بسم الله الرحمن الرحيم

ANATMOY

FINAL | Lecture 5

# Forearm: Extensors


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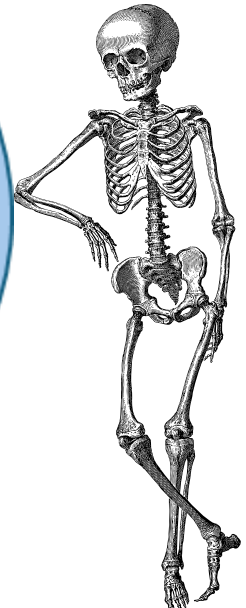
وَإِن تَتَوَلَّوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوا أَمْثَالَكُم

اللهم استعملنا ولا تستبدلنا

**Color Code:** Slides + Dr. doesn't mention | Slides + Dr. mentions | Extra from Dr.


Quiz!

Some notes regarding

- Lecture 6 (The Hand)
- Lecture 7 (Upper Limb Nerve Injuries)

were explained by the Dr., but we chose not to mention them here as they are totally covered in the coming 2 lectures.

خلي دراسة المحاضرة هاي تخلص معكم بسرعة
كل اشي بوقته حلو
دعواتكم

# Contents of the Lateral Fascial Compartment of the Forearm

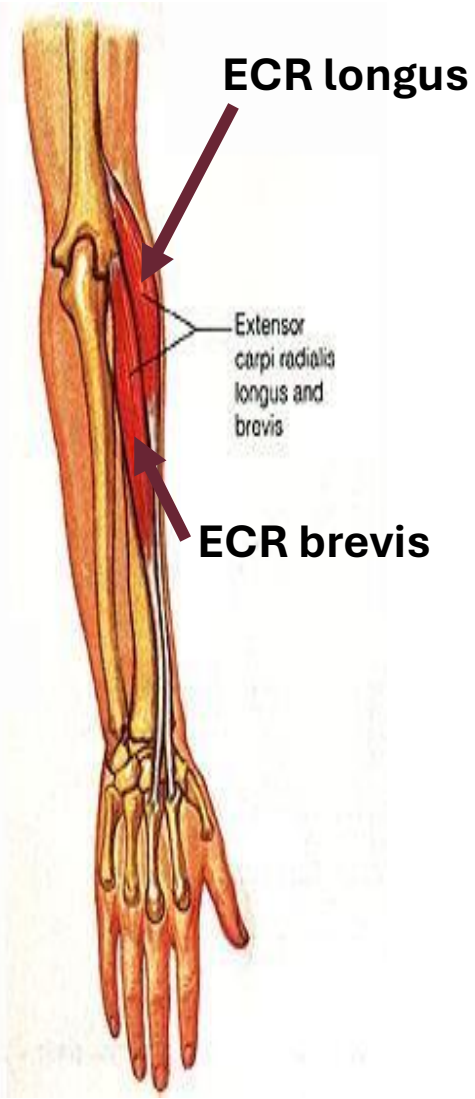
- The lateral fascial compartment may be regarded as part of the posterior fascial compartment
- Muscles:

**(1) Brachioradialis**

**(2) Extensor carpi radialis longus**

- Blood supply: Radial and brachial arteries
- Nerve supply to the muscles: Radial nerve


(1)




(2)

# Muscles of the Lateral Fascial Compartment of the Forearm

Karate Muscle ➔ Elbow Flexion in Midpronation (halfway between pronation and supination)

1. Brachioradialis is ant to elbow joint, acts as an accessory flexor of this joint.
2. Extensor carpi radialis longus

**Action for Extensor carpi radialis longus**: Extends and abducts wrist

**Origin:**

- Both of them originates from the Lateral supracondylar ridge of humerus
- The origin of Extensor carpi radialis longus is above the origin of Brachioradialis

**Insertion:**

- Brachioradialis:
  - Base of styloidprocess of radius
- Extensor carpi radialis longus:
  - Posterior (dorsal) surface of base of second metacarpal bone

➢ Nerve Supply:

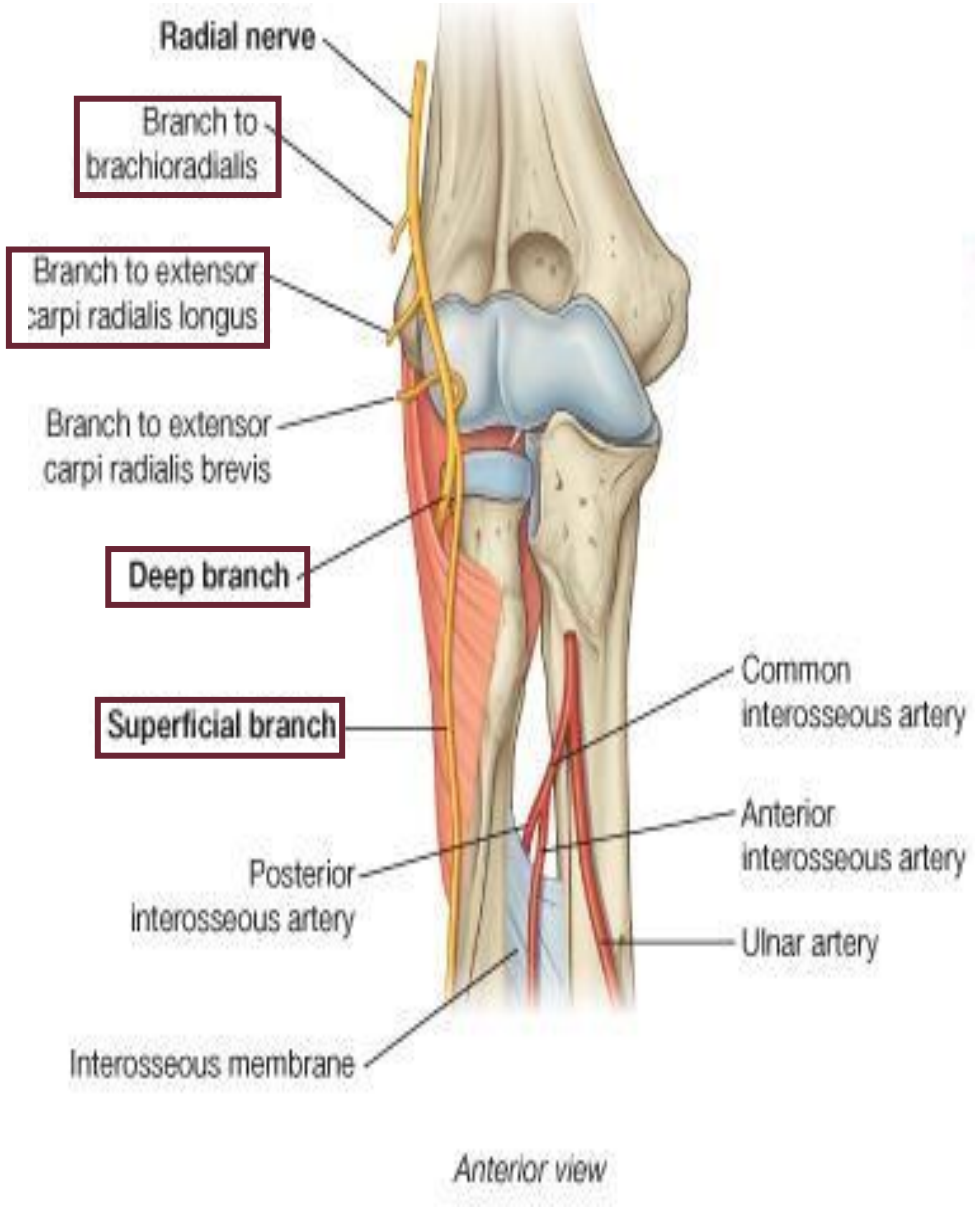
➢ Radial nerve before it divides into superficial and deep branches

- The arterial supply is derived from branches of the radial and brachial arteries

