Brachial plexus

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It is a nerve plexus, lying in the lower part of neck, behind the clavicle and in the axilla.

Stages: It is formed of 4 stages;

I. Stage of Roots:
   - Lies in the posterior triangle of neck.
   - formed by the ventral rami of the spinal nerves; C_{5,6,7,8} and T_{1}

II. Stage of Trunks: " 3 trunks; upper, middle and lower "
   - Lies also in the posterior triangle of neck.
   - The upper trunk is formed by union of ventral rami of C_{5} and C_{6}.
   - The middle trunk is formed by ventral ramus of C_{7} alone.
   - The lower trunk is formed by union of ventral rami of C_{8} and T_{1}.

III. Stage of Divisions:
   - Lies behind the clavicle.
   - Each trunk divides into 2 divisions; anterior and posterior.

IV. Stage of cords: " 3 cords "
   - Lies in the axilla ( in relation to the axillary artery).
   - The posterior cord is formed by the posterior divisions of the 3 trunks.
- The lateral cord is formed by the anterior divisions of the upper and middle trunks.
- The medial cord is formed by the anterior division of the lower trunk.

(Fig.) Brachial Plexus (Stages and Branches)

Branches of the plexus:

I. Supraclavicular Branches:

i. From the Roots:

1. Dorsal scapular nerve (C₅) "Nerve to rhomboideus muscles; minor and major".
2. Long thoracic nerve (C₅,₆,₇). "Nerve to serratus anterior muscle".

N.B.: Other twigs arise from all roots to posterior muscles, including scalene and longus colli muscles from all roots. Also twig from C₅ shares in formation of phrenic nerve.
ii. From the Trunks:

Only the upper trunk (C5,6) gives the following branches;

1. Suprascapular nerve (to supraspinatus and infraspinatus muscles).
2. Subclavius nerve, (to subclavius muscle).

II. Infraclavicular Branches:

i. From the posterior cord: "U-L-N-A-R"

1. Upper subscapular nerve (C5,6).
2. Nerve to latissimus dorsi (Thoracodorsal nerve) (C5,6,7).
3. Lower subscapular nerve (C5,6).
4. Axillary nerve (circumflex nerve)(C5,6).
5. Radial nerve (C5,6,7,8, T1).

ii. From the lateral cord (C5,6,7):

1. Lateral root of median nerve
2. Lateral pectoral nerve.

iii. From the medial cord (C8, T1):

1. Medial root of median nerve
2. Medial pectoral nerve
3. Ulnar nerve.
4. Medial cutaneous nerve of arm.
5. Medial cutaneous nerve of forearm.
## Main Nerves of Upper Limb

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Muscles supplied</th>
<th>Action of Muscles</th>
<th>Effect of Nerve Lesion</th>
<th>Deformity</th>
</tr>
</thead>
</table>
| Long thoracic nerve          | - Serratus anterior | - pulls scapula forwards (puts medial border of scapula in contact with ribs).  
- rotates scapula in raising the arm above the head (acting with trapezius). | - Backward projection of medial border of scapula.                                      | Winging of scapula        |
| Axillary nerve               | - Deltoid muscle. | - Abduction of arm (from 18 to 90°).  
- Anterior fibers help in flexion and medial rotation of arm.  
- Posterior fibers help in extension and lateral rotation of arm. | - Paralysis of deltoid and teres minor.  
- Loss of abduction (from 18 to 90°).  
- Loss of cutaneous sensation in the lower half of deltoid. | - Flattening of the shoulder, due to atrophy of deltoid.  
- Downward subluxation of humerus if deltoid and supraspinatus are paralysed. |
<p>|                              | - Teres minor     | - helps in adduction and lateral rotation of arm.                                 |                                                                                        |                           |</p>
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<tr>
<td>Radial nerve (C5,6,7,8 and T1)</td>
<td>Triceps (each head takes a nerve fibers; nerve to long head arises in axilla and nerve to medial head and to lateral head arise in arm) - Anconeus</td>
<td>Extension of elbow</td>
<td>Loss of extension of elbow</td>
<td>Wrist (or hand) drop and Finger drops.</td>
</tr>
<tr>
<td>Brachialis (small part)</td>
<td>Brachioradialis</td>
<td>Supination by supinator.</td>
<td>Loss of supination of the extended forearm.</td>
<td></td>
</tr>
<tr>
<td>Extensor carpi radialis longus</td>
<td>Extensor carpi radialis brevis</td>
<td>Extension of wrist by extensor carpi muscles.</td>
<td>Loss of extension of wrist joint.</td>
<td></td>
</tr>
<tr>
<td>Extensor digitorum</td>
<td>Extensor digiti minimi</td>
<td>Extension of joints of fingers by extensor digitorum.</td>
<td>Loss of extension of metacarpophalangeal joints of fingers.</td>
<td></td>
</tr>
<tr>
<td>Extensor carpi unaris</td>
<td>Supinator</td>
<td></td>
<td>N.B.: Interphalangeal joints are not paralyzed, because this action is also done lumbricals and interossei which are not affected.</td>
<td></td>
</tr>
<tr>
<td>Abductor pollicis longus</td>
<td>Extensor pollicis longus</td>
<td></td>
<td>-Loss of cutaneous sensation on the dorsal surface of lateral two-thirds of hand and lateral three and half fingers.</td>
<td></td>
</tr>
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Distribution of Branches of Radial Nerve
**Musculo-cutaneous Nerve**

