

Brachial Plexus

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General Overview

- Formed by **ventral rami of spinal nerves C5–T1**.
 - Supplies **upper limb** (motor + sensory + sympathetic).
 - Lies in **posterior triangle of neck and axilla**.
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Formation (5-3-6-3-5 Rule)

- **Roots (5)** ? C5, C6, C7, C8, T1.
- **Trunks (3)** ? Upper (C5–C6), Middle (C7), Lower (C8–T1).
- **Divisions (6)** ? Each trunk splits into anterior + posterior divisions.
- **Cords (3)** ? Named in relation to axillary artery.
 - Lateral cord (from anterior divisions of upper and middle trunk).
 - Medial cord (from anterior division of lower trunk).
 - Posterior cord (from all posterior divisions).

- **Branches (5 major terminal nerves)** ? Musculocutaneous, Axillary, Radial, Median, Ulnar.

? **Mnemonic:** “*Randy Travis Drinks Cold Beer*” (Roots ? Trunks ? Divisions ? Cords ? Branches).

Dissection of Brachial Plexus

Step 1: Exposure in Neck (Posterior Triangle)

- Reflect sternocleidomastoid.
 - Identify **roots C5–T1** between scalenus anterior and medius.
 - Follow them to form **upper, middle, and lower trunks** above clavicle.
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Step 2: Trunks and Divisions

- Upper trunk ? gives suprascapular and nerve to subclavius.
 - Each trunk splits into anterior and posterior divisions behind clavicle.
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Step 3: Cords in Axilla

- Remove pectoralis major, reflect pectoralis minor.
 - Axillary artery exposed ? cords arranged around it:
 - **Lateral cord** (lateral to artery).
 - **Medial cord** (medial to artery).
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- **Posterior cord** (posterior to artery).
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Step 4: Branches from Cords

- **Lateral cord** ? musculocutaneous nerve, lateral root of median nerve, lateral pectoral nerve.
 - **Medial cord** ? ulnar nerve, medial root of median nerve, medial pectoral nerve, medial cutaneous nerves of arm and forearm.
 - **Posterior cord** ? axillary nerve, radial nerve, upper subscapular, lower subscapular, thoracodorsal nerves.
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Step 5: Terminal Branches

- **Musculocutaneous nerve** ? anterior arm.
- **Axillary nerve** ? deltoid, teres minor, shoulder skin.
- **Radial nerve** ? posterior arm, forearm, hand.
- **Median nerve** ? anterior forearm, hand (lateral 3½ digits).
- **Ulnar nerve** ? medial forearm, hand (medial 1½ digits).

Clinical Anatomy of Brachial Plexus

1. Injuries to Upper Trunk (C5–C6) ? Erb–Duchenne Palsy

- **Causes:**

- Excessive increase in angle between neck and shoulder (birth injury, fall on shoulder).
 - **Nerves affected:** Suprascapular, musculocutaneous, axillary.
 - **Muscles paralyzed:** Deltoid, biceps, brachialis, supraspinatus, infraspinatus.
 - **Clinical features:**
 - Arm hangs by side, medially rotated.
 - Forearm extended and pronated.
 - “**Waiter’s tip deformity**”.
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2. Injuries to Lower Trunk (C8–T1) ? Klumpke’s Palsy

- **Causes:**
 - Sudden upward pull of arm (grabbing support while falling, difficult breech delivery).
 - **Nerves affected:** Ulnar nerve, median nerve (partly).
 - **Muscles paralyzed:** Intrinsic muscles of hand, long flexors of fingers.
 - **Clinical features:**
 - **Claw hand** deformity.
 - Sensory loss along medial forearm and hand.
 - May be associated with **Horner’s syndrome** (sympathetic involvement).
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3. Injury to Posterior Cord

- **Causes:** Trauma, compression (crutch palsy).
 - **Nerves affected:** Axillary and radial.
 - **Clinical features:**
 - Loss of shoulder abduction (deltoid paralysis).
 - Wrist drop (radial nerve palsy).
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4. Isolated Nerve Injuries (Important in Axilla)

- **Long thoracic nerve injury**
 - Cause: during axillary dissection, mastectomy.
 - Clinical: **winged scapula**, inability to abduct arm above 90°.
- **Axillary nerve injury**
 - Cause: fracture of surgical neck of humerus, dislocation of shoulder.
 - Clinical: Loss of deltoid action, inability to abduct arm beyond 15°, loss of sensation over regimental badge area.
- **Radial nerve injury**
 - Cause: compression in axilla ("Saturday night palsy"), midshaft humerus fracture.
 - Clinical: **Wrist drop**, sensory loss over dorsum of hand.

- **Musculocutaneous nerve injury**

- Rare.
- Weak flexion of elbow, loss of lateral forearm sensation.

- **Ulnar nerve injury**

- Clawing of medial two fingers, loss of adduction of thumb, sensory loss on medial hand.

- **Median nerve injury**

- Ape thumb deformity, loss of opposition, sensory loss in lateral 3½ digits.
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5. Thoracic Outlet Syndrome

- Compression of brachial plexus and subclavian vessels between clavicle and 1st rib.
 - Symptoms: pain, numbness, vascular insufficiency in upper limb.
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6. Brachial Plexus Block

- Local anesthesia injected around cords in axilla.
- Produces anesthesia of entire upper limb (used in surgeries).