# Radial Nerve

a branch of the posterior cord of brachial plexus

- The radial nerve pierces the lateral intermuscular septum in the lower part of the arm and passes forward into the cubital fossa
- It then passes downward in front of the lateral epicondyle of the humerus, lying between the brachialis on the medial side and the brachioradialis and extensor carpi radialis longus on the lateral side
- At the level of the lateral epicondyle, it divides into superficial and deep branches



# Branches of Radial nerve

The radial nerve descends in the spiral groove along with the profunda brachii artery, then crosses to the lateral side of the arm. It continues downward and reaches the cubital fossa, where it divides into its terminal branches:
· Superficial branch (sensory)
· Deep branch (motor) for posterior muscles

1. Muscular branches to:
    1. Brachioradialis
    2. Extensor carpi radialis longus
    3. It gives a small branch to the lateral part of the brachialis muscle

2. Articular branches to the elbow joint

3. Deep branch of the radial nerve (posterior interosseus nerve). This winds around the neck of the radius, within the supinator muscle and enters the posterior compartment of the forearm

4. Superficial branch of the radial nerve

# Superficial Branch of the Radial Nerve

- The superficial branch of the radial nerve is the direct continuation of the nerve after its main stem has given off its deep branch in front of the lateral epicondyle of the humerus
- It runs down in the anterior compartment of the forearm under cover of the brachioradialis muscle on the lateral side of the radial artery
- In the distal part of the forearm, it leaves the artery and passes backward under the tendon of the brachioradialis
- It reaches the posterior surface of the wrist, where it divides into terminal branches that supply the skin on the lateral two thirds of the posterior surface of the hand
- and the posterior surface over the proximal phalanges of the lateral three and a half fingers.
- The area of skin supplied by the nerve on the dorsum of the hand is variable

# Contents of the Posterior Fascial Compartment of the Forearm

- The superficial group (slides 11 to 15):

(1) extensor carpi radialis brevis,
(2) extensor digitorum,
(3) extensor digiti minimi,
(4) extensor carpi ulnaris,
(5) anconeus.

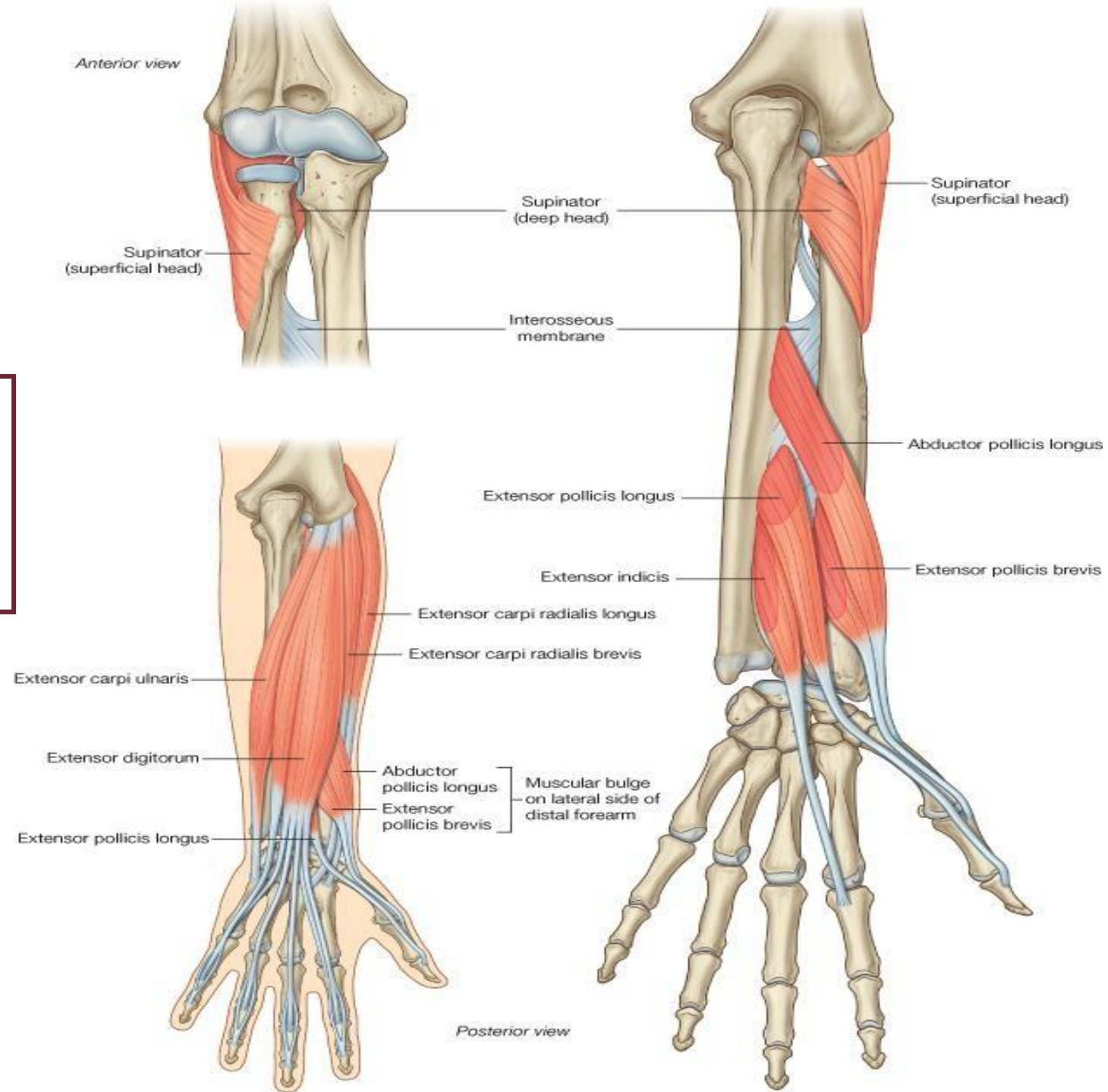
These muscles possess a common tendon of origin, which is attached to the lateral epicondyle of the humerus

- The deep group includes (slides 16 to 20):

(1) the supinator,
(2) abductor pollicis longus,
(3) extensor pollicis brevis,
(4) extensor pollicis longus,
(5) extensor indicis.

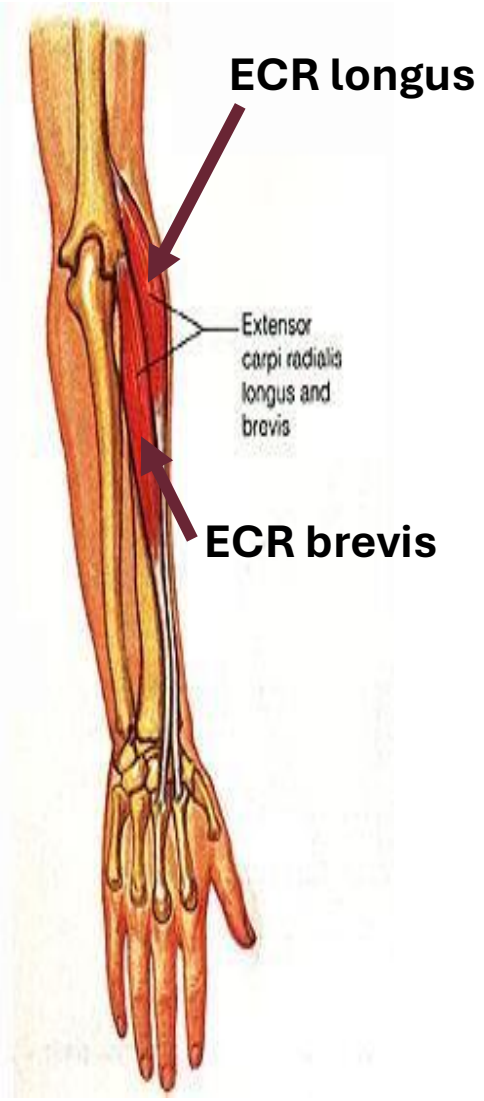
- Blood supply: Posterior and anterior interosseous arteries
- Nerve supply to the muscles: **Deep branch of the radial nerve (posterior interosseous nerve).**

This picture was in the last slide originally.
Not all 10 muscles are shown.
We prefer to find each muscle's figure in the coming separate slides.



