

Upper limb Muscles of the forearm (front)

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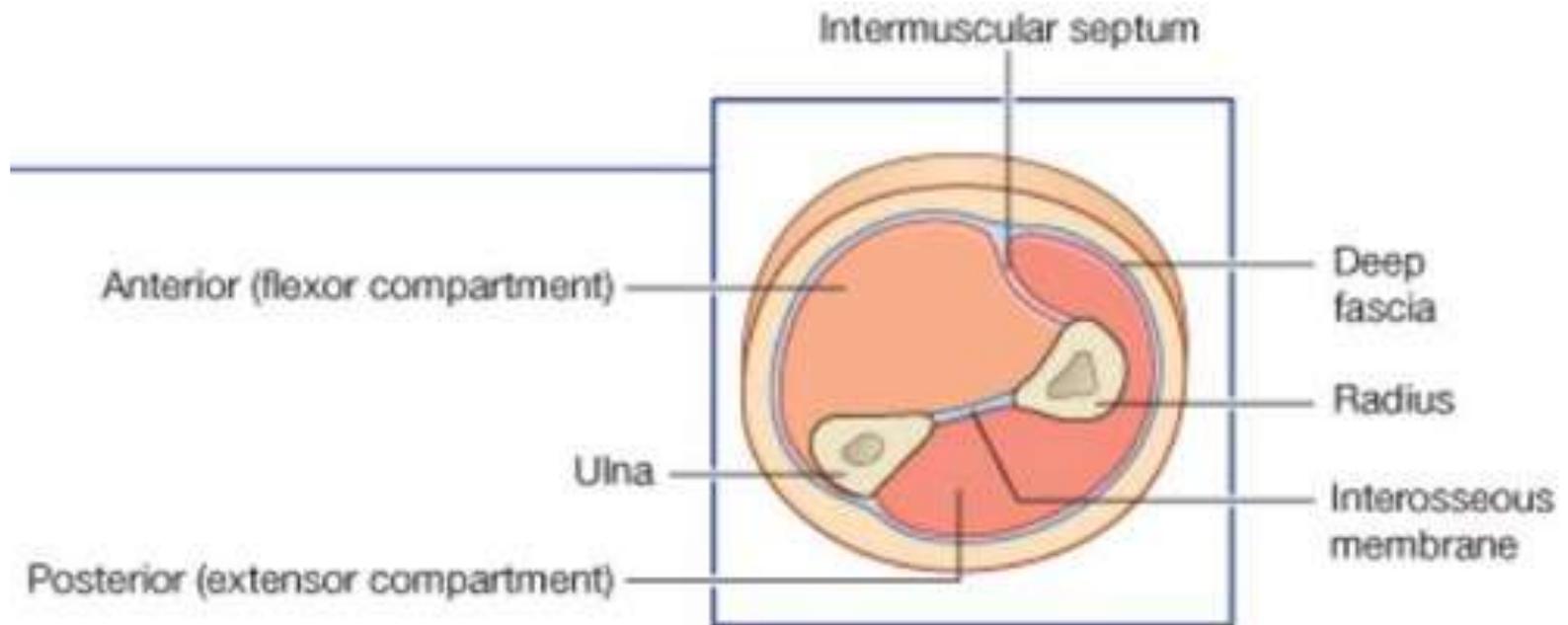
The forearm is divided into two compartments:

❑ A **ventromedial** or flexor compartment:

An anterior group (the **FLEXORS** of the wrist and fingers and the **PRONATORS**)

❑ A **dorsolateral** or extensor compartment:

A posterior group (the **EXTENSORS** of the wrist and fingers and the **SUPINATOR**)



FOREARM MUSCLES OF THE ANTERIOR COMPARTMENT

The muscles in the anterior compartment of the forearm have the following similar features:

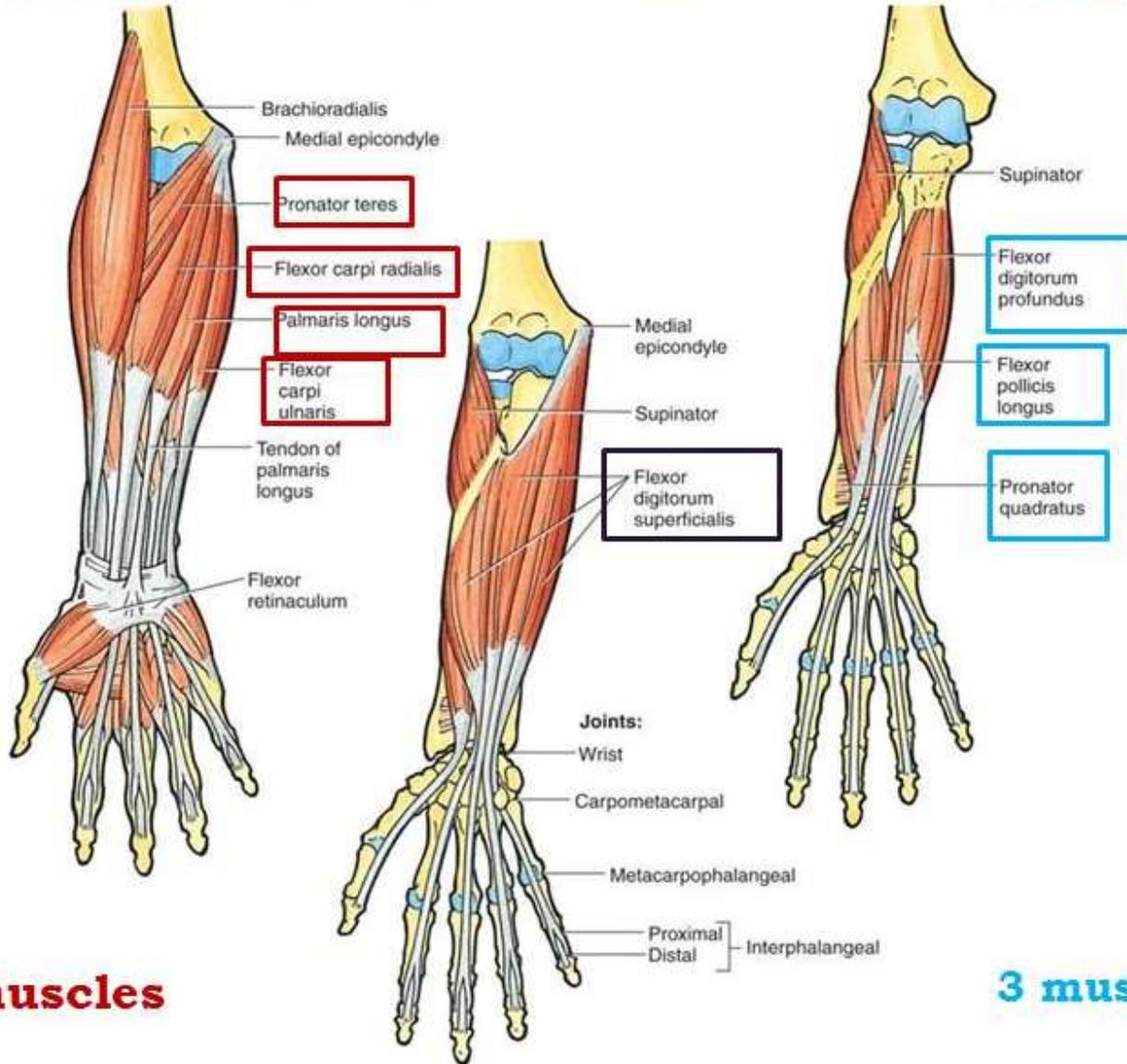
- ❑ **Common attachment [origin]: Medial epicondyle** of the humerus.
- ❑ **Common innervation: Median nerve** with minimal contribution from the ulnar nerve.
- ❑ **Common action: Flexion.**
- ❑ **The vascular supply:** branches of the ulnar and radial arteries.
- ❑ **The muscles in the anterior compartment of the forearm are divided into **THREE GROUPS**:**
 - ✓ **SUPERFICIAL**
 - ✓ **INTERMEDIATE**
 - ✓ **DEEP**



Superficial

Intermediate

Deep



4 muscles

3 muscles

Anterior views

Contents of the Anterior Fascial Compartment of the Forearm

☐ Muscles:

❖ Superficial Group, consisting of:

- ✓ The Pronator Teres
- ✓ The Flexor Carpi Radialis
- ✓ The Palmaris Longus
- ✓ The Flexor Carpi Ulnaris

❖ Intermediate Group consisting of:

- ✓ The Flexor Digitorum Superficialis

❖ Deep Group consisting of:

- ✓ The Flexor Pollicis Longus
- ✓ The Flexor Digitorum Profundus
- ✓ The Pronator Quadratus

☐ Blood supply to the muscles: Ulnar and radial arteries

☐ Nerve supply to the muscles: All the muscles are supplied

by the **MEDIAN NERVE** and its branches, EXCEPT the

I. Flexor Carpi Ulnaris and

II. The Medial Part Of The Flexor Digitorum Profundus

→ which are supplied by the **ulnar nerve**

Superficial group

❖ Pronator Teres Muscle.