Mnemonics – Brachial Plexus

1. Order of Brachial Plexus Formation

? “Randy Travis Drinks Cold Beer”

- **Roots** ? C5, C6, C7, C8, T1
 - **Trunks** ? Upper, Middle, Lower
 - **Divisions** ? Anterior + Posterior (6 total)
 - **Cords** ? Lateral, Medial, Posterior
 - **Branches** ? terminal nerves
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2. Branches from Roots

? “Dorsal Scalp”

- **Dorsal scapular nerve** (C5)
 - **Suprascapular nerve** (C5–C6)
 - **Long thoracic nerve** (C5–C7)
 - **Phrenic nerve contribution** (C5)
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3. Branches from Trunks

? “SALT” (from Upper trunk – C5–C6)

- **Suprascapular nerve**
- **A** nerve to
- **L** nerve to

- **T ? Subclavius**
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4. Branches from Cords

- **Lateral cord ? “LML”**

- **L**ateral pectoral nerve
- **M**usculocutaneous nerve
- **L**ateral root of median nerve

- **Medial cord ? “M4U”**

- **M**edial pectoral nerve
- **M**edial cutaneous nerve of arm
- **M**edial cutaneous nerve of forearm
- **M**edial root of median nerve
- **U**lnar nerve

- **Posterior cord ? “STAR”**

- **S**ubscapular nerves (upper & lower)
- **T**horacodorsal nerve
- **A**xillary nerve

- **Radial nerve**
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5. Major Terminal Branches

? **“MARMU”**

- **M**usculocutaneous
 - **A**xillary
 - **R**adial
 - **M**edian
 - **U**lnar
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6. Root Values of Major Nerves

? **“Muscles Are Really Made Useful”**

- **M**usculocutaneous ? C5–C7
 - **A**xillary ? C5–C6
 - **R**adial ? C5–T1
 - **M**edian ? C5–T1
 - **U**lnar ? C8–T1
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7. Erb’s Point (Upper trunk, C5–C6)

? **“POLTS”**

- **Pectoralis major** (clavicular part – weak)
- **Outer rotators** (supraspinatus, infraspinatus, teres minor)
- **Latissimus dorsi** (partially)
- **Teres major**
- **Scapular muscles**

(Remember clinical result ? Waiter's tip deformity)

Clinicoanatomical Problems – Brachial Plexus

1. Erb–Duchenne Palsy (Upper Trunk Injury, C5–C6)

- **Case:** A newborn after difficult delivery cannot abduct or laterally rotate arm; forearm remains extended and pronated.
 - **Q:** What is the deformity called?
? *Waiter's tip deformity.*
 - **Q:** Which nerves are affected?
? Suprascapular, musculocutaneous, axillary.
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2. Klumpke's Palsy (Lower Trunk Injury, C8–T1)

- **Case:** A laborer falls and grasps a branch with hand ? later presents with clawing of fingers.

- **Q:** What deformity is seen?
? *Claw hand*.
 - **Q:** Which additional syndrome may be associated?
? Horner's syndrome (T1 sympathetic involvement).
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3. Saturday Night Palsy

- **Case:** A man sleeps with arm hanging over chair after drinking, wakes up with inability to extend wrist.
 - **Q:** Which nerve is involved?
? Radial nerve (posterior cord).
 - **Q:** What clinical sign is seen?
? *Wrist drop*.
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4. Axillary Nerve Injury

- **Case:** A patient with fracture of surgical neck of humerus cannot abduct arm beyond 15°; deltoid wasting present.
 - **Q:** Which sensory area is affected?
? Skin over deltoid (regimental badge area).
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5. Long Thoracic Nerve Injury

- **Case:** A woman after axillary lymph node clearance surgery has protrusion of medial scapula on wall push test.

- **Q:** What is this called?
? Winging of scapula.
 - **Q:** Which movement is impaired?
? Abduction of arm above 90° (loss of scapular rotation).
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6. Thoracodorsal Nerve Injury

- **Case:** During breast cancer surgery, patient develops difficulty in climbing and rowing.
 - **Q:** Which muscle is paralyzed?
? Latissimus dorsi.
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7. Median Nerve Injury (at wrist – Carpal Tunnel)

- **Case:** A typist has numbness in lateral 3½ digits and difficulty opposing thumb.
 - **Q:** What deformity develops?
? Ape thumb deformity.
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8. Ulnar Nerve Injury

- **Case:** A man sustains injury to medial epicondyle of humerus; little and ring finger show hyperextension at MCP and flexion at IP joints.
 - **Q:** Name the deformity.
? Claw hand (ulnar type).
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9. Musculocutaneous Nerve Injury

- **Case:** Rare trauma leads to weakness of elbow flexion and loss of sensation on lateral forearm.
 - **Q:** Which muscles are paralyzed?
? Biceps brachii, brachialis, coracobrachialis.
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10. Axillary Artery Aneurysm

- **Case:** A patient has pulsatile swelling in axilla with pain and paresthesia in upper limb.
- **Q:** What is the cause?
? Axillary artery aneurysm compressing brachial plexus cords.