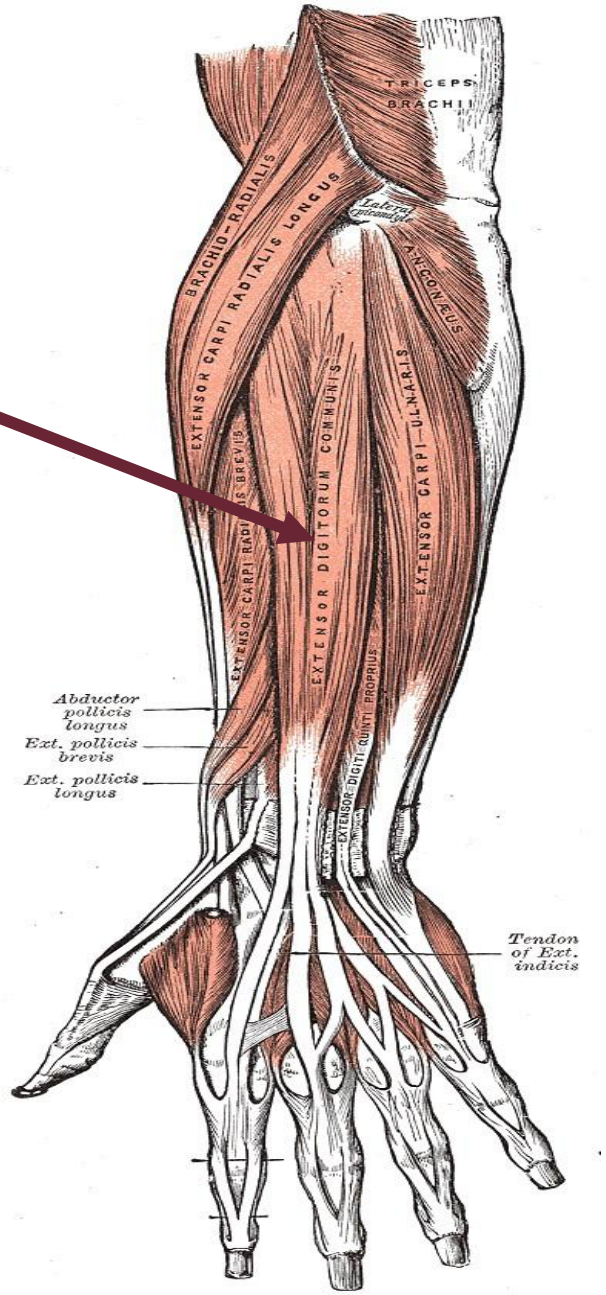
# EXTENSOR CARPI RADIALIS BREVIS

- **O**: Common extensor tendon attached to the Lateral epicondyle of humerus. Radial collateral ligament of elbow.
- **I**: Dorsal surfaces of bases of 2nd and 3rd metacarpals.
- Lies deep to extensor carpi radialis longus.
- **A**: Extends and abducts wrist.
- **NS**: Posterior interosseous nerve.



# EXTENSOR DIGITORUM

- **O**: Common extensor tendon attached to the Lateral epicondyle of humerus, Forms four tendons, each passes into a finger
- **I**: Base of dorsal surfaces of middle and distal phalanges. The dorsal digital expansion (connective tissue) holds phalanges together, serving as an insertion site for various muscles.
- **A:** Extends all joints of hand
- **NS**: Posterior interosseous nerve.



# EXTENSOR DIGITI MINIMI

- An accessory extensor of little finger, medial to extensor digitorum.
- **O**: Common extensor tendon attached to the Lateral epicondyle of humerus
- **I**: Dorsal digital expansion of little finger along with the tendon of extensor digitorum.
- **A**: Extends MCP & IP joints of little finger
- **NS**: Posterior interosseous nerve

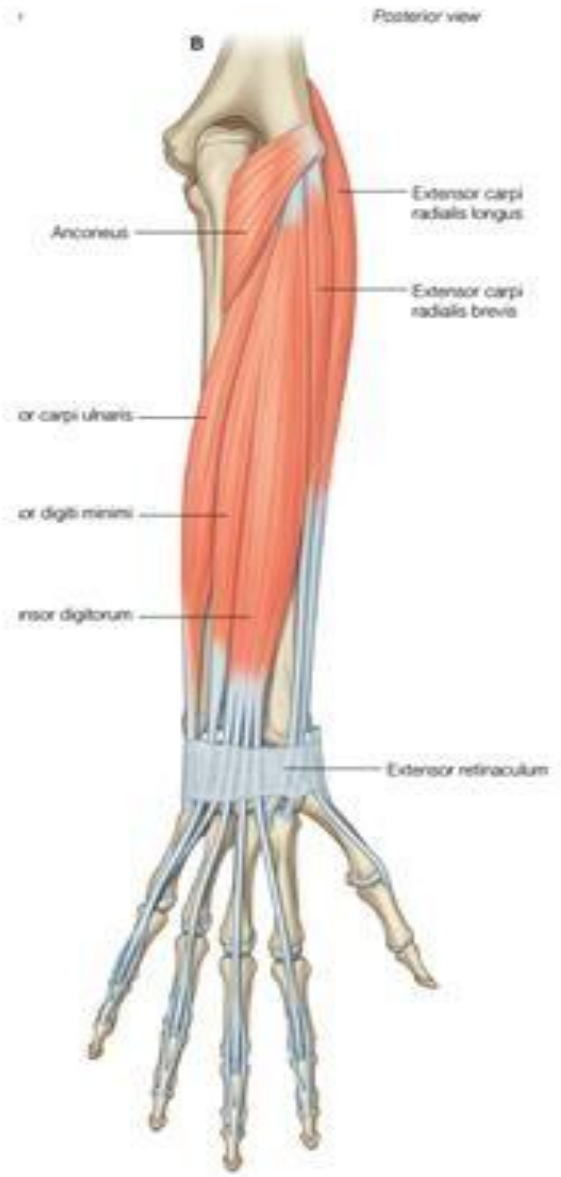
We can move the little finger and index finger more than the other fingers because they are innervated by specific muscles: the extensor indices for the index finger and the extensor digiti minimi for the little finger

# EXTENSOR CARPI ULNARIS

- Lies medial to the extensor digiti minimi
- **O**: Common extensor tendon attached to the Lateral epicondyle of the humerus (ulnar side)
- Posterior border of ulna by an aponeurosis
- **I**: Medial side of the base of $5^{th}$ metacarpal .
- **A**: Extends and adducts the wrist
- **NS**: Posterior interosseous nerve

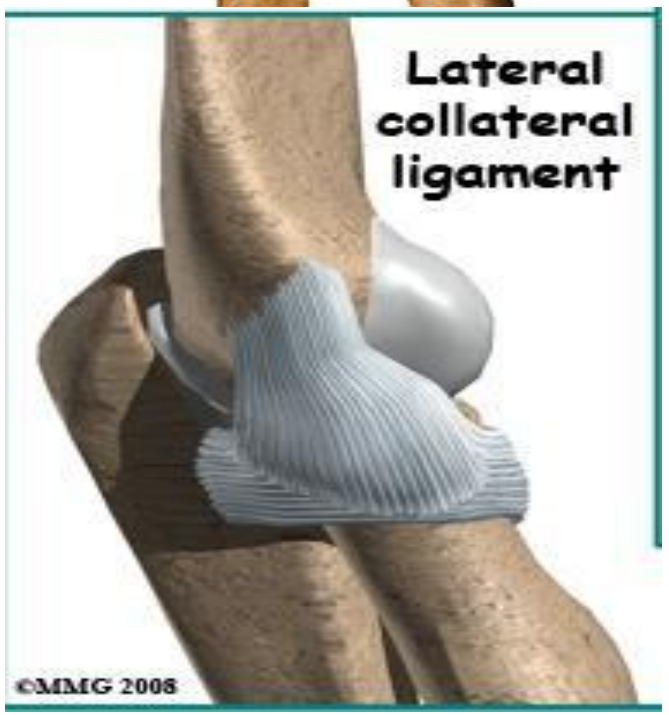
# ANCONEUS

- Small triangular muscle behind the cubital joint.
- **O**: Post surface of lat epicondyle of humerus.
- **I**: Lat aspect of Olecranon
  - Proximal 1/4th of post surface of ulna.
- **A**: Weak extensor of elbow
- **NS**: Radial Nerve (before it divides)



