

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**.

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.

Step 2: Trunks and Divisions

- Upper trunk ? gives suprascapular and nerve to subclavius.
- Each trunk splits into anterior and posterior divisions behind clavicle.

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).

- **Posterior cord** (posterior to artery).

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.

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**”.

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).

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).

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 $3\frac{1}{2}$ digits.

5. Thoracic Outlet Syndrome

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

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

2. Branches from Roots

? “Dorsal Scalp”

- Dorsal scapular nerve (C5)
- Suprascapular nerve (C5–C6)
- Long thoracic nerve (C5–C7)
- Phrenic nerve contribution (C5)

3. Branches from Trunks

? “SALT” (from Upper trunk – C5–C6)

- Suprascapular nerve
- A nerve to
- L nerve to

- **T ? Subclavius**

4. Branches from Cords

- **Lateral cord ? “LML”**

- **Lateral pectoral nerve**
- **Musculocutaneous nerve**
- **Lateral root of median nerve**

- **Medial cord ? “M4U”**

- **Medial pectoral nerve**
- **Medial cutaneous nerve of arm**
- **Medial cutaneous nerve of forearm**
- **Medial root of median nerve**
- **Ulnar nerve**

- **Posterior cord ? “STAR”**

- **Subscapular nerves (upper & lower)**
- **Thoracodorsal nerve**
- **Axillary nerve**

- Radial nerve

5. Major Terminal Branches

? “**MARMU**”

- Musculocutaneous
- Axillary
- Radial
- Median
- Ulnar

6. Root Values of Major Nerves

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

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

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.

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).

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.*

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).

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).

6. Thoracodorsal Nerve Injury

- **Case:** During breast cancer surgery, patient develops difficulty in climbing and rowing.

- **Q:** Which muscle is paralyzed?

? Latissimus dorsi.

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.

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).

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.

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.