



Brachial Plexus - Essentials

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[Brachial Plexus](#)

OVERVIEW

Roots

- Typically formed from the C5–T1 roots (their ventral rami).

Trunks

- [Upper \(superior\) trunk](#): C5, C6
- [Middle trunk](#): C7
- [Lower \(inferior\) trunk](#): C8, T1

Divisions

- [Posterior divisions](#) all join to form the posterior cord.
- [Anterior division](#) lower trunk forms the medial cord.
- [Anterior division](#) upper and middle trunks form the lateral cord.

Cords

- [Posterior cord](#) forms the radial nerve and the axillary nerve.
- [Medial cord](#) forms the ulnar nerve and a portion of the median nerve.
- [Lateral cord](#) forms the musculocutaneous nerve, and branches from the lateral and medial cords join to form the median nerve.

Major Terminal Nerves

- [Radial nerve](#) (innervates extensor musculature)
- [Ulnar nerve](#) (innervates medial (pinkie side of the hand) flexors that lie below)
- [Median nerve](#) (innervates lateral (thumb side of the hand) flexors that lie below the elbow)

RELEVANT ANATOMICAL LANDMARKS

Posteriorly

- [Scapula](#)
- 1st rib

Medially (posteriorly)

- [Vertebral bodies](#) of levels: C4, C5, C6, C7, and T1.
- C5, C6, and C7 roots lie above their corresponding vertebrae T1.
- C8 root lies below C7/above T1.
- T1 root lies below its vertebra.

Laterally

- [Humerus](#)
- [Coracobrachialis](#) muscle in the supero-medial shoulder

Transverse

- Clavicle

BRACHIAL PLEXUS INNERVATION PATTERNS&NBSP;

TRUNKS/CORDS/NERVES

I. [Upper trunk](#)/[Lateral cord](#)/[Musculocutaneous nerve](#)

- Erb's point is where C5 and C6 come together (Clinical Correlation: [Erb's Palsy](#)).
- Upper and middle trunks extend to form the lateral cord.
- The lateral cord forms the musculocutaneous nerve, which penetrates the coracobrachialis muscle to ultimately run underneath the biceps brachii, which it innervates.

II. [Lower trunk](#)/[Medial cord](#)/[Ulnar nerve](#)

- Lower trunk forms the medial cord, which runs down the medial aspect of the arm as the ulnar nerve.

III. [Upper trunk](#), [Middle trunk](#), & [Lower trunk](#)/[Posterior cord](#)/[Radial nerve](#) & [Axillary nerve](#)

- The posterior cord forms from posterior divisions of all three trunks and extends laterally, and posteriorly, to form the radial nerve, which runs within the spiral groove on the posterior aspect of the humerus and wraps back anteriorly around the humerus, distally.
- The axillary nerve exits the axilla posteriorly through the quadrilateral space to wrap around the humerus and innervate the deltoid.

The **quadrilateral space** forms from:*

- The surgical neck of the humerus (laterally), triceps (long head) medially, teres minor (superiorly), and teres major (inferiorly).
- The posterior circumflex artery runs within this space.

IV. [Lateral cord](#) & [Medial cord](#)/[Median nerve](#)

- The median nerve forms from lateral and medial cords, and runs medial to the humerus but lateral to the ulnar nerve.

V. [Lower trunk](#)/[Medial cord](#)/[Medial brachial cutaneous nerve](#) and [medial antebrachial cutaneous nerve](#)

- Sensory nerves that cover the medial aspect of the upper arm and forearm, respectively.
- In ulnar nerve injuries, medial arm and forearm sensation is spared due to sparing of these cutaneous nerves; in contrast, in medial cordopathies/lower trunk plexopathies, medial forearm and upper arm sensation is impaired.

AXILLARY ARTERY

The axillary artery and its relationship to the brachial plexus

- A continuation of the subclavian artery.
- It climbs over the first rib, passes over the posterior cord, & beneath the lateral and medial cords.
- The cords are named by their relationship to the axillary artery (specifically the 2nd portion of it):
 - Lateral cord lies lateral.
 - Posterior lies posterior.
 - Medial lies medial.

[LONG THORACIC NERVE](#)

- Formed from C5, C6, and C7.
- Innervates the serratus anterior muscle: it pulls the scapula forward (protracts it) (opposite the rhomboids).
- In scapular winging there is prominence of the inferomedial border of the scapula, most commonly from long thoracic nerve injury and resultant serratus anterior weakness.
- The long thoracic nerve is derived directly from the nerve roots, themselves — not from the brachial plexus, which means that in a pure brachial plexopathy, the serratus anterior is spared.

KEY PLEXOPATHIES

I. [Upper Trunk](#)

- [Erb's palsy](#) (aka Erb-Duchenne) is an upper trunk plexopathy.
- Produces a "waiter's tip" deficit, which pictorializes the arm being at the side and pronated – the hand ready to receive the tip!
- Occurs from trauma, such as birth trauma, which more commonly causes an Erb's palsy than a Klumpke's palsy.

II. [Lower Trunk](#)

- [Klumpke's Palsy](#) and [Thoracic Outlet Syndrome](#) are lower trunk plexopathies
- Produce claw hand wherein the metacarpalphalangeal joints extend and the proximal interphalangeal joints flex, like a claw – it affects both ulnar and distal median nerve musculature, so all fingers are affected!
- Thoracic outlet syndrome can also cause vascular compression signs, like edema and arm discoloration, from subclavian artery compression.

*Clinical Correlation: Birth trauma causes an **Erb's palsy** 4x more commonly than **Klumpke's palsy**.*