PERIPHERAL NERVE DAMAGE

Upper limb

By: Maysaa al-khalaileh
ULNAR NERVE
*Is one of the major terminal branches of brachial plexus (C8,T1)

*Course and branches of ulnar nerve:

*Function of ulnar nerve
It is a deformity with hyperextension of the MCP joints and flexion of the IP joints of the fingers (loss of flexion at MCP and extension at IP joints)
Levels of the lesion

High:
above the level of elbow, entire nerve function is lost

Low:
1) Below the elbow at the junction of the middle and lower third of forearm:
*Spared: - function of FDP and FUC
*Lost:
1) Motor: HTM, It's, Lum, PB
2) Sensory: dorsal aspect of hand and one and half fingers
2) Proximal to Guyon`s canal:

* Spared: FDP, FCU and dorsal sensation
* Lost: same as above + loss of volar sensation
3) Distal to Guyon`s canal:

* Spared: FDP, FCU, HTM, PB, dorsal and volar sensation

* Lost: interosseous and lumbricals
Guyon’s Canal Syndrome

- Overuse of the wrist, especially flexion and ulnar deviation
- Placing constant pressure on the palm
- Symptoms are pain, numbness, and tingling in the anterior side of the palm, last finger, and ½ of the ring finger
Froment's sign.

When the patient attempts to pinch with the thumb and index finger, the long flexor of the thumb is used to substitute for the thumb adductor, resulting in flexion of the thumb at the interphalangeal joint.

This characteristic appearance is present in this patient's left hand, caused by an ulnar nerve lesion at the elbow.
Card test
Inability to hold a card or paper in between fingers due to loss of adduction by the palmar interossei

Pen test
Unable to touch the pen due to the loss of action of abductor pollicis brevis
Treatment of ulnar nerve injury

1) prevention
2) nonsurgical treatment
3) surgical treatment
1) Avoid frequent use of the arm with the elbow bent.

2) If you use a computer frequently, make sure that your chair is not too low. Do not rest the elbow on the armrest.

3) Avoid putting pressure on the inside of the arm (do not drive with the arm resting on the open window).

4) Keep the elbow straight at night when you are sleeping (done by wrapping a towel around the straight elbow, wearing an elbow pad backwards, or using a special brace).
Figure 5: Loosely wrapping a towel around your arm with tape can help you to remember not to bend your elbow during the night.
1) Anti-inflammatory drugs, ibuprofen, (to reduce swelling around the nerve).

2) Steroid (cortisone) injections around the ulnar nerve are not generally used because there is a risk of damage to the nerve.

3) Exercises (prevents arm and wrist from stiffness).
Surgical treatment

**If the nerve is very compressed; or if there is muscle wasting**

Surgery:
1) Around the elbow and the wrist or both
More commonly, the nerve is moved from its place behind the elbow to a new place in front of the elbow. This is called an anterior transposition of the ulnar nerve.

The nerve can be moved:
- 1) under the skin and fat (subcutaneous transposition),
- 2) within the muscle (intermuscular transposition),
- 3) under the muscle (submuscular transposition).
*The higher the lesion of the median and ulnar nerve injury, the less prominent is the deformity and vice versa, because in higher lesions the long finger flexors are paralysed.

*The loss of finger flexion makes the deformity look less obvious.
Radial nerve
(in the radial groove)

Deep branch of the radial nerve
Causes:

General causes:
- metabolic diseases, collagen diseases,
- malignancies, endogenous or exogenous toxins,
- chemical or mechanical trauma, etc.

Local causes:
1) In the axilla:
- Aneurysm of the axillary vessels / Crutch palsy
2) In the shoulder:
- Proximal humeral / Shoulder dislocation
3) In the spiral groove (5`s)
Shaft
Saturday night
Syringe palsy
`S` march`s tourniquet palsy
4) Between spiral groove and lateral epicondyle:
shaft humerus / Supracondylar humerus / Lateral epicondyle of humerus / Penetrating and gunshot injuries /
5) At the elbow:
Posterior dislocation of elbow / head of radius

6) Causes in the forearm:
both bones of forearm / Penetrating and gunshot injuries
Levels of lesion

High
above spiral groove---- total palsy

Low :

Type 1 (Between the spiral groove and the lateral epicondyle ) : -
Spared : - elbow extensor
Lost : -
1)Motor : wrist extensor , thumb extensor , finger extensor
2) Sensory : dorsum of first web space
Type 2 (below the elbow)

Spared:
Elbow extensor / Wrist extensor

Lost:
Motor: thumb extensor, finger extensor
Sensory: First web space
Clinical features

Depend upon the site of the injury:

*Lesions in or above the axilla:

Paralysis and wasting of all the muscles innervated. Clinically, this is manifest as:

1) weakness of forearm extension and flexion - triceps and brachioradialis
2) wrist drop and finger drop - paralysis of the extensors of the wrist and digits
3) weakness of the long thumb abductor and extensor muscles
4) Sensory loss on the dorsum of hand and forearm appropriate to the cutaneous distribution
Lesions around the humerus spare brachioradialis and extensor carpi radialis longus.

