

# Brachial Plexus

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## 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).

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## 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

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##### 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**

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### **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**”

- Musculocutaneous
  - Axillary
  - Radial
  - Median
  - Ulnar
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## 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
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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

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### 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.