# SUPINATOR

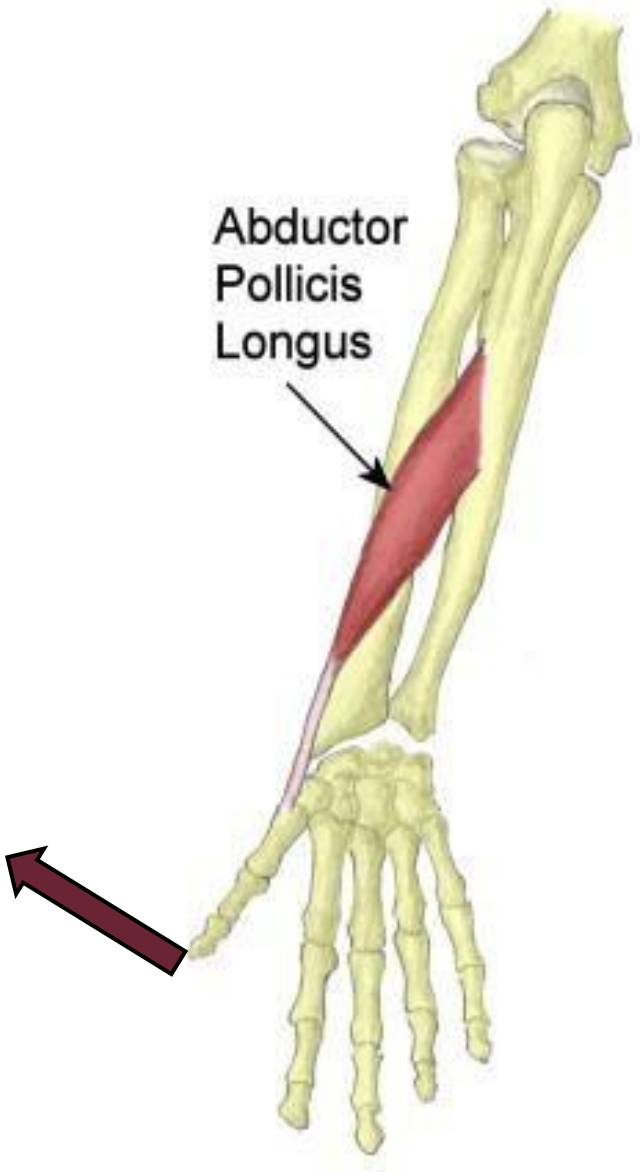
- **Two heads**
- **O**: **Superficial head**: lat epicondyle of humerus, radial collateral lig of elbow, annular lig
- **Deep head:** supinator crest of ulna, post part of triangular area in front of it
- **I**: Lat surface of prox 1/3 of radius
- **A**: Supinates the forearm and hand
- **NS**: Posterior interroseous nerve.




Supinator → supination in anatomical position
Biceps brachii (muscle of screwing) → supination during elbow flexion

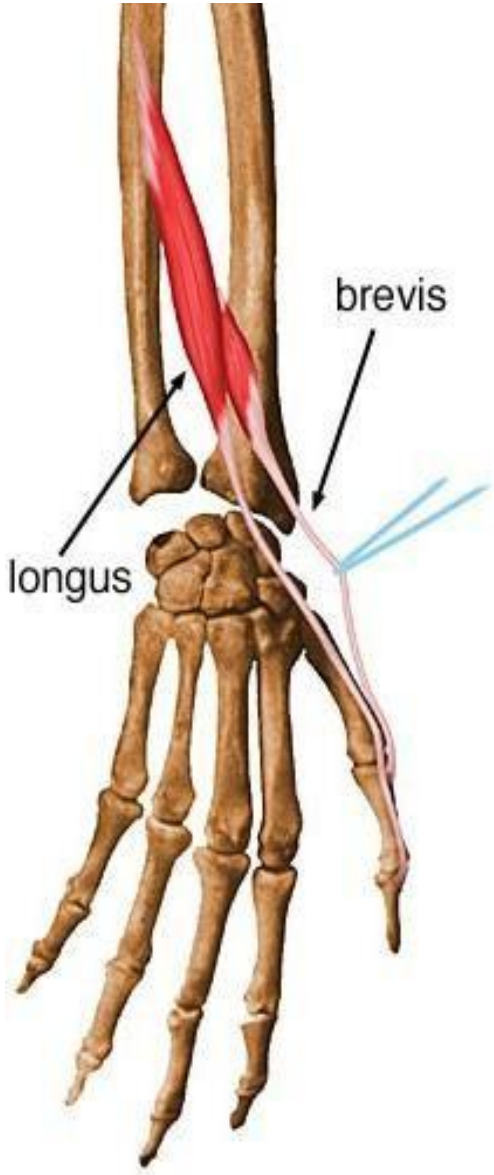
# ABDUCTOR POLLICIS LONGUS

- **O:** Prox post surfaces of the radius, ulna, and interosseous memb.
- **I:** Radial side of base of 1st metacarpal and trapezium.
- **A**: Abd and ext of thumb at carpometacarpal joint
- **NS**: Posterior interosseous nerve



# EXTENSOR POLLICIS BREVIS

- **O:** Post surface of radius, interosseous membrane.
- **I**: Dorsal surface of base of prox phalanx of thumb.
- **A**: Extends prox phalanx and metacarpal of thumb.
- **NS**: Posterior interosseous nerve.



# EXTENSOR POLLICIS LONGUS

- **O**: Posterior surface of ulna interosseous memb.
- **I**: Dorsal surface of distal phalanx of the thumb
- **A**: Extends all joints of the thumb
- **NS**: Posterior interosseous nerve.

# EXTENSOR INDICES

- **O**: Posterior surface of ulna distal to extensor pollicis longus, interosseous memb.
- **I**: Ulnar side of tendon of extensor digitorum for index finger **+ dorsal digital expansion**
- **A**: Extension of Index finger.
- **NS**: Posterior interosseous nerve