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| Musculo-cutaneous Nerve | - Biceps brachii  
  - Brachialis (Greater part)  
  - Coracobrachialis | - Flexion of elbow by 2 B-Muscles; Biceps and Brachialis 
  - Supination by biceps.  
  - Helps in flexion of shoulder by coracobrachialis. | - Loss of flexion of elbow.  
  - Loss of supination of the forearm. | The forearm is extended and pronated. |
## Median Nerve

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<tr>
<td>Median nerve (C 5,6,7,8 &amp; T 1)</td>
<td>I. In forearm: -Pronator teres -Flexor carpi radialis -Palmaris longus -Fexor digitorum superficialis -Anterior interosseous nerve: To the: *Flexor pollicis longus *Flexor digitorum profundus (lateral half) *Pronator quadrates</td>
<td>-Pronation by 2 pronator muscles. -Helps in flexion of wrist by flexor digitorum superficialis and profundus, flexor carpi radialis and Palmaris longus. -Flexion of joints of fingers by flexor digitorum superficialis and profundus -Flexion of thumb by flexor pollicis longus and brevis. -Opposition of thumb by opponens pollicis.</td>
<td>-Weakness of flexion of wrist. -Loss of pronation. -Loss of flexion of all joints of index and middle fingers. -Loss of flexion of thumb. -Loss of opposition of thumb. -Atrophy of thenar muscles -Loss of cutaneous sensation on the front of lateral two thirds of palm and three and half fingers.</td>
<td>Flattening of thenar eminence Deformity is Ape &quot;or monkey’s&quot; hand.</td>
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<tr>
<td>II. In hand: - 3 thenar muscles - First 2 lumbricals</td>
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## Ulnar Nerve

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<tr>
<td>Ulnar nerve (C₈ &amp; T₁)</td>
<td>I. In forearm: - Flexor carpi ulnaris - Flexor digitorum profundus (medial half) II. In hand: - 3 hypothenar muscles - Last 2 lumbricals - All interossei muscles - Adductor pollicis. Palmaris brevis.</td>
<td>- Helps in flexion of wrist by flexor carpi ulnaris - Abduction of medial 4 fingers away from middle line by dorsal interossei. - Adduction of medial 4 fingers to middle line by palmar interossei. - Adduction of thumb by adductor pollicis.</td>
<td>- Weakness of flexion of wrist. - Loss of flexion of terminal interphalangeal joints of medial 2 fingers. - Loss of adduction and abduction of medial 4 fingers. - Loss of adduction of thumb. - Atrophy of hypothenar muscles - Loss of cutaneous sensation on the front and dorsum of medial one third of palm and medial one and half fingers.</td>
<td>Flattening of hypothenar muscles Deformity is <strong>partial claw hand</strong>. (This is due to paralysis of all interossei muscles, so the medial 4 fingers are flexed at the interphalangeal joints and extended at metacarpophalangeal joints. The condition is not marked in the first 2 fingers because their lumbricals are not affected.)</td>
</tr>
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</table>
Deformities of the hand. (a) Radial palsy—wrist drop. (b) Ulnar nerve palsy—‘partial claw hand.
(c) Median nerve palsy—‘monkey’s hand’. (d) Volkmann’s contracture—another claw hand deformity.
The pale blue areas represent the usual distribution of anaesthesia.
(About: Ellis, H. "Clinical Anatomy")
Erb's Palsy

It is a lesion of the upper trunk of brachial plexus, Mostly occurs as a result of difficult labour in newborns.

Muscles that are paralyzed:
- It leads to paralysis of deltoide, supraspinatus, infraspinatus, teres minor, biceps, brachialis, bracioradialis and supinator.

Effects This causes:
- loss of abduction and arm hangs beside the body,
- loss of flexion and the forearm is extended,
- loss of supination and the forearm is pronated.
The deformity is called Police-man tip position