Radial and Ulnar Nerves

Musculoskeletal block- Anatomy-lecture 10
Objectives

✓ Describe the anatomy of the radial & ulnar nerves regarding:
  origin, course, and distribution.

✓ List the branches of the nerves.

✓ Describe the causes and manifestations of nerve injury.
Radial Nerve

**Origin:** One of the five branches of the Posterior cord of the brachial plexus.
- Begins in the axilla
- The largest branch of nerves in the upper limb

**Supplies:** Nerve of the extensor compartment.
- All muscles of the posterior compartment of the arm and forearm

Radial nerve in the axilla

The radial nerve lies posterior to the axillary artery. The radial nerve continuous into the posterior compartment of the arm. The radial nerve then gives three branches in the axilla.
- It winds around the back of the arm in the Spiral Groove (radial groove) on the back of the humerus between the heads of the triceps.

- In the spiral groove, the nerve is accompanied by the Profunda Vessels and it lies directly in contact with the shaft of the humerus (a Dangerous Position).

Course In the Forearm

• It pierces the Lateral Intermuscular septum.
• Descends in front of the Lateral Epicondyle.
• Passes forward into the Cubital Fossa.
• Divides into
  1. **Superficial** branches
     • Conti. of the radial nerve
     • Purely cutaneous
  2. **Deep** branches.
     • (Post. interosseous)
# Radial Nerve Branches

<table>
<thead>
<tr>
<th>in the Axilla</th>
<th>in the Spiral Groove arm</th>
<th>close to lateral epicondyle: In the flexor compartment of Arm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cutaneous to:</strong></td>
<td><strong>Cutaneous to:</strong></td>
<td><strong>Muscular to:</strong></td>
</tr>
<tr>
<td>1. Posterior cutaneous nerve of arm</td>
<td>1. Lower lateral cutaneous nerve of arm</td>
<td>1. Brachioradialis</td>
</tr>
<tr>
<td></td>
<td>2. Posterior cutaneous nerve of forearm</td>
<td>2. Extensor carpi radialis longus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Brachialis</td>
</tr>
<tr>
<td><strong>Muscular to:</strong></td>
<td><strong>Muscular to:</strong></td>
<td><strong>Articular to:</strong></td>
</tr>
<tr>
<td>1. Long &amp; Medial heads of Triceps</td>
<td>1. Lateral &amp; Medial heads of Triceps</td>
<td>1. Elbow joint</td>
</tr>
<tr>
<td></td>
<td>2. Anconeus</td>
<td></td>
</tr>
</tbody>
</table>

[Diagram of radial nerve branches]
Superficial Branch

1. Continuation of the radial nerve
2. Purely cutaneous.
3. Runs down in the flexor compartment.
4. Winds around the lower end of the radius deep to BR
5. Crosses the pollicis muscle to reach the back of the hand.

**Supplies:**

It's a sensory nerve supplying the majority of the dorsum of the hand.
- The skin on the lateral (radial) two and half digits or the 3 and a half of proximal phalanges.
- The skin corresponding half of the hand.

Deep Branch (posterior interosseous)

**Course:**

It winds around the neck of the radius, within the supinator muscle, and enters the posterior compartment of the forearm.

**Muscular:**

Extensor compartment

<table>
<thead>
<tr>
<th>Superficial branch</th>
<th>Deep branch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Extensor carpi radialis brevis</td>
<td>1. Supinator</td>
</tr>
<tr>
<td>2. Extensor carpi ulnaris</td>
<td>2. Abductor pollicis longus</td>
</tr>
<tr>
<td>3. Extensor digitorum</td>
<td>3. Extensor pollicis brevis</td>
</tr>
<tr>
<td>4. Extensor digiti minimi</td>
<td>4. Extensor pollicis longus</td>
</tr>
<tr>
<td>5. Extensor indicis</td>
<td>5. Extensor indicis.</td>
</tr>
</tbody>
</table>

The superficial branch is sensory whereas the deep branch is motor. Supinator and ECRB in cubital fossa. All other from extensor compartment.
## Applied Anatomy: Injury of Radial Nerve

### In The Axilla

**Transient paralysis**

1. **Improper use of crutch** *(pressing the nerve in the axilla).*
2. **Saturday night palsy** *(draping the arm over the chair in a state of diminished consciousness)* The triceps, the anconeus, and the long extensors of the wrist are paralyzed.

“All muscles and skin supplied by it will be affected”

Wrist dropping: **YES**  
Extension of Elbow: **NO**  
Extension of Fingers: **NO**

### In The Spinal Groove (In The Arm)

- Most common—fracture of the shaft of the humerus.
- The characteristic lesion is “WRIST DROP” the inability to extend WRIST and metacarpophalangeal joint. All the branches from this point will be affected, while the branches from axilla (posterior of the forearm, long and medial head of triceps) are intact.