في التشهد عند التحيات، بنقدر نحرك إصبع السبابة بسهولة لانه اله عضلة منفردة

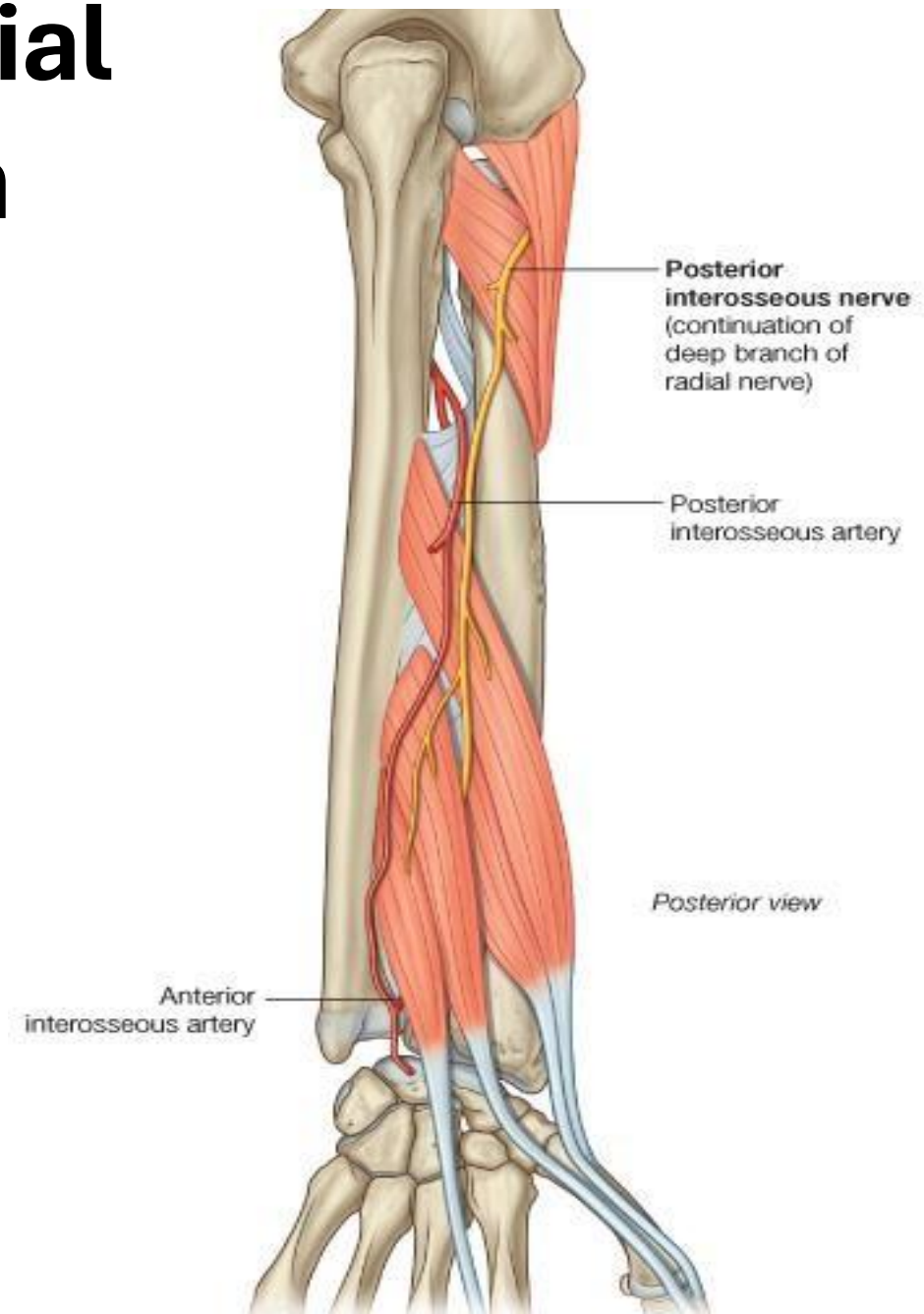
بس التركيز على الي ركز عليه بالمحاضرة والله أعلم

**Professor's advice:** الجدول مهم ☺

| Muscle | Origin | Insertion | Nerve supply | Action |
|---|---|---|---|---|
| brachioradialis | lateral supracondylar ridge of humerus | styloid process of radius | radial | flexes forearm and supinates hand |
| extensor carpi radialis longus | lateral supracondylar ridge of humerus | base of 2nd metacarpal | radial | extends and abducts the wrist |
| extensor carpi radialis brevis | lateral epicondyle of humerus | base of 3rd metacarpal | radial | extends and abducts the wrist |
| extensor carpi ulnaris | lateral epicondyle of humerus posterior border of ulna | base of 5th metacarpal | radial | extends and adducts the hand |
| extensor digitorum | lateral epicondyle of humerus | extensor expansion over fingers | radial | extends fingers, hand and forearm |
| extensor digiti minimi | lateral epicondyle of humerus | extensor expansion of little finger | radial | extends little finger |
| anconeus | back of lateral epicondyle of humerus | olecranon process poster surface of ulna | radial | extends forearm |
| supinator | lateral epicondyle of humerus crest of ulna | upper third of radius | radial | supinates the hand |
| abductor pollicis longus | posterior surface of ulnar middle aspect of radius | base of 1st metacarpal | radial | abducts thumb |
| extensor pollicis brevis | middle 1/3rd of radius | base of proximal phalanx of thumb | radial | extends thumb |
| extensor pollicis longus | middle 1/3rd ulna & interosseous membrane | base of distal phalanx of thumb | radial | extends thumb |
| extensor indicis | posterior surface of ulna | extensor expansion of index finger | radial | extends index finger |

# Arteries of the Posterior Fascial Compartment of the Forearm

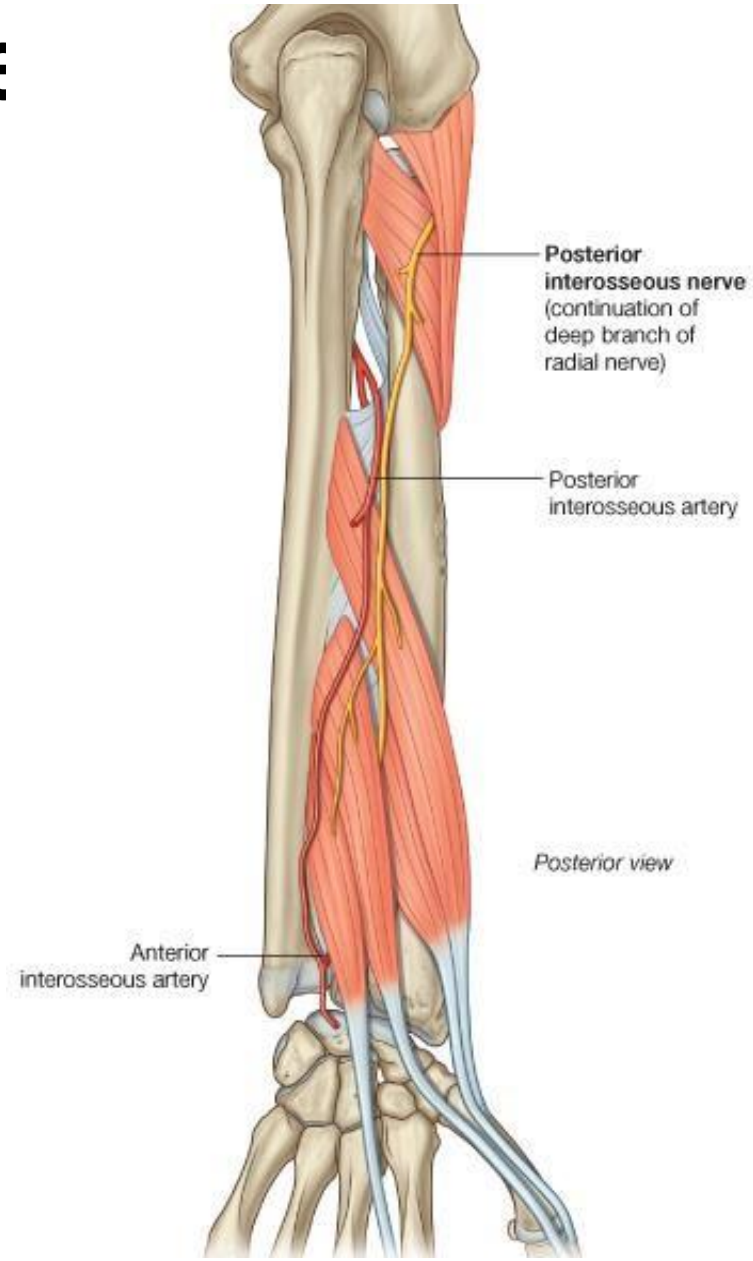
- The anterior and posterior interosseous arteries arise from the common interosseous artery, a branch of the ulnar artery
- They pass downward on the anterior and posterior surfaces of the interosseous membrane, respectively, and supply the adjoining muscles and bones.
- They end by taking part in the anastomosis around the wrist joint.




The common interosseous artery (of the ulnar artery) gives anterior and posterior interosseous arteries.
Anterior part: continues in the anterior compartment of forearm and pierces into the posterior compartment near the wrist.
Posterior part: pierces into the posterior compartment of forearm and stays there and anastomoses with the anterior part near the wrist.