العَضَلَةُ الكَابَةُ المَدَوَّرَة

❖ Flexor Carpi Radialis Muscle.

العَضَلَةُ المُنْبِيَّةُ الكُفْرِيَّةُ للرُّسْغِ

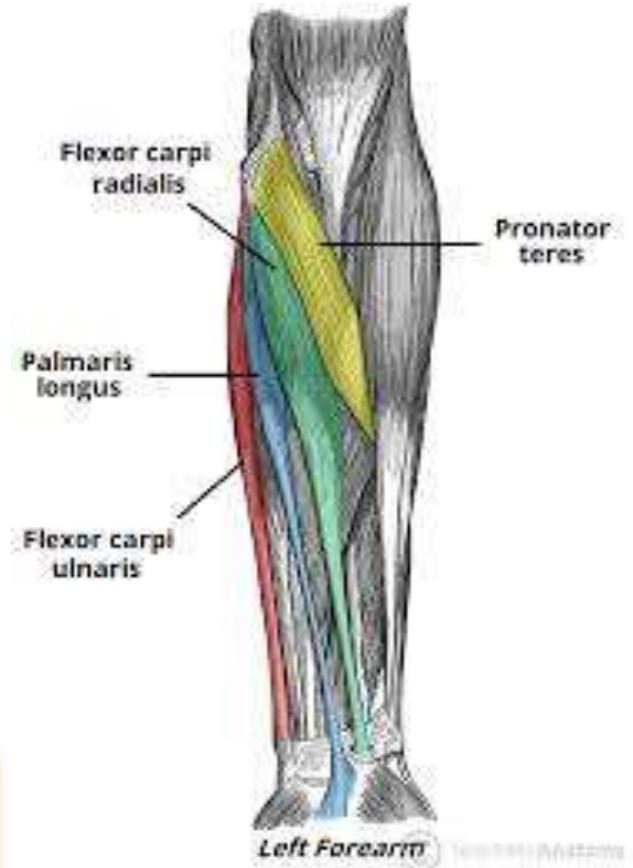
❖ Palmaris Longus Muscle.