Posterior interosseous palsy (due to a dislocation or fracture of the elbow).

Weakness of finger extension, and of thumb extension and abduction.

Little or no wrist drop, and usually, no sensory loss.
Wrist Drop (Radial Nerve Injury)
Muscles supplied by the radial nerve and **how to test each:**

C7,8: triceps - ask patient to extend elbow against resistance.
C5,6: brachioradialis - ask patient to flex elbow with forearm half way between pronation and supination.
C6,7: extensor carpi radialis longus - ask patient to extend wrist to radial side with fingers extended.
C5,6: supinator - with arm by side, ask patient to resist hand pronation.
C7,8: extensor digitorum - ask patient to keep fingers extended at MCP joint.
C7,8: extensor carpi ulnaris - ask patient to extend wrist to ulnar side. C7,8: abductor pollicis longus - ask patient to abduct thumb at 90° to palm.
C7,8: extensor pollicis brevis - ask patient to extend thumb at MCP joint.
C7,8: extensor pollicis longus - ask patient to resist thumb flexion at IP joint.
- Mixed nerve (contain motor & sensory fibers).
- Root value: C 5,6,7,8 & T1
- Runs in the median plane of the forearm, so it's called median nerve

Median nerve is formed by lateral root from lateral cord and medial root from medial cord of brachial plexus
- Median nerve runs lateral side of axillary artery

In arm
- median nerve continues to run on the lateral side of brachial artery till the middle of arm, where it crosses infront of the artery and passes anterrior to the elbow joint into forearm
In forearm
- Enters to the forearm b/w two heads of pronator teres

- Muscular braches supply muscles of thenar eminence (abductor pollicis brevis, opponens pollicis and flexor pollicis brevis)
Finally divides into 4 to 5 palmar digital branches supplying lateral three and half digit and their nail beds.

- Also, motor branches are given to the first and second lumbrical muscles.
INJURY TO MEDIAN NERVE

- Median nerve is most commonly injured near the wrist or high up in the fore arm

- **Low median nerve palsy**
  - Injury in the distal third of the forearm
  - Cuts infront of wrist or by carpal dislocation
  - There will be sparing of the forearm muscles, but the muscles of the hand will be paralysed
  - **Thenar eminence is wasted and thumb abduction and opposition are weak**
  - Sensation is lost over the radial three and half digits and trophic changes may seen
High median nerve palsy

- Injury proximal to the elbow
- Generally due to forearm fractures or elbow dislocation
- Stabs and gunshot wounds may damage the nerve at any level
- This will cause paralysis of all the muscles supplied by the median nerve in the forearm and hand
Three separate syndromes are recognised

1. Carpal tunnel syndrome
2. Pronator syndrome
3. Anterior interosseous syndrome

**Pronator syndrome**

*Pronator teres* syndrome is a compression neuropathy of the median nerve at the *elbow*.

**Anterior interosseous syndrome**

A medical condition in which damage to the anterior interosseous nerve (AIN), a motor branch of the median nerve, causes pain in the forearm and a characteristic weakness of the pincer movement of the thumb and index finger.
Carpal tunnel syndrome

- It is compressive neuropathy of median nerve as it passes through the carpal tunnel of the wrist joint.

- Causes
  - Ideopathic - Most common
  - Inflammatory - Rheumatoid Arthritis - Wrist osteoarthritis
  - Post traumatic - Bone thickening
  - Endocrine – Myxoedema

- High prevalence rates have been reported in persons who perform certain repetitive wrist motions (frequent computer users)
Symptoms and Signs include

- Pain of the hand and wrist associated with tingling and numbness, classically distributed along the median nerve (the palmar side of the thumb, the index and middle fingers, and the radial half of the ring finger).

- Typically, the patient wakes at night with burning or aching pain and shakes the hand to obtain relief and restore sensation.

- Thenar atrophy and weakness of thumb opposition and abduction may develop late.
Physical examination for CTS

- Phalen’s Maneuver
  or reverse prayer sign

Tinel’s sign
Digital nerves
Nerves supplying the hand

Palmar aspect: 3 and ½ fingers supplied by median nerve, 1 and ½ fingers supplied by ulnar nerve

Dorsal aspect: more than 50% supplied by radial nerve, the rest by ulnar and some by median nerve

Palmar digital nerves may refer to:

- Common palmar digital nerves of median nerve
- Common palmar digital nerves of ulnar nerve
- Proper palmar digital nerves of median nerve
- Proper palmar digital nerves of ulnar nerve

Dorsal digital nerves may refer to:

Dorsal digital nerves of radial nerve
Dorsal digital nerves of ulnar nerve
- Digital nerve gets injured by 2 way
- **Direct damage to one of the main nerve (radial, ulnar, median)**
- Or by direct damage to the hand

The patient complaint from pain, stiffness, loss of functions or contracture

**The main nerve responsible for motor supplying for the hand??**

Median nerve
Major nerve for hand sensory and motor

SPECIAL TEST FOR EACH NERVE ON HAND

A: MEDAIN NERVE
B: ULNAR NERVE
C: RADIAL NERVE
Thank you