Wrist dropping: **YES**  
Extension of Elbow: **YES**  
Extension of Fingers: **NO**

“The 2 heads of triceps are working therefor patient can extend the elbow joint”
## Applied Anatomy: Injury of Radial Nerve In The Forearm

<table>
<thead>
<tr>
<th>Injuries of <strong>Deep Branch</strong> of the Radial Nerve</th>
<th>Injuries of <strong>Superficial Branch</strong> of the Radial Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Deep radial nerve is <strong>Motor nerve</strong>.</td>
<td>• Superficial radial nerve is <strong>Sensory nerve</strong>.</td>
</tr>
<tr>
<td>• Causes:</td>
<td>• Injury like a stab wound, results in a variable small area of anesthesia over the dorsum of the hand and lateral three and half fingers up to the base of their distal phalanges. (or distal interphalangeal joint)</td>
</tr>
<tr>
<td>- Fractures of the proximal end of the radius.</td>
<td>• Sensory loss is <strong>minimal</strong> caused by Overlapping by the median and ulnar nerves.</td>
</tr>
<tr>
<td>- During dislocation of the radial head.</td>
<td></td>
</tr>
<tr>
<td>• <strong>No wrist Drop</strong>, the nerve supply to the supinator and the extensor carpi radialis longus will be undamaged, and because the latter muscle is powerful, it will keep the wrist joint extended.</td>
<td></td>
</tr>
<tr>
<td>• <strong>No loss of sensation.</strong></td>
<td></td>
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</tbody>
</table>
**Ulnar Nerve**

**Origin:** Begins in the axilla (Continuation of the **medial cord**)

**Supplies:**
1. Some flexors muscle on ulnar side of the forearm. (flexor carpi ulnaris, medial side of flexor digitorum)
2. Most of intrinsic muscles of the hand.
3. Skin of the ulnar one and a half digit.

**Ulnar Nerve: Course**

<table>
<thead>
<tr>
<th>In Axilla &amp; Arm</th>
<th>In forearm</th>
<th>In the wrist</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Descends</strong> along the medial side of the following arteries: Axillary &amp; Brachial.</td>
<td>• Enters between the two heads of the Flexor Carpi Ulnaris muscle.</td>
<td>• <strong>Passes</strong> anterior (superficial) to <strong>flexor retinaculum.</strong></td>
</tr>
<tr>
<td>• Pierces the medial intermuscular septum.</td>
<td>• <strong>Descend on DF profundus</strong></td>
<td>• Lateral to pisiform bone.</td>
</tr>
<tr>
<td>• Passes behind the <strong>medial epicondyle of humerus at the elbow.</strong> (Funny Bone)</td>
<td>• <strong>Descends behind the flexor carpi ulnaris.</strong></td>
<td>• Medial to ulnar artery.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Medial to ulnar artery.</strong></td>
<td>• <strong>Divides into:</strong> superflcial and deep branches</td>
</tr>
</tbody>
</table>

The ulnar nerve originates from the C8-T1 nerve roots which form the medial cord of the brachial plexus.
Ulnar Nerve: Branches

Of the Forearm

**Muscular to**
(1 & ½) muscle

**Articular to**
Medial ½ Flexor Digitorum Profundus
Flexor Carpi Ulnaris
Elbow joint

**Cutaneous to**

*Palmar cutaneous*
Supplies the skin over the medial part of the palm

*Dorsal cutaneous*
Supplies the skin over the back of medial side of the hand & medial 1+ ½ fingers

It has no branches in the arm or axilla
Ulnar Nerve: Branches of the hand

Branches of **Superficial** Terminal Branch:

1. **Muscular:**
   - Palmaris Brevis.

2. **Cutaneous:**
   - Skin over the Palmar aspect of the medial 1+ ½ fingers (including nail beds).

Branches of **Deep** Terminal Branch:

1. **Muscular:**
   - Hypothenar Eminence.
   - All Interossei (Palmar & Dorsal).
   - 3rd & 4th (Radial) Lumbricals.
   - Adductor pollicis. (ends by supplying it)

2. **Articular:**
   - Carpal joints.
## Ulnar Nerve: Injury

Most commonly injured • Behind the elbow • At wrist
- The classical sign of a low lesion “CLAW HAND”
- Hyperextension of the MCP joints of ring and little fingers • Flexion of the IP joints

<table>
<thead>
<tr>
<th>Behind the Elbow:</th>
<th>At the Wrist:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Atrophy</strong> of Ulnar (medial) side of forearm.</td>
<td>• <strong>Claw Hand.</strong></td>
</tr>
<tr>
<td>• Flexion of the wrist with Abduction*.</td>
<td>• Wasting of Hypothenar Eminence.</td>
</tr>
<tr>
<td>• Claw hand.</td>
<td></td>
</tr>
<tr>
<td>• Wasting of Hypothenar Eminence.</td>
<td></td>
</tr>
<tr>
<td>• <strong>Claw hand.</strong></td>
<td></td>
</tr>
</tbody>
</table>

