabetes mellitus) ▪ Nutritional (Vit. B12 Deficiency) ▪ Toxic (drugs or medications like isoniazide causes vit. B6 deficiency) ▪ Vasculitic ▪ Immune (Guillain-Barre syndrome) ▪ Infective (leprosy, HIV) ▪ Malignant : either direct compression or paraneoplastic ▪ Traumatic/compressive
3. Pathology	
▪ Axonal degeneration ▪ Segmental demyelination ▪ Small fiber	

❖ Presentations

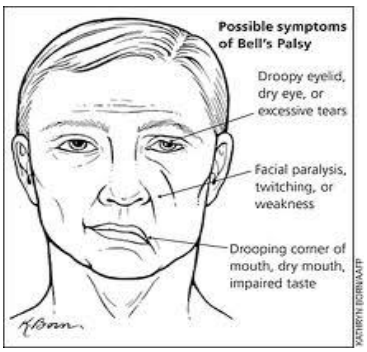
1- Cranial mononeuropathy:

* Sixth cranial (abducent) nerve palsy

might be because of ↑ intracranial pressure (False localization sign)

* Bell's palsy (facial nerve)

- **Common** mono-cranial neuropathy , idiopathic.
- It could be due to an inflammatory process
- Affect any age
- Wasting of the facial nerve
- Could be mild or moderate (80% will resolve spontaneously)
- If it's severe we sometimes give Steroids and Acyclovir



2- Wasting of first interosseous muscle:

- Ulnar neuropathy
- T1 nerve involvement, to make sure:

- Thenar muscle wasting in T1 involvement not in ulnar.
- Sensory loss in T1 is in the medial side of the forearm, while it is in the little finger and to half of the ring finger on both the palm and back side in ulnar involvement

3- **ERB's palsy** (C5-C6)

- Due to injury of brachial plexus at birth.
- When there is involvement of proximal muscle wasting this indicates radiculopathy.

❖ Investigations

- **Biochemical** (Blood sugar, U&E, B12).
- **Nerve Conduction Study** (tells us if it is neuropathy, and whether it's axonal or demyelinating) / **EMG**.
- **CSF** (Helps in radiculpathy like Guillain-Barre syndrome, you will find CSF protein high).
- **Protein electropheresis, Auto antibodies** (anti-GM1, MAG Abs).
- **Biopsy**
  - No myelin around axons.
  - You can see inflammatory process (like in Leprosy).
  - Axo-axonal change.
  - Onion bulb.
- **Genetic** (CMT1 duplication in Charcot-Marie-Tooth)

❖ Approach to diagnosis

A process of "Pattern Recognition":

- Typical Clinical pictures.
- Pathological.
- Mode of Onset (most IMP.) : (Acute - Subacute – Chronic)

1- Acute Onset

- **GBS** **
- **Traumatic**

- **Vasculitis**
- **Herpes Zoster**
- Diphtheria
- Porphyria
- Toxic (Thallium)

** Guillan-Barre Syndrome "GBS"

- Relatively **common**.
- Acute inflammatory (Autoimmune) polyradiculo-neuropathy.
- Primarily affects motor nerves.
- 75% of cases are preceded by an infection (URTI, diarrhea) 2-3 weeks earlier.

GBS-Clinical features:

Abrupt onset with rapidly ascending weakness/paralysis of all four extremities;

- frequently progresses to involve respiratory, facial, and bulbar muscles.
- Usually symmetric (but not always).
- Weakness may be mild or severe.
- Weakness usually progresses from distal to central muscles.
- If generalized paralysis is present, it can lead to respiratory arrest.
- Autonomic features (e.g., arrhythmias, tachycardia, postural hypotension) are dangerous complications.

Diagnosis made by a combination of:

1- Clinical findings.
2- CSF analysis: elevated protein, but normal cell count.
3- Electrodiagnostic studies: decreased motor nerve conduction velocity.

Management of GBS: Medical emergency

- Carefully monitor pulmonary function. Mechanical ventilation may be necessary.

- Administer IV immunoglobulin if the patient has significant weakness.
- If progression continues, **plasmapheresis** may reduce severity of disease.
- **Do not give steroids**. They are usually harmful and never helpful in Guillain-Barré syndrome.
- Physiotherapy .

In Guillain-Barré syndrome, rapid progression to respiratory failure can occur within hours. Therefore, a timely and accurate diagnosis is critical. If you suspect Guillain-Barré syndrome, immediately admit the patient to the hospital for monitoring.

2- Sub-acute Onset

Symmetric .. Sensory-motor

- **Toxic**
- **Nutritional (Alcohol)**
- **Paraneoplastic (Sensory neuronopathy)**

Asymmetric...Motor-sensory (mono. mult.)

- **Vasculitis**
- **Diabetic amyotrophy**

3- Chronic Onset ***

Hereditary

- Hereditary Motor and Sensory Neuropathy (Charcot-Marie-Tooth)
- Neuropathies associated with hereditary neurological or non-neurological diseases

Acquired

- Diabetic distal sensory neuropathy
- Leprosy…worldwide!
- Autoimmune neuropathies
- Para-Neoplastic

- Others **(uremia….)**

*** Diabetic Neuropathy (DN)

- **Classification Of DN**
  - Polyneuropathy .. sensory / Distal sensory neuropathy (80%)
  - Focal & multifocal …. Motor
- **DN Pathogenes is Multifactorial**
  - Metabolic
  - Vascular
  - Axonal transport & protein synthesis
  - Immune
- **Treatment Of DN**
  - Cornerstone → Tight control
  - Insulin Injection Therapy, 64% risk reduction of developing DN over 5 yrs.
  - Patient education.
  - Analgesia.