🩹 NERVE INJURIES OF UPPER LIMB

🔹 BRACHIAL PLEXUS OVERVIEW

👉 Roots → Trunks → Divisions → Cords → Branches

Roots (C5–T1)

↓

Trunks (Upper, Middle, Lower)

↓

Divisions (Anterior/Posterior)

↓

Cords (Lateral, Medial, Posterior)

↓

Terminal Branches

🔹 TERMINAL NERVES

- Musculocutaneous (C5–C7)
- Axillary (C5–C6)
- Radial (C5–T1)
- Median (C6–T1)
- Ulnar (C8–T1)

🟢 BRACHIAL PLEXUS INJURIES

🔴 1. UPPER TRUNK LESION (C5–C6)

👉 Erb–Duchenne Palsy

CAUSE

- Excessive separation of head & shoulder
- Birth injury / trauma

NERVES INVOLVED

- Suprascapular
- Axillary
- Musculocutaneous

MUSCLES PARALYZED

- Deltoid
- Supraspinatus
- Infraspinatus

- Biceps brachii
- Brachialis
- Teres minor

🔹 DEFORMITY

👉 "Waiter's tip position"

- Arm adducted
- Medially rotated
- Elbow extended
- Forearm pronated

🔹 SENSORY LOSS

- Lateral side of arm

🔴 2. LOWER TRUNK LESION (C8-T1)

👉 Klumpke Palsy

🔹 CAUSE

- Excessive abduction of arm
- Cervical rib / tumor

🔹 MUSCLES AFFECTED

- Intrinsic hand muscles

🔹 DEFORMITY

👉 Claw hand

- MCP hyperextension
- IP flexion

🔹 SENSORY LOSS

- Medial arm, forearm, hand
- Medial 2 fingers

🟢 INDIVIDUAL NERVE INJURIES

🔴 3. LONG THORACIC NERVE (C5-C7)

🔹 MUSCLE

- Serratus anterior

🔹 EFFECT

👉 Winged scapula

- Medial border protrudes
- Difficulty raising arm

🔴 4. AXILLARY NERVE (C5–C6)

🔹 CAUSE

- Surgical neck fracture
- Shoulder dislocation
- Crutch injury

🔹 MUSCLES

- Deltoid
- Teres minor

🔹 DEFICITS

- Loss of abduction (15–90°)
- Loss of lateral rotation

🔹 SENSORY LOSS

- Over lower half of deltoid

🔴 5. RADIAL NERVE (C5–T1)

🔹 CAUSE

- Midshaft humerus fracture
- Compression ("Saturday night palsy")

🔹 MUSCLES

- Extensors of wrist & fingers

🔹 DEFICIT

👉 Wrist drop

- Inability to extend wrist
- Inability to extend MCP joints

🔹 SENSORY LOSS

- Posterior arm, forearm
- Dorsum of hand

🔴 6. MEDIAN NERVE

🔹 COMMON INJURIES

- Supracondylar fracture
- Carpal tunnel syndrome

🔹 DEFICITS

👉 Loss of thumb opposition

👉 Ape thumb deformity

🔹 HAND SIGN

👉 Hand of Benediction (on flexion)

🔹 SENSORY LOSS

- Lateral 3½ fingers

🔴 7. ULNAR NERVE

🔹 CAUSE

- Medial epicondyle fracture
- Guyon's canal compression

🔹 MUSCLES AFFECTED

- Interossei
- Medial lumbricals
- Adductor pollicis

🔹 DEFICIT

👉 Claw hand (ulnar claw)

🔹 SIGNS

- Loss of finger abduction/adduction
- Positive Froment's sign

🔹 SENSORY LOSS

- Medial 1½ fingers

🔥 HIGH-YIELD SUMMARY TABLE

Nerve	Injury	Deformity
Upper trunk	C5–C6	Waiter's tip
Lower trunk	C8–T1	Claw hand
Long thoracic	Serratus anterior	Winged scapula
Axillary	Deltoid	Loss of abduction
Radial	Extensors	Wrist drop

Median	Thenar	Ape thumb
Ulnar	Interossei	Claw hand

⭐ MUST REMEMBER:

✔ Erb = Waiter's tip

✔ Klumpke = Claw hand

✔ Radial = Wrist drop

✔ Median = Ape thumb

✔ Ulnar = Claw hand

✔ Long thoracic = Winged scapula

💡 QUICK RECALL:

- C5–C6 → Erb → Waiter tip

- C8–T1 → Klumpke → Claw hand
- Radial → Wrist drop
- Median → Ape thumb
- Ulnar → Claw hand

🔴 8. RADIAL NERVE

🔹 Origin

- From posterior cord of brachial plexus
- Root value: C5–T1

🔹 Functions

📌 Motor:

- Supplies extensor muscles of arm & forearm

📌 Sensory:

- Posterior cutaneous nerve of arm
- Posterior cutaneous nerve of forearm
- Lower lateral cutaneous nerve of arm
- Dorsum of hand (lateral 3½ fingers)

🔹 Branches

📌 In Arm:

- To Triceps
- To Anconeus

📌 In Forearm:

🔸 Superficial branch (sensory)

- Supplies skin of dorsum of hand

🔸 Deep branch (motor → Posterior interosseous nerve)

Supplies:

- Brachioradialis
- Extensor carpi radialis longus & brevis
- Supinator
- Extensor digitorum
- Extensor digiti minimi
- Extensor carpi ulnaris
- Abductor pollicis longus
- Extensor pollicis longus & brevis
- Extensor indicis

🔴 INJURIES OF RADIAL NERVE

🔹 1. Injury in Axilla

📌 Causes:

- Crutch pressure
- Improper sleeping position ("Saturday night palsy")
- Fracture of proximal humerus

📌 Motor Loss:

- Paralysis of:
  - Triceps
  - Anconeus
  - All extensors

👉 Result: Wrist drop

📌 Sensory Loss:

- Posterior arm
- Posterior forearm
- Dorsum of hand
- Lateral 3½ fingers

🔹 2. Injury in Spiral Groove

📌 Causes:

- Fracture shaft of humerus
- Compression on arm
- Prolonged tourniquet

📌 Key Point:

- Triceps mostly spared

📌 Motor:

👉 Wrist drop

📌 Sensory:

- Dorsum of hand
- Lateral 3½ fingers

🔹 3. Injury to Deep Branch (Posterior Interosseous Nerve)

📌 Causes:

- Fracture of proximal radius

📌 Motor:

- Extensors of fingers affected

📌 Key Point:

❌ No wrist drop (ECRL still working)

📌 Sensory:

❌ No sensory loss

🔹 4. Injury to Superficial Branch

📌 Causes:

- Stab wounds

📌 Motor:

❌ None

📌 Sensory:

- Small area on dorsum of hand

🔴 9. MUSCULOCUTANEOUS NERVE

- Root Value
  - C5-C7

- Course
  - Pierces coracobrachialis
  - Runs between:
    - Biceps
    - Brachialis

- Motor Supply
  - Coracobrachialis
  - Biceps brachii
  - Brachialis

🔹 Sensory Supply

- Lateral side of forearm

  → via lateral cutaneous nerve of forearm

🔹 Injury

📌 Rare (protected nerve)

📌 Effects:

- Weak flexion of elbow
- Weak supination
- Sensory loss → lateral forearm

🔴 10. MEDIAN NERVE

🔹 Root Value

- C5–T1

🔹 Motor Supply

📌 Forearm:

- Pronator teres
- Flexor carpi radialis
- Palmaris longus
- Flexor digitorum superficialis
- Flexor pollicis longus
- FDP (lateral half)
- Pronator quadratus

📌 Hand:

- Thenar muscles
- Lateral 2 lumbricals

🔹 Sensory Supply

- Lateral palm
- Lateral 3½ fingers
- Dorsal distal phalanges

🔴 INJURIES OF MEDIAN NERVE

🔹 1. Injury at Elbow

📌 Causes:

- Supracondylar fracture

📌 Motor Loss:

- Loss of pronation
- Loss of wrist flexion (partial)
- Loss of thumb flexion
- Thenar muscle wasting

