

The Forearm 2

Extensor & lateral Compartments of the Forearm

1-Lateral Fascial Compartment (at the lateral side of the forearm)

*Some books mention the lateral compartment contain just the Brachioradialis and they consider that the extensor carpi radialis longus in the extensor compartment

*Other books mention that the lateral compartment contain the Brachioradialis and the extensor carpi radialis longus because the origin of the two muscles is above the lateral epicondyle (common extensor origin/tendon) exactly from the lateral supracondylar ridge of humerus.

*So we consider that the Lateral Fascial Compartment contain both (the Brachioradialis and the extensor carpi radialis longus) , for these two muscles :

* blood (arterial) supply : radial & brachial arteries.

* nerve supply : radial nerve.

1- brachioradialis :

- **origin** : from the Lateral supracondylar ridge of humerus

- **insertion of brachioradialis is** : Base of styloid process of radius

** **Note** : brachial artery divides into ulnar and radial arteries before it arrives the cubital fossa , and supplies the brachialis and brachioradialis muscles.

** Nerve supply to the muscles: Radial nerve (before its division at the level of the lateral epicondyle to give superficial and deep branches)

** **note** : Brachioradialis is called (عضلة الكارتيه) because when we do that position < this muscle do the flexion at elbow joint & mid prone position → this is the action of this muscle



2-the extensor carpi radialis longus muscle :

- **Origin** : from the Lateral supracondylar ridge of humerus

- **Insertion** : Posterior surface of base of second metacarpal bone

- **Action** : extension of the forearm

*radial nerve pierces the lateral intermuscular septum above the lateral epicondyle and becomes in the anterior compartment of the forearm , then this nerve divides into :

- Deep branch of the radial nerve pierces the supinator muscle and it goes to the posterior compartment and supply all muscles there except 3 muscles :
 - 1- Brachioradialis
 - 2- the extensor carpi radialis longus
 - 3- anconeus muscles ((anconeus is a small muscle could be found at the back of the elbow joint))

** the Deep branch has a 2nd name which is : posterior interosseous nerve. (important)

- Superficial branch could be found under the cover of Brachioradialis, it moves toward the back of the hand and gives cutaneous to lateral 2/3 of the back of the hand (we will discuss it more when we take The hand) , in fact this area supplied by superficial branch is variable in size.

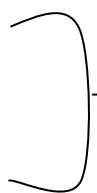
2- Posterior Fascial Compartment of the Forearm

Muscles in this compartment are divided into: superficial and deep groups

The superficial group includes the:

- 1- extensor carpi radialis brevis,
- 2- extensor digitorum,
- 3- extensor digiti minimi,
- 4- extensor carpi ulnaris,
- 5- and anconeus (it's the only has a nerve supply from the radial nerve , others (superficial & deep groups) from the posterior interosseous (deep branch nerve) .

The deep group includes :

- 1- the supinator, (located between the ulna and radius bones)
 - 2- abductor pollicis longus,
 - 3- extensor pollicis brevis ,
 - 4- extensor pollicis longus,
 - 5- and extensor indicis.
- 
- these are the boundaries snuff box

These muscles are supplied by the deep branch of radial nerve (posterior interosseous nerve)

*supination opposite to pronation

Note: biceps` action is supination & flexion (struing)

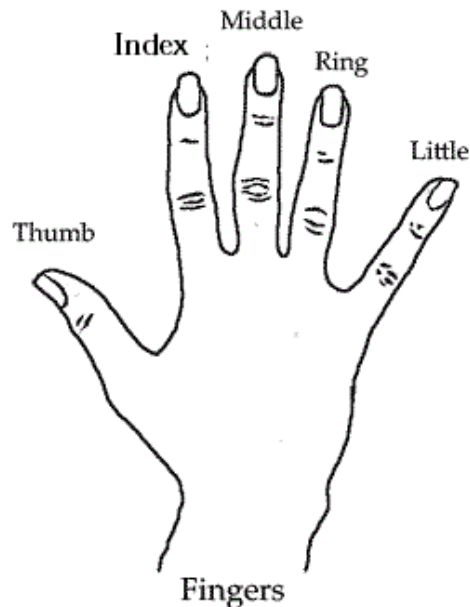
Some Locations:

extensor carpi ulnaris at the ulnar side

extensor carpi radialis brevis & longus at the lateral side (but brevis is more medial)