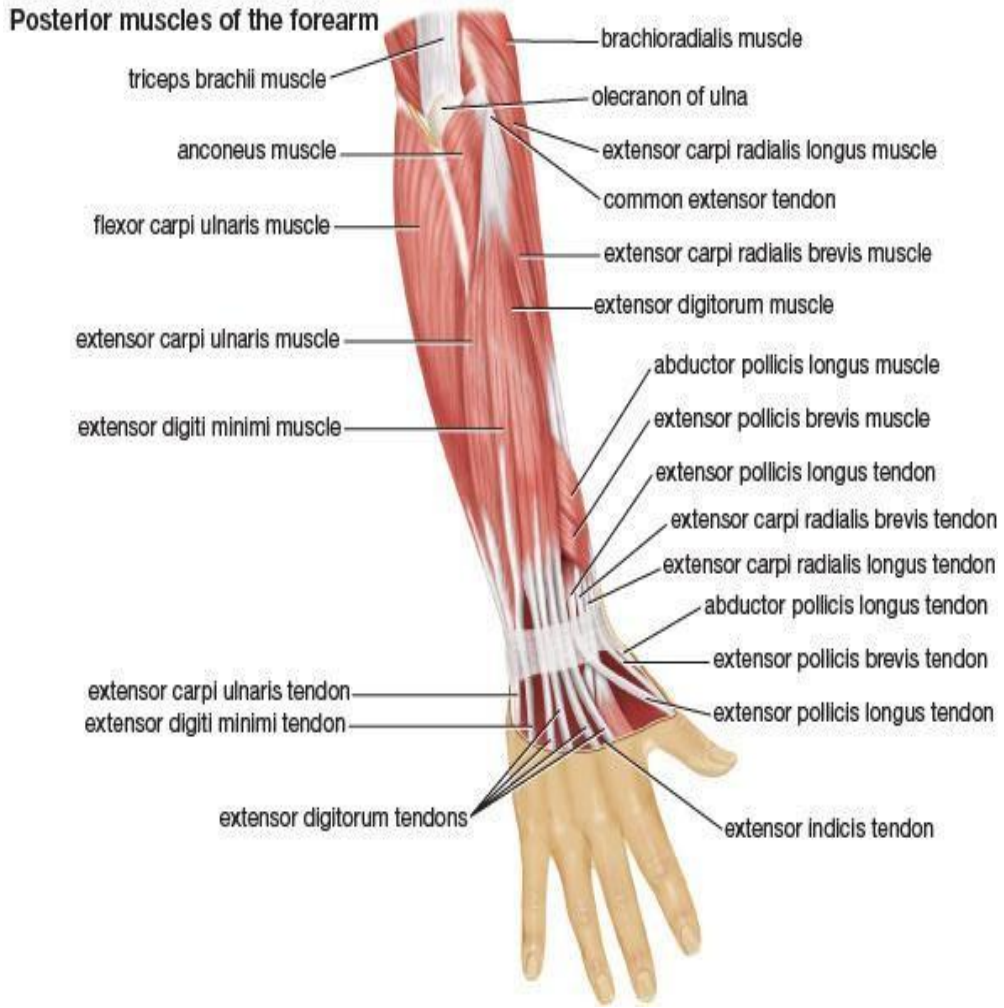
# Deep Branch of the Radial Nerve

- The deep branch arises from the radial nerve in front of the lateral epicondyle of the humerus in the cubital fossa
- pierces the supinator and winds around the lateral aspect of the neck of the radius in the substance of the muscle to reach the posterior compartment of the forearm.
- The nerve descends in the interval between the superficial and deep groups of muscles
- It eventually reaches the posterior surface of the wrist joint.
- Branches:
  - Muscular branches
  - Articular branches to the wrist and carpal joints



# Extensor Retinaculum

- The extensor retinaculum is a thickening of deep fascia that stretches across the back of the wrist and holds the long extensor tendons in position.
- converts the grooves on the posterior surface of the distal ends of the radius and ulna into six separate tunnels for the passage of the long extensor tendons.
- Each tunnel is lined with a synovial sheath, which extends above and below the retinaculum on the tendons.
- The tunnels are separated from one another by fibrous septa that pass from the deep surface of the retinaculum to the bones.
- The retinaculum is attached medially to the pisiform bone and the hook of the hamate and laterally to the distal end of the radius.
- The upper and lower borders of the retinaculum are continuous with the deep fascia of the forearm and hand, respectively.
- It creates fixation for the tendons



# Carpal Tunnel

- The bones of the hand and the flexor retinaculum form the carpal tunnel
- The median nerve lies in a restricted space between the tendons of the flexor digitorum superficialis and the flexor carpi radialis muscles

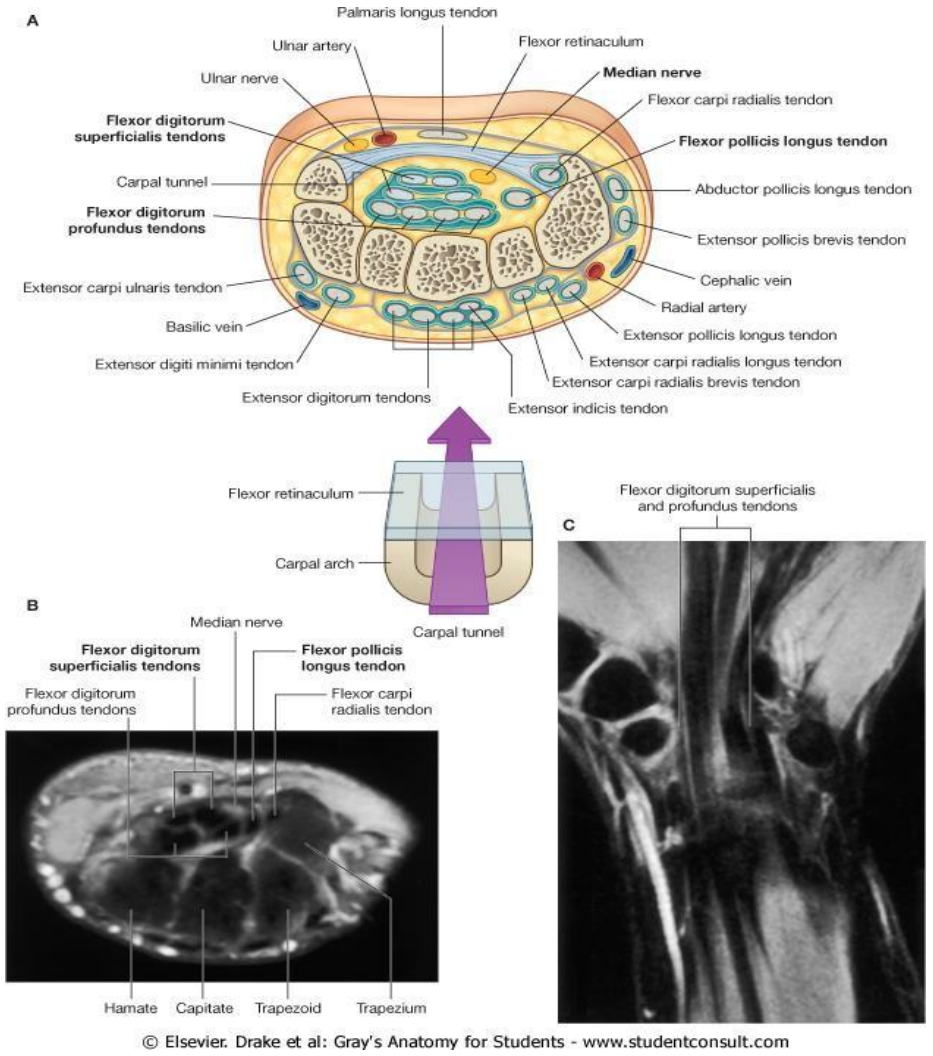
Carpal tunnel syndrome will be discussed in detail in lecture 7