📌 Deformity:

👉 Ape hand

- Thumb adducted & laterally rotated

👉 Pointing index sign

- When making fist

📌 Sensory Loss:

- Lateral palm
- Lateral 3½ fingers

🔹 2. Injury at Wrist

📌 Causes:

- Cut injury near flexor retinaculum

📌 Motor:

- Loss of thumb opposition
- Thenar flattening
- Lumbricals (1st & 2nd) affected

📌 Deformity:

👉 Ape hand

📌 Sensory:

- Same as above

🔹 3. Carpal Tunnel Syndrome ⭐

📌 Cause:

- Compression of median nerve under flexor retinaculum

📌 Symptoms:

- Pain
- Tingling
- Numbness (lateral 3½ fingers)
- Worse at night

📌 Signs:

- Thenar wasting
- Loss of opposition

🔥 QUICK REVISION TABLE

🔹 Nerve Lesions

Nerve	Deformity

Radial	Wrist drop
Median	Ape hand
Ulnar	Claw hand

🔹 Key Points

- Radial → Extensors
- Median → LOAF muscles
- Ulnar → All intrinsic hand muscles

🔴 11. ULNAR NERVE

🔹 Root Value

- C8–T1

- Motor Supply
  - Flexor carpi ulnaris
  - FDP (medial half)
  - All intrinsic hand muscles except:
    - Thenar muscles
    - Lateral 2 lumbricals

- Sensory Supply
  - Medial 1½ fingers
  - Medial hand (palmar + dorsal)

🔴 ULNAR NERVE INJURY

🔹 Injury at Elbow ⭐

📌 Causes:

- Fracture of medial epicondyle
- Compression behind medial epicondyle ("funny bone")

📌 Motor Loss:

🔸 Forearm:

- Flexor digitorum profundus (medial half) → affected

  👉 Terminal phalanges of ring & little finger cannot flex

- Flexor carpi ulnaris → affected

  👉 Wrist flexion causes abduction (radial deviation)

🔸 Hand:

- Hypothenar muscles → wasting → flattening
- Interossei muscles → paralyzed

  👉 Loss of:

  - Finger abduction
  - Finger adduction
  - Cannot hold paper between fingers
- Lumbricals (medial 2) → paralyzed
- Adductor pollicis → paralyzed

  👉 Loss of thumb adduction

📌 Deformity:

👉 Claw Hand (Partial claw)

- MCP joints → hyperextended
- IP joints → flexed
- More prominent in ring & little fingers

📌 Special Test

👉 Froment's Sign

- Patient holds paper between fingers
- Positive sign:
  - 👉 Thumb flexes (using flexor pollicis longus)
  - 👉 Indicates adductor pollicis paralysis

📌 Sensory Loss:

- Medial 1½ fingers

- Medial side of hand (palmar + dorsal)

🔹 Injury at Wrist

📌 Causes:

- Cut injury
- Compression (e.g., Guyon's canal)

📌 Motor Loss:

- Intrinsic hand muscles affected
- FDP spared

📌 Deformity:

👉 Claw Hand (More prominent)

💡 Reason:

- FDP working → strong flexion of IP joints
- Leads to more obvious clawing

📌 Sensory Loss:

- Medial 1½ fingers (palmar side)
- Dorsal loss limited (posterior cutaneous branch spared)

🟢 COMPARISON

🔹 Elbow vs Wrist Ulnar Injury

Feature	Elbow Injury	Wrist Injury
FDP	Paralyzed	Intact
Clawing	Less	More
Sensory loss	Palm + dorsum	Mostly palm
Severity	More functional loss	More deformity

🟢 CLASSIC HAND DEFORMITIES

Nerve	Deformity
Ulnar nerve	Claw hand

Median nerve	Ape hand / Hand of benediction
Radial nerve	Wrist drop

🔥 QUICK REVISION

- Ulnar nerve → Intrinsic hand muscles
- Elbow injury → Less claw
- Wrist injury → More claw
- Test → Froment's sign (+)
- Loss → Finger abduction/adduction

-> The End <-