Some tendons :

- extensor indicis has a tendon in the index finger
- extensor digiti minimi has a tendon in the little finger
- abductor pollicis longus + extensor pollicis brevis + extensor pollicis longus each one has a tendon in the thumb



Blood supply: Posterior and anterior interosseous arteries (mainly from the posterior) , but we include the anterior one because in the upper border of pronator quadrates this artery goes backward and became at the posterior compartment and it supplies the carpal bones muscles

Nerve supply to the muscles: Deep branch of the radial nerve (posterior interosseous nerve)... except anconeus , brachioradialis , extensor carpi radialis longus.

Muscles :

1- EXTENSOR CARPI RADIALIS BREVIS

Origin : Lateral epicondyle of humerus. & Radial collaeral lig of elbow

Insertion : Dorsal surfaces of bases of 2nd and 3rd metacarpals .

Note : it Lies deep to extensor carpi radialis longus.

Action : Extends and abducts wrist.

NerveSupply : Posterior interosseous nerve.

2- EXTENSOR DIGITORUM

It makes a dorsal digital expansion (extensor expansion) for the deep fascia , also we can consider it as a connective tissue which connects with the base of the middle phalanges , while 2 other tendon connect with 2 distal phalanges to make extension

Origin : Lateral epicondyle of humerus

Note : Forms four tendons, each passes into the four medial fingers

Insertion : Base of dorsal surfaces of middle and distal phalanges.

Action :Extends all joints of hand also for the 4 fingers and wrist joint

Nerve Supply : Posterior interosseous nerve

Note : we can find some **EXTENSOR DIGITORUM** tendons connected to each other

***index finger has a separate tendon** with the tendon from (extensor indicis)

***little finger has a separate tendon** with the tendon from (extensor digiti minimi)

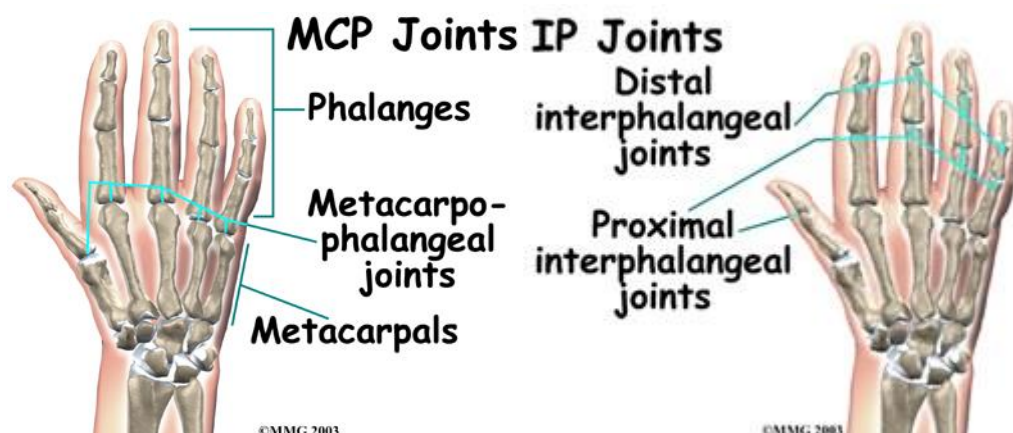
3- EXTENSOR DIGITI MINIMI

Origin : Lateral epicondyle of humerus

Insertion : Dorsal digital expansion of little finger along with the tendon of extensor digitorum.

Action :Extends MetaCarpialPhalangeal (MCP) &InterPhalangeal (IP) joints of little finger

Nerve Supple : Posterior interosseous nerve



4-EXTENSOR CARPI ULNARIS

***it`s at the ulnar side**

Origin : Lateral epicondyle of the humerus +

back of ulna Posterior border of ulna by an aponeurosis

Insertion : Medial side of the base of 5th metacarpal may extend to back pisiform before .

Action : Extends and adducts the wrist

Nerve Supply : Posterior interosseous nerve

***Notice that this muscle (not like flexor carpi ulnaris) has a name with ulnaris but its innervations is NOT from ulnar nerve**

5- ANCONIUS

*** triangular in shape**

Origin : Posterior surface of lat epicondyle of humerus.