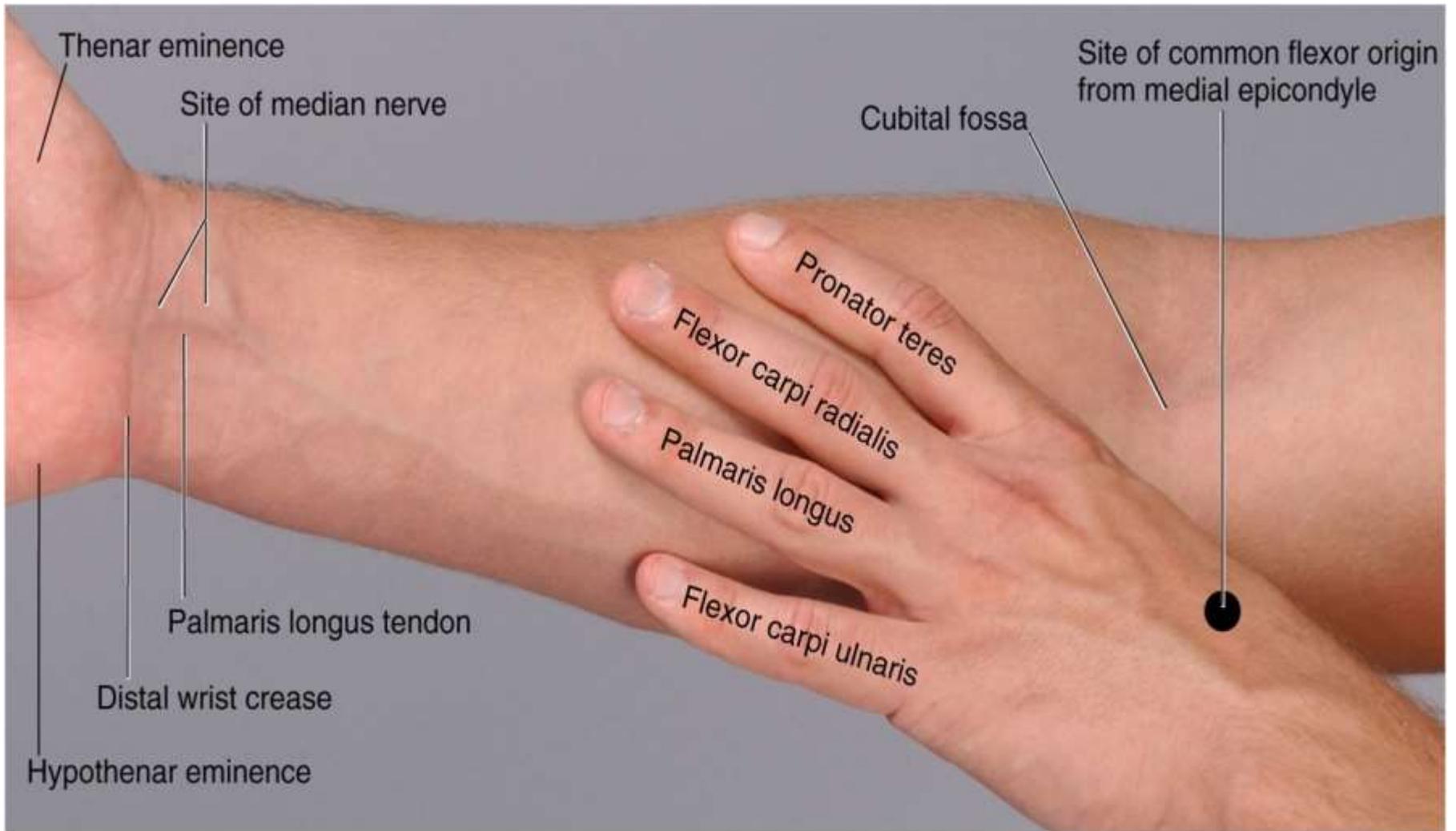
العَضَلَةُ الرَّاحِيَّةُ الطَّوِيلَة

❖ Flexor Carpi Ulnaris Muscle.

العَضَلَةُ المُنْبِيَّةُ الزَّنْدِيَّةُ للرُّسْغِ

Carpi is the genitive form of the **Latin** carpus meaning wrist → الرُّسْغِي





(A) Anterior view of supinated forearm

Pronator Teres

ORIGIN:

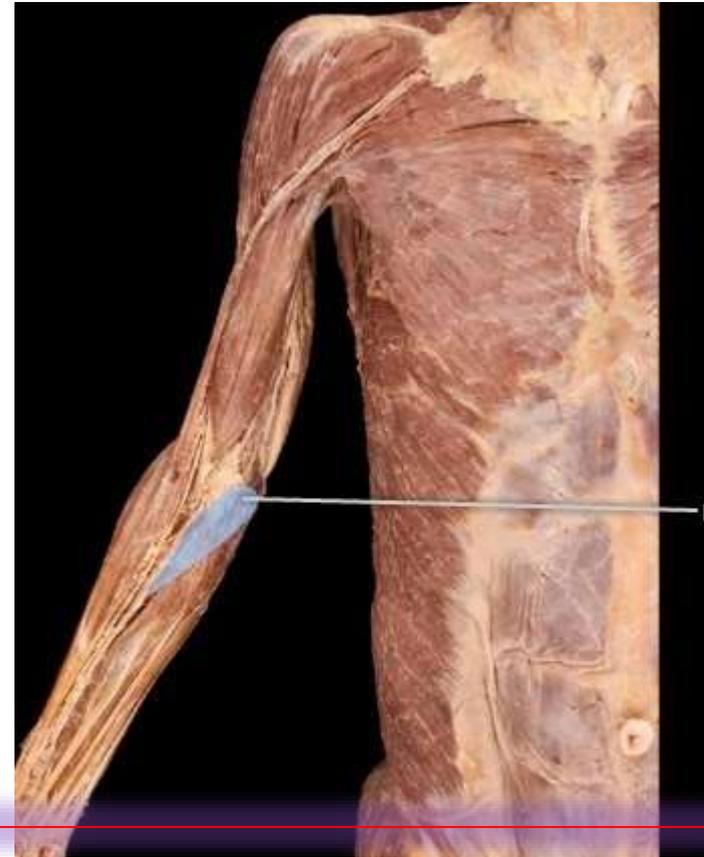
Humeral head: Medial epicondyle and supracondylar ridge of Humerus