# Structures on the Anterior Aspect of the Wrist

3 Ulnar (VAN) and 3 Palmar (4 to 6)

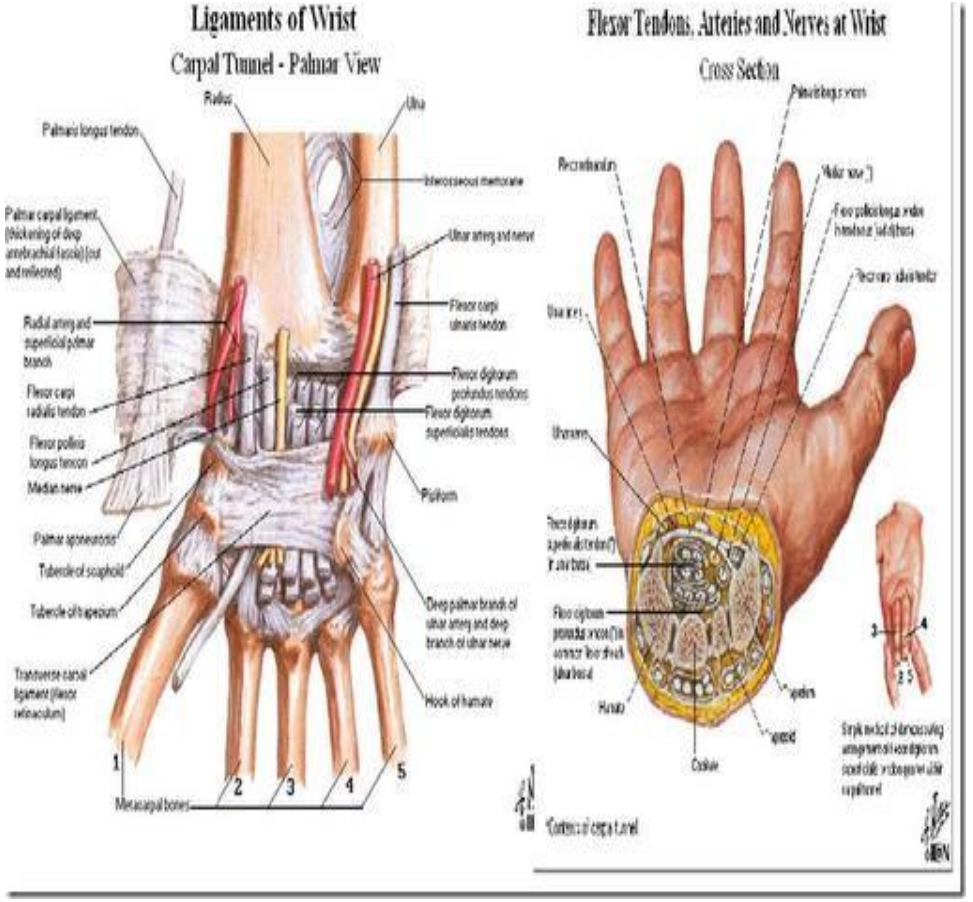
- The following structures pass superficial to the flexor retinaculum *from medial to lateral.*

1. Flexor carpi ulnaris tendon, ending on the pisiform bone.
2. Ulnar Nerve lies lateral to the pisiform bone.
3. Ulnar Artery **and Vein** lies lateral to the ulnar nerve.
4. Palmar cutaneous branch of the ulnar nerve.
5. Palmaris longus tendon (if present), passing to its insertion into the flexor retinaculum and the palmar aponeurosis.
6. Palmar cutaneous branch of the median nerve.



These were explained in lecture 5
See modified 4 slide 32

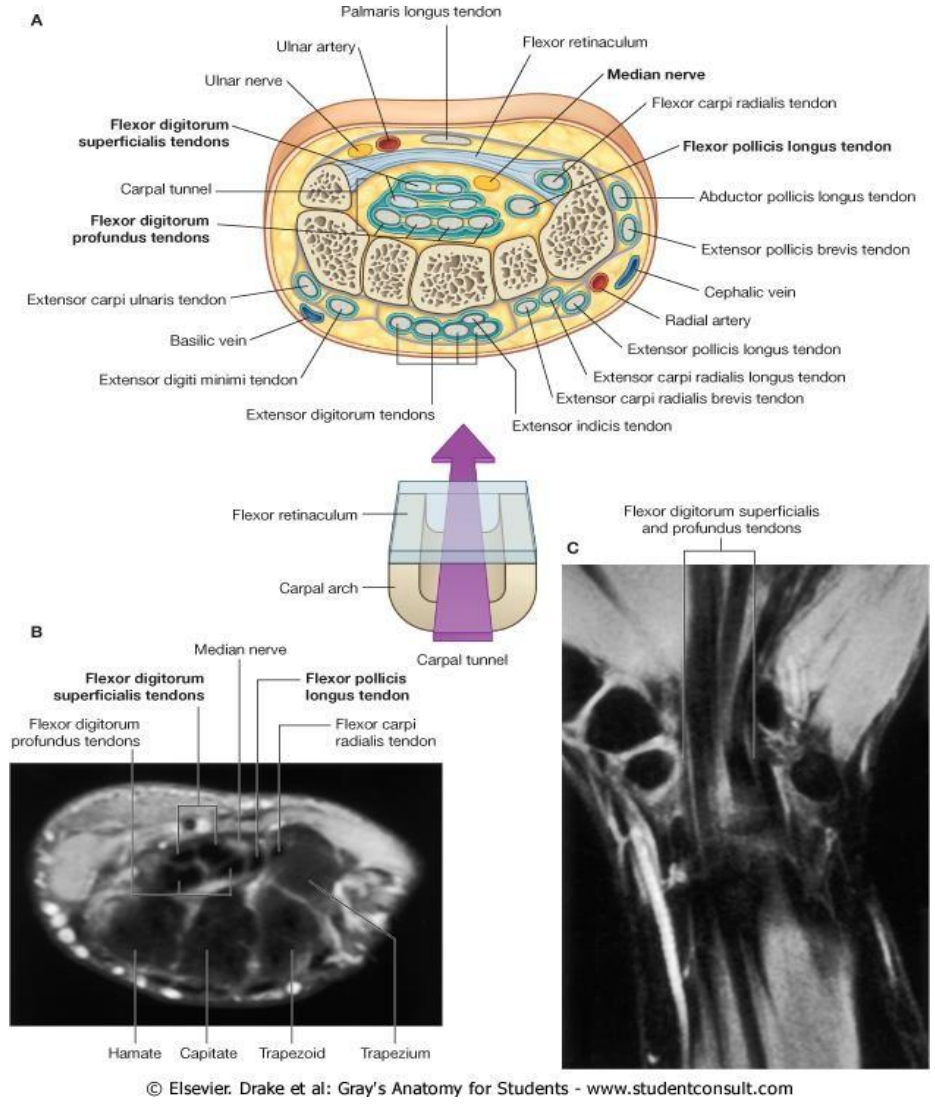
- The following structures pass beneath the flexor retinaculum *from medial to lateral.*
- Flexor digitorum superficialis tendons and, posterior to these, the tendons of the flexor digitorum profundus; both groups of tendons share a common synovial sheath.
- Median nerve
- Flexor pollicis longus tendon surrounded by a synovial sheath
- Flexor carpi radialis tendon going through a split in the flexor retinaculum. The tendon is surrounded by a synovial sheath.



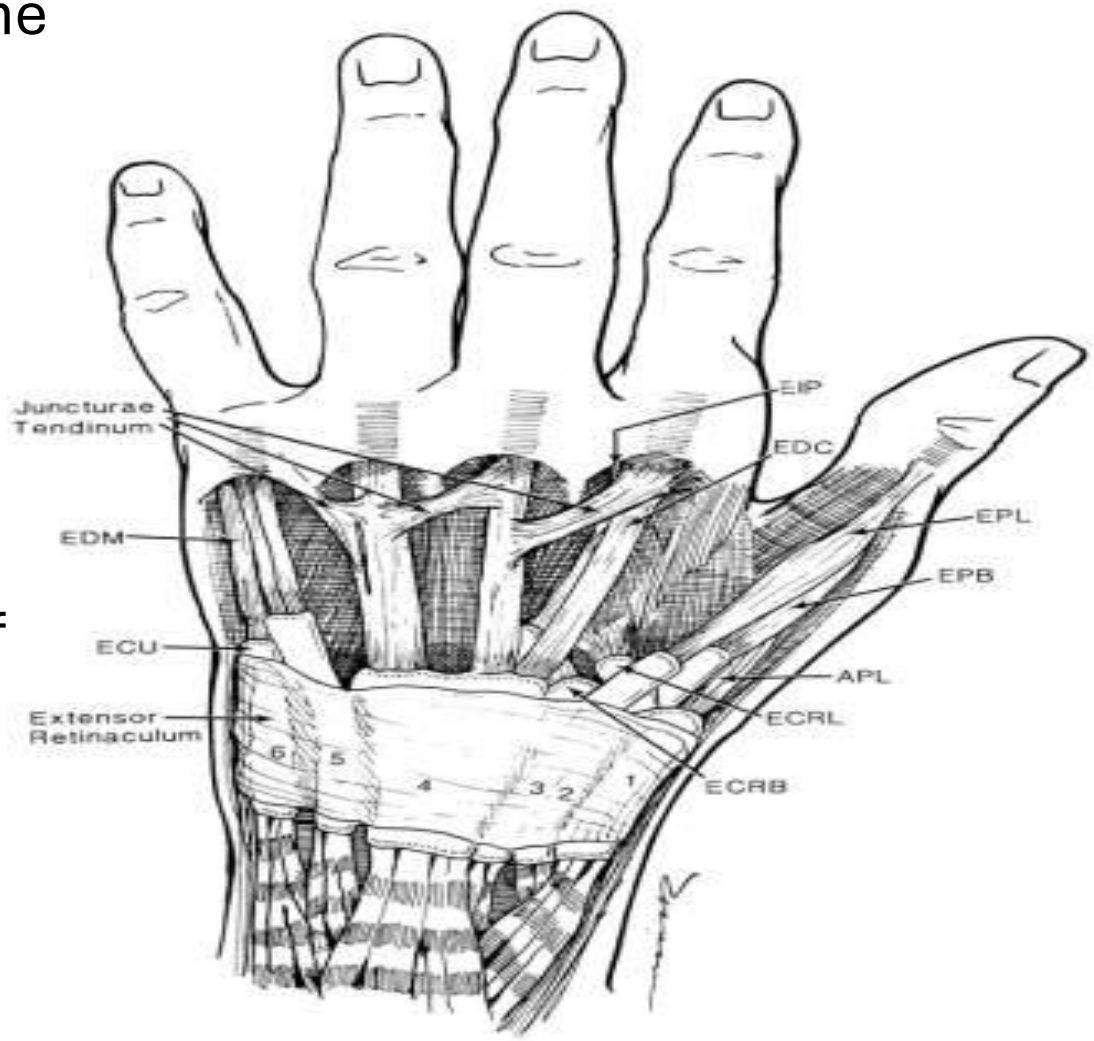
# Structures on the Posterior Aspect of the Wrist

- The following structures pass superficial to the extensor retinaculum *from medial to lateral*.

1. Dorsal (posterior) cutaneous branch of the ulnar nerve.
2. Basilic vein. (Starts from the little finger)
3. Cephalic vein. (Starts from the thumb)
4. Superficial branch of the radial nerve.

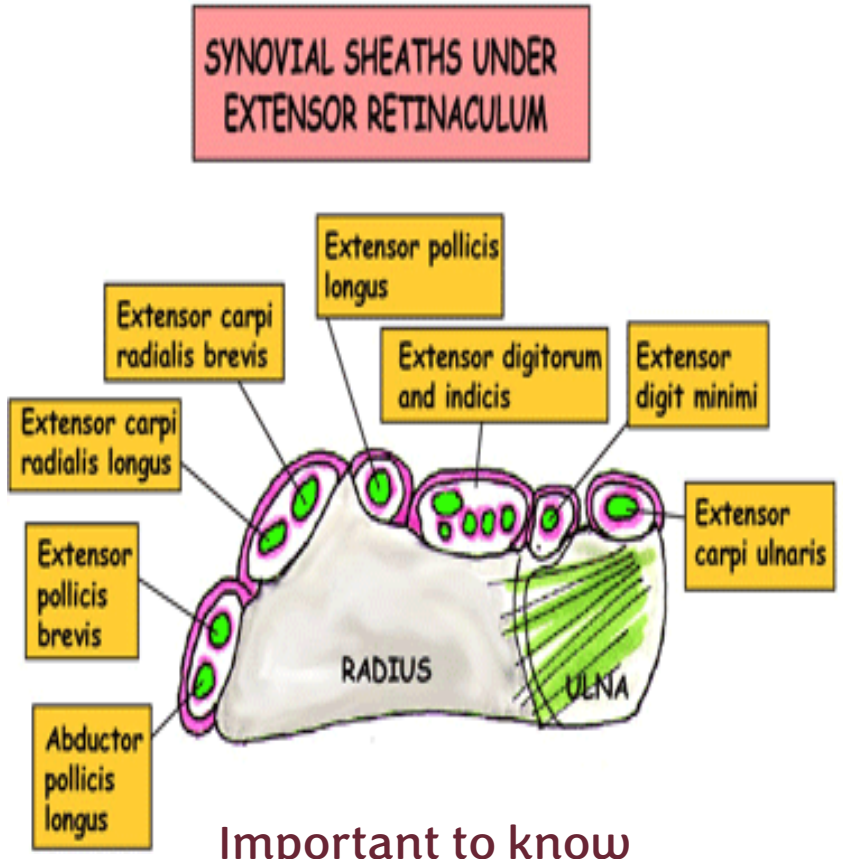


- Beneath the extensor retinaculum, fibrous septa pass to the underlying radius and ulna and form six compartments that contain the tendons of the extensor muscles.
- Each compartment is provided with a synovial sheath, which extends above and below the retinaculum.
- The following structures pass beneath the extensor retinaculum *from medial to lateral*.
    1. **Extensor carpi ulnaris tendon** which grooves the posterior aspect of the head of the ulna into the 5th metacarpal bone.
    2. **Extensor digiti minimi tendon** situated posterior to the distal radioulnar joint.
    3. **Extensor digitorum** and **extensor indicis tendons** share a common synovial sheath and are situated on the lateral part of the posterior surface of the radius.



4. **Extensor pollicis longus tendon** winds around the medial side of the dorsal tubercle of the radius.
5. **Extensor carpi radialis longus** and **brevis tendons** share a common synovial sheath and are situated on the lateral part of the posterior surface of the radius.
6. **Abductor pollicis longus** and the **extensor pollicis brevis tendons** have separate synovial sheaths but share a common compartment.

- The radial artery reaches the back of the hand by passing between the lateral collateral ligament of the wrist joint and the tendons of the abductor pollicis longus and extensor pollicis brevis




Important to know

# EXTENSOR RETINACULUM

## **<u>*STARTING FROM LATERAL SIDE*</u>

| COMPARTMENT | STRUCTURES |
|---|---|
| I | Abductor pollicis longus |
| | Extensor pollicis brevis |
| II | Extensor carpi radialis longus |
| | Extensor carpi radialis brevis |
| III | Extensor pollicis longus . |
| IV | Extensor digitorium |
| | Extensor indicis |
| | Post interrosseous nerve |
| | Ant nerve interrosseous artery |
| V | Extensor digiti minimi |
| VI | Extensor carpi ulnaris. |

# For any feedback, scan the code or click on it.

Corrections from previous versions:

| Versions | Slide # and Place of Error | Before Correction | After Correction |
|---|---|---|---|
| V0 → V1 | 5<br><br>13 | **Action for both**<br><br>We can move the little finger and index finger more than the other fingers because they are innervated by specific muscles: the extensor digitorum for the index finger and the extensor digiti minimi for the little finger | **Action for Extensor carpi radialis longus**<br><br>We can move the little finger and index finger more than the other fingers because they are innervated by specific muscles: the extensor indices for the index finger and the extensor digiti minimi for the little finger |
| V1 → V2 | | | |

# رسالة من الفريق العلمي:


الليلة 29 رمضان فلا تفوتوها