Insertion : Lateral aspect of Olecranon process , Proximal 1/4th of posterior surface of ulna.

Action : Weak extensor of elbow

Nerve Supply : Radial Nerve

**** Note : (ABE) anconeus + Brachioradialis + the extensor carpi radialis longus :) → Nerve Supply : Radial Nerve**

But for other muscles .. the nerve supply is posterior interosseous.

6- SUPINATOR

***very important muscle (in exam) because :**

A) pierced by deep branch of radial nerve

b) it crosses the capital fossa while it is consider as a deep muscle of the extensor

c) it has a superficial & deep heads (origins)

Origin :

Superficial head:

1- lateral epicondyle of humerus,

2- radial (lateral) collateral ligament

3- annular ligament... (surrounds the head of radius)... and this important in the pronation and supination.

Deep head : supinator crest of ulna, posterior part of triangular area in front of it

Insertion : Lateral surface of proximal 1/3 of radius

Action : Supinates the forearm and hand

Nerve supply : Posterior interosseous nerve

Note : annular ligament which surrounds the head of radius is so important in pronation and supination because the head of radius move inside this ligament

7- ABDUCTOR POLLICIS LONGUS

Origin : Proximal posterior surfaces of the radius and ulna, and interosseous membrane.

Insertion : Radial side of the base of 1st metacarpal . And Trapezium

Action : Abduction and extension of the thumb at carpometacarpal joint

Nerve Supply : Posterior interosseous nerve

8- EXTENSOR POLLICIS BREVIS

Origin : Posterior surface of radius, interosseous membrane.

Insertion : Dorsal surface of base of the proximal phalanx of thumb.

Action : Extends proximal phalanx and metacarpal of thumb.

Nerve Supply: Posterior interosseous nerve.

9- EXTENSOR POLLICIS LONGUS

- It goes to the distal phalanges

Origin : Posterior surface of ulna , interosseous membrane .

Insertion : Dorsal surface of distal phalanx of the thumb

Action : Extends , abducts all joints of the thumb

Nerve Supply : Posterior interosseous nerve.

***snuff box boundaries :**

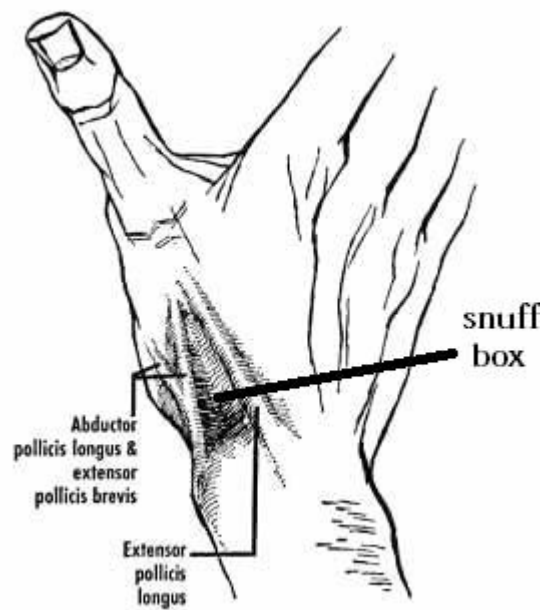
Anterior : abductor pollicis longus, extensor pollicis brevis

Posterior : extensor pollicis longus

Base : scafoïd & trapezium

Roof : skin (superficial fascia)

It content : radial artery , cephalic vein , superficial branch of radial nerve



10-EXTENSOR INDICES

Origin : Posterior surface of ulna distal to extensor pollicis longus, interosseous membrane

Insertion : Ulnar (medial) side of the tendon of extensor digitorum of index finger.

***opposite to** extensor digiti minimi (lateral to the side of extensor digitorum`s tendon)

Action : Extension of Index finger.

Nerve Supply : Posterior interosseous nerve

Arteries of the Posterior Fascial Compartment of the Forearm

- 1- The anterior and posterior interosseous arteries arise from the common interosseous artery, a branch of the ulnar artery
- 2- Anterior interosseous lies in the anterior compartment on the interosseous membrane.
- 3- posterior interosseous artery supply all muscles of the extensor (branches: muscular , joint , carpal anastomosis around carpal bones) , and connected with anterior interosseous.. because anterior interosseous (artery & nerve) pierces interosseous membrane at the upper border of pronator quadratus) .. goes from anterior to posterior. The nerve doesn't have any role in the posterior because there is posterior interosseous nerve but the artery takes part in the anastomosis around the carpal bones.
- 4- So anterior & posterior interosseous arteries end by taking part in the anastomosis around the wrist joint (carpal bones).

**** Note :** posterior interosseous nerve (Deep Branch of the Radial Nerve) is the major nerve in the posterior compartment < and supplies all extensor muscles except (ABE) ... anconeus , brachioradialis , and extensor carpi radialis longus.

**** This nerve could be injured at the level of the nick of radius , so the hand can not have full extension (just little extension) , so it will cause finger drop ,, not wrist drop !**

While the radial nerve could be injured at the mid of the shaft of radius, so it will cause wrist drop (hand drop : which contain finger drop)

برافو عليك برافو عليك برافو عليك فهدا شاطر !.....

Summary :

Common site of injury :

- Posterior interosseous ----→ nick of radius
- Radial nerve ----→ mid of the shaft of radius

Effect of this injury :

- Posterior interosseous --→ finger drop
- Radial nerve --→ wrist drop

* extensor carpi radialis longus ,which crosses the wrist at the base of the 2ed metacarpal, prevents wrist drop (hand drop) , but causes finger drop!

** The division of radial nerve is at the level of lateral epicondyle

Extensor Retinaculum

- 1- Part of deep fascia
- 2- At the lateral side its connected to styloid process & scaphoid
- 3- At the medial (ulnar) side its connected to pisiform & hook of hamate
- 4- Its function is to fixation of extensor tendons
- 5- (4) structures pass superficial to it (above the extensor retinaculum) which are ; 2 veins (cephalic vein + basilic vein) and 2 nerves (superficial branch of radial nerve + dorsal branch of ulnar nerve).... 2×2
- 6- It contain 6 compartments deep to it caused by septa (the septa extend from extensor retinaculum to the carpal bones) , works as tunnels for the passage and the fixation of the tendons ...

***** The compartments : (from lateral to medial)**

- a) 1st tunnel found lateral to styloid process of radius and contains :
(abductor pollicis longus tendon & extensor pollicis brevis tendon)
- b) 2nd tunnel found medial to styloid process and contains : (extensor carpi radialis longus tendon & extensor carpi radialis brevis tendon)
- c) 3rd tunnel contains : (extensor pollicis longus tendon) , this tendon is stabilized by radial tubercle
- d) 4th tunnel lateral to inferiorradioulnar joint contains : (extensor digitorum tendons & extensor indicis)
- e) 5th tunnel behind the joint (inferiorradioulnar joint) contains : (extensor digiti minimi tendon)
- f) 6th tunnel .. medial to the joint contains : (extensor carpi ulnaris tendon)

Remember that : 6 structures pass above the flexor retinaculum which is ; 3 ulnar (ulnar nerve +ulnar artery + ulnar vein) and 3 palmar (palmar branch of ulnar nerve + palmar branch of median nerve + Palmaris longus tendon) **3×3**

Carpal tunnel

- 1- It is a groove in the carpal bones
- 2- Located deep to the flexor retinaculum
- 3- Median nerve passes through it , under the flexor retinaculum
- 4- Its called carpal tunnel syndrome when it presses the median nerve

Structures on the Anterior Aspect of the Wrist

******(4) flexor digitorum superficialis tendons pass through the carpal tunnel as two levels ... little & index → deep level , middle & ring → superficial level (not at the same level like _--_) , while the (4) flexor digitorum profundus tendons pass through the carpal tunnel at the same level

Posterior compartment

*** superficial to extensor retinaculum**

*** Contents from lateral to medial :**

cephalic vein ,

basilic vein ,

nerves (superficial branch of radial & dorsal branch of ulnar)

****there is an synovial sheath that surrounds each compartment and its tendons**

For example :

- abductor pollicis longus tendon & extensor pollicis brevis tendon surrounded by one synovial sheath

- extensor carpi radialis longus tendon & extensor carpi radialis brevis tendon surrounded by one synovial sheath
- extensor pollicis longus tendon surrounded by one synovial sheath

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و آخر دعوانا أن الحمد لله رب العالمين