Ulnar head: coronoid process of ulna

INSERTION: Lateral aspect of shaft of radius

NERVE SUPPLY: Median nerve C6, 7

ACTION: Pronation and flexion of forearm

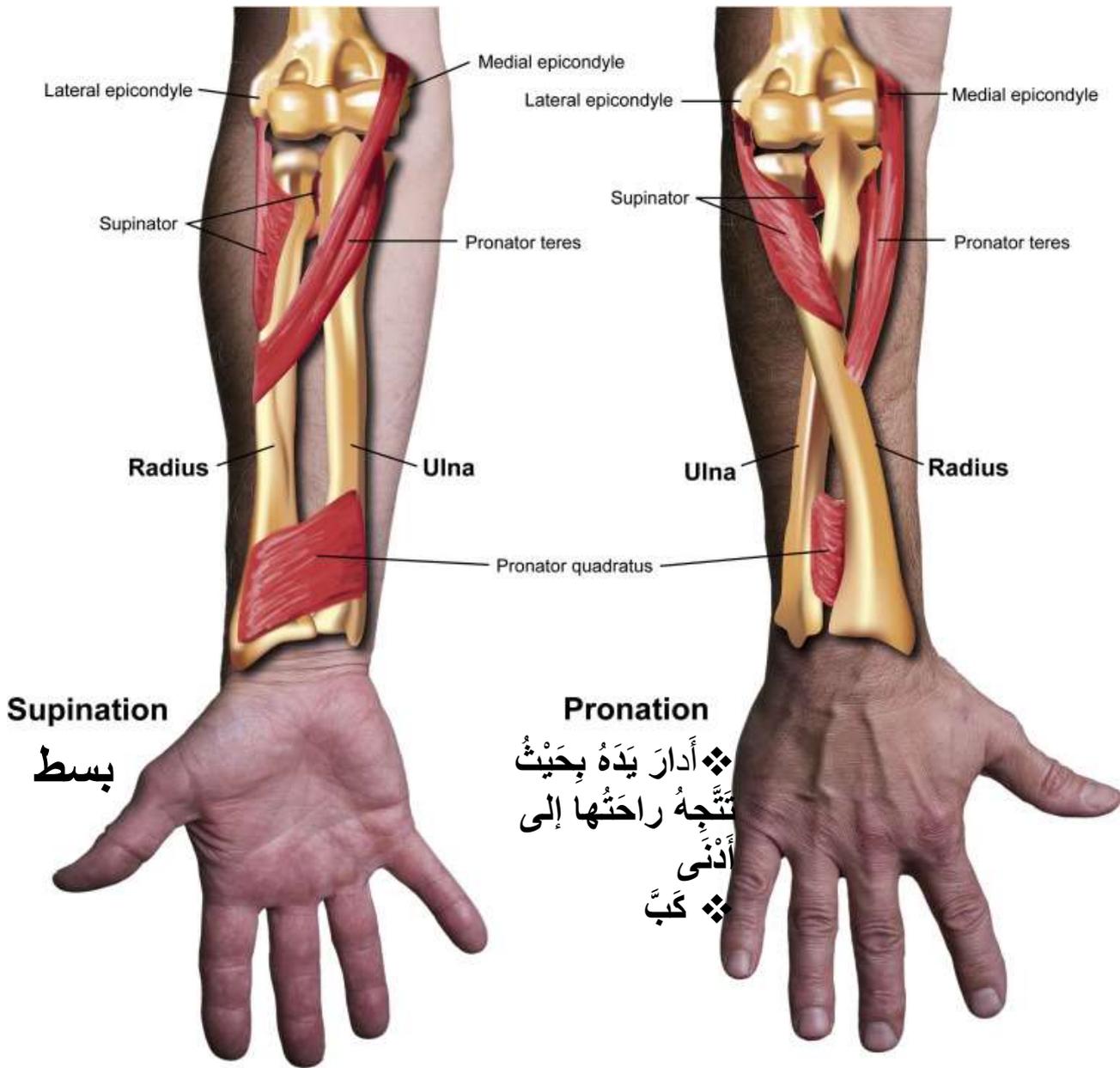


NOTE: The muscle named after its action (pronation) →

PRONATOR

Teres is a Latin word that **means** round and smooth or cylindrical.

PRONATOR TERES is **named** because of its action and shape; it is a rounded muscle that pronates



Flexor Carpi Radialis

ORIGIN: Medial epicondyle of humerus

INSERTION: Bases of second and third Metacarpal bones

NERVE SUPPLY: Median nerve

ACTION: Flexes and abducts hand at wrist joint



Flexor Carpi Ulnaris

ORIGIN:

- **Humeral head:** Medial epicondyle of humerus
- **Ulnar head:** Medial aspect of Olecranon process and posterior border of ulna

INSERTION: Pisiform bone, hook of the Hamate, base at fifth Metacarpal bone

NERVE SUPPLY: Ulnar nerve C8; T1

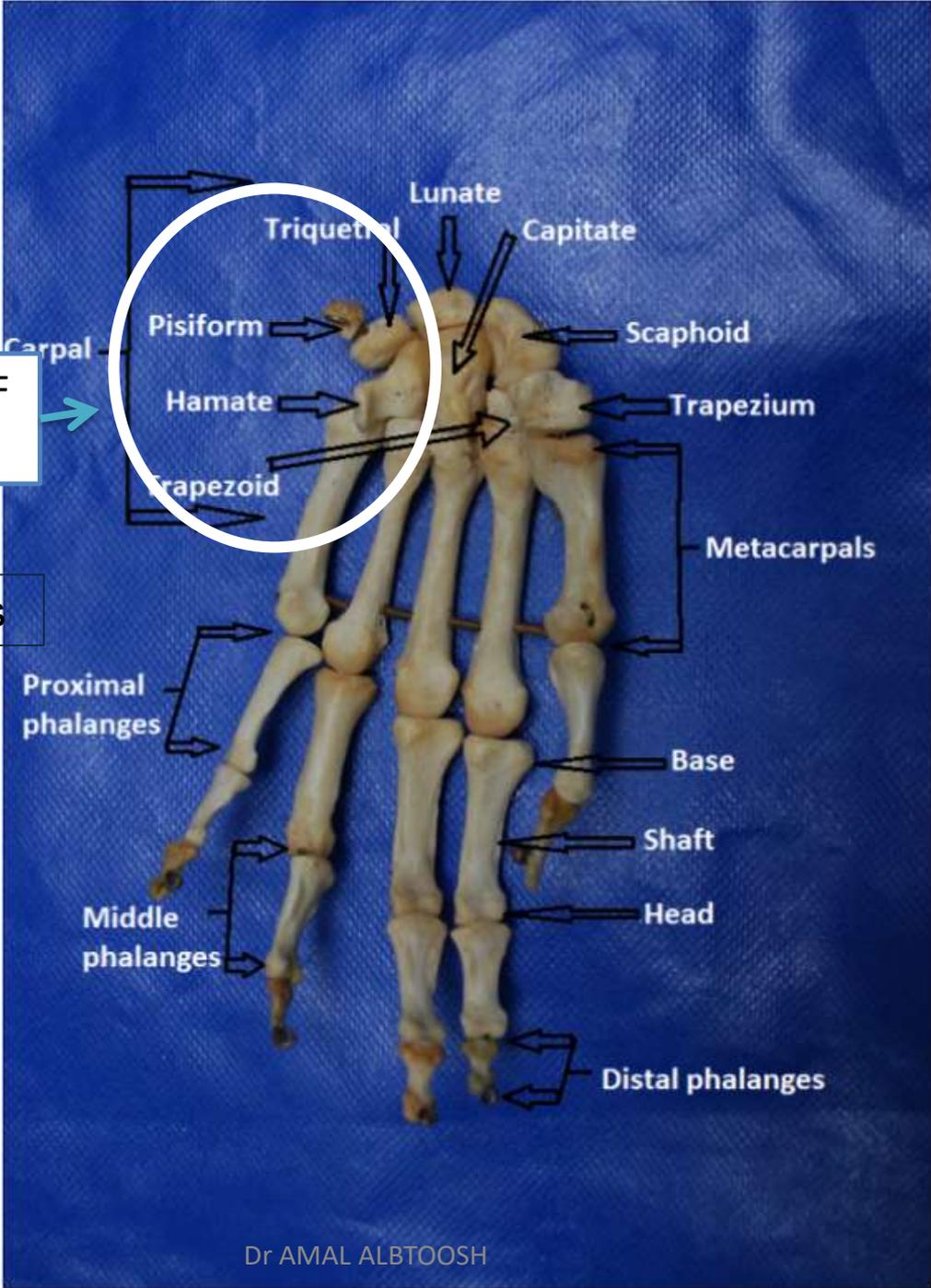
ACTION: Flexes and adducts hand at wrist joint



- ❖ The flexor carpi ulnaris is accompanied by the ulnar artery and ulnar nerve. That is why the ulnar nerve innervates the flexor carpi ulnaris.
- ❖ The flexor carpi ulnaris approaches the Pisiform then the 5th metacarpal bone.

INSERTION OF
FCU MUSCLE

FCU: Flexor Carpi Ulnaris



PALMARIS LONGUS MUSCLE

ORIGIN: Medial epicondyle of humerus

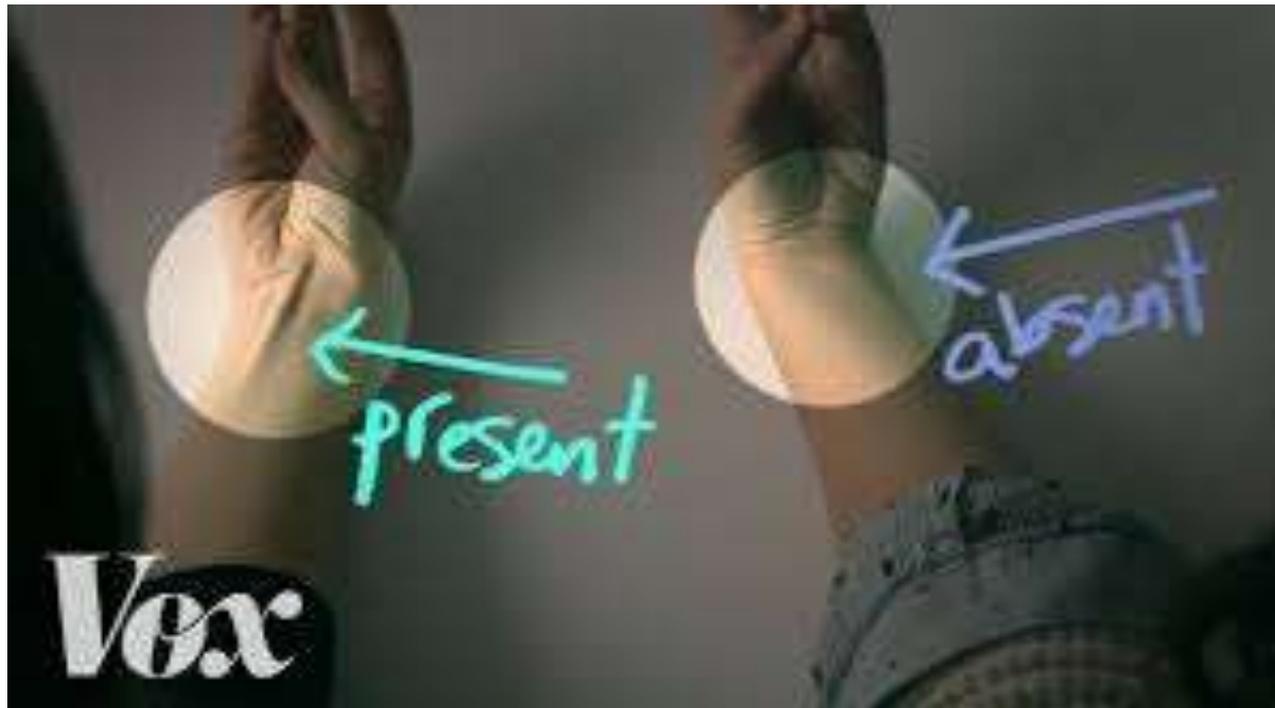
INSERTION: palmar aponeurosis

NERVE SUPPLY: Median nerve

ACTION: Flexes hand



The **palmaris longus** is a muscle visible as a small tendon between the flexor carpi radialis and the flexor carpi ulnaris, although it is not always present. It is absent in about 10-15% of the population.



INTERMEDIATE GROUP FLEXOR DIGITORUM SUPERFICIALIS MUSCLE.

Possesses two heads.

ORIGIN:

Humeroulnar head: Medial epicondyle of humerus; medial border of coronoid process of ulna

Radial head: Oblique line on anterior surface of shaft of radius.

INSERTION: Middle phalanx of medial four fingers.

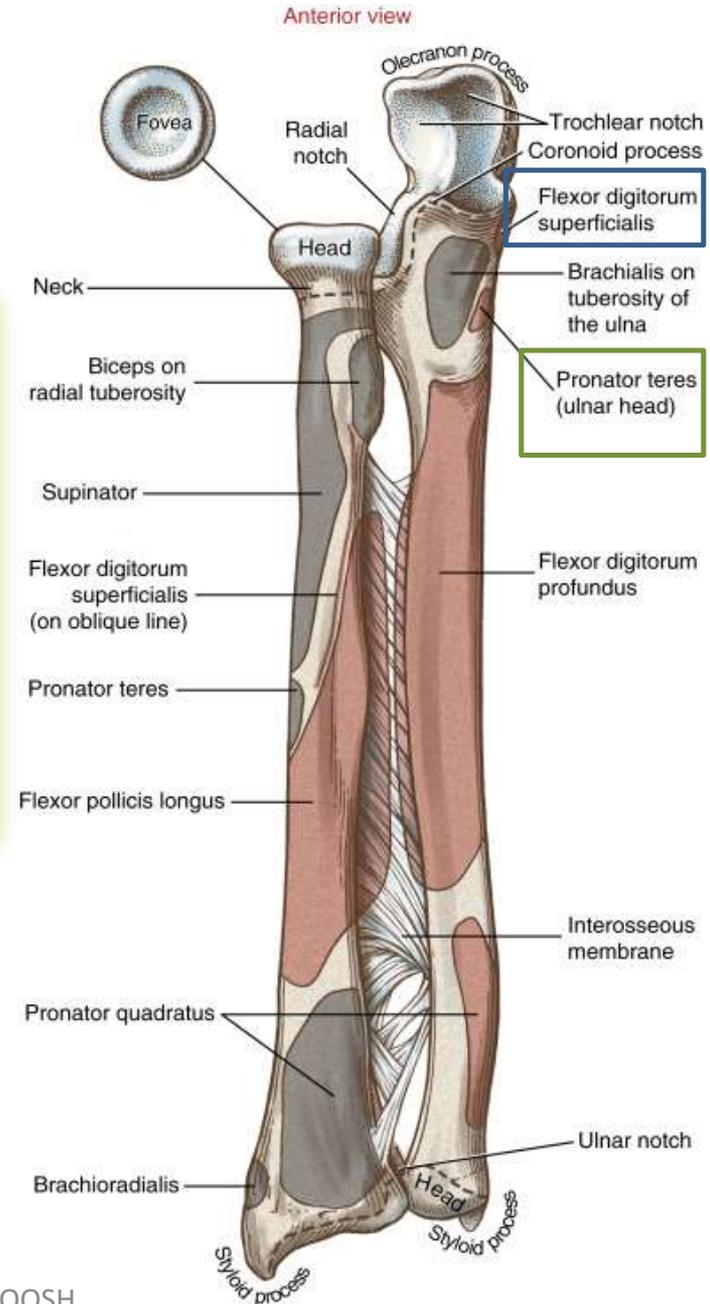
ACTION: Flexes middle phalanx of fingers and assists in flexing proximal phalanx and hand.

NERVE SUPPLY: MEDIAN NERVE



THE FOUR TENDONS OF THE FLEXOR DIGITORUM SUPERFICIALIS MUSCLE CROSS UNDER THE FLEXOR RETINACULUM AT THE WRIST AND ENTER THE HAND THROUGH THE CARPAL TUNNEL

Both the **Pronator Teres** & **Flexor digitorum superficialis muscle** Have attachment to Medial epicondyle of humerus; Medial **Border Of Coronoid Process Of Ulna**



DEEP GROUP

- FLEXOR POLLICIS LONGUS MUSCLE