*There will be flexion with radial deviation since the flexor carpi radialis is working while the flexor carpi ulnaris is not

![Claw Hand](image-url)
This slide was a homework in males slides
We got the Information from wikipedia

<table>
<thead>
<tr>
<th>The conditions</th>
<th>Definition</th>
<th>Signs</th>
<th>Picture</th>
</tr>
</thead>
</table>
| Cubital tunnel syndrome, At the elbow joint | Condition that involves pressure or stretching of the ulnar nerve (also known as the “funny bone” nerve). | - Numbness or tingling in the ring  
- Small fingers  
- Pain in the forearm  
- May involve weakness in the hand | ![Picture](ulnar_nerve_compressed_cubital_tunnel.jpg) |
| Ulnar tunnel syndrome (Guyon’s canal syndrome), At the wrist joint | Caused by entrapment of the ulnar nerve in the Guyon canal as it passes through the wrist | Usually begin with a feeling of pins and needles in the ring and little fingers before progressing to a loss of sensation and/or impaired motor function of the intrinsic muscles of the hand | ![Picture](ulnar_nerve_compressed_guyon_canal.jpg) |

Why it’s called funny bone?  
Because of the funny feeling you feel after you hit the ulnar nerve in the elbow region “cubital fossa” in the 4&5 fingers.
Summary of branches of Ulnar Nerve:

- Ulnar nerve (C8-T1)
- No branches from brachial plexus
- Axilla
- Upper arm
- Elbow joint
- Flexor carpi ulnaris
- Flexor digitorum profundus (medial half)
- Radial side of the forearm
- Posterior cutaneous branch
- Palmar cutaneous branch
- Wrist joint
- Muscles of hypothenar eminence
- Adductor pollicis
- Third and fourth lumbricals
- Interossei
- Palmaris brevis
- Joint of hand
- Palmar digital branches to medial 1½ fingers
- Skin of medial side of dorsum of hand and medial 1½ fingers

Summary of branches of Radial Nerve:

- Radial nerve (C5-C8-T1)
- No branches from brachial plexus
- Axilla
- Lower lateral cutaneous nerve of arm
- Triceps (long head)
- Triceps (medial head)
- Triceps (lateral head)
- Triceps (medial head)
- Posterior cutaneous nerve of forearm
- Brachialis (small part)
- Brachioradialis
- Extensor carpi
- Elbow joint
- Upper arm
- Deep branch of radial nerve
- Extensor carpi radialis brevis
- Supinator
- Extensor digitorum
- Extensor digiti minimi
- Extensor carpi ulnaris
- Abductor pollicis longus
- Extensor pollicis longus
- Extensor pollicis brevis
- Extensor indicis
- Forearm
- Skin of lateral side of dorsum of hand and lateral 3½ fingers
Question 1: Which one of the following nerves is the largest branch in the upper limb?
A. ulnar nerve  
B. radial nerve  
C. median nerve  
D. axillary nerve

Question 2: Where does the radial nerve divide?
A. spiral groove  
B. lateral epicondyle  
C. cubital fossa  
D. wrist

Question 3: The radial nerve is derived from:
A. C5, C6  
B. C5, C6, C7  
C. C5, C6, C7, C8  
D. C5, C6, C7, C8, T1

Question 4: Injury of the deep branch of radial nerve causes wrist drop.
A. true  
B. false

Question 5: The ulnar nerve at the wrist:
A. Lies lateral to the ulnar artery  
B. Passes through the carpal tunnel into the hand  
C. Lies superficial to palmaris brevis  
D. Gives off a deep terminal branch lateral to the pisiform bone

Question 6: As a result of injury of the ulnar nerve at the wrist:
A. marked atrophy of the thenar eminence  
B. wasting of hypothenar eminence  
C. loss of sensation over the thumb  
D. both A and C are correct

Question 7: A patient presented with injury to the superficial branch of the ulnar nerve. Which muscle is affected?
A. Palmaris Brevis  
B. Palmaris Longus  
C. Palmaris Superficialis  
D. Palmaris Profundus

Question 8: The ulnar nerve descends ______ along the brachial and axillary artery.
A. anteriorly  
B. posteriorly  
C. medially  
D. laterally

Team members

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- Salman Alagla
- Ziyad Al-jofan
- Suhail Basu hail
- Ali Aldawood
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- Mohammed Al-huq bani
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- Noura Al Turki
- Amirah Al-Zahrani
- Alhanouf Al-haluli
- Sara Al-Abdulkarem
- Rawan Al Zayed
- Reema Al Masoud
- Renad Al Haq bani
- Nouf Al Humaidhi
- Fay Al Buqami
- Jude Al Khalifah
- Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- Danah Al Halees
- Haifa Al Waily
- Rema Al Mutawa
- Amirah Al Dakhilallah
- Maha Al Nahdi
- Renad Al Mutawa
- Ghaida Al Braithen
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Special thank for Anatomy team 436

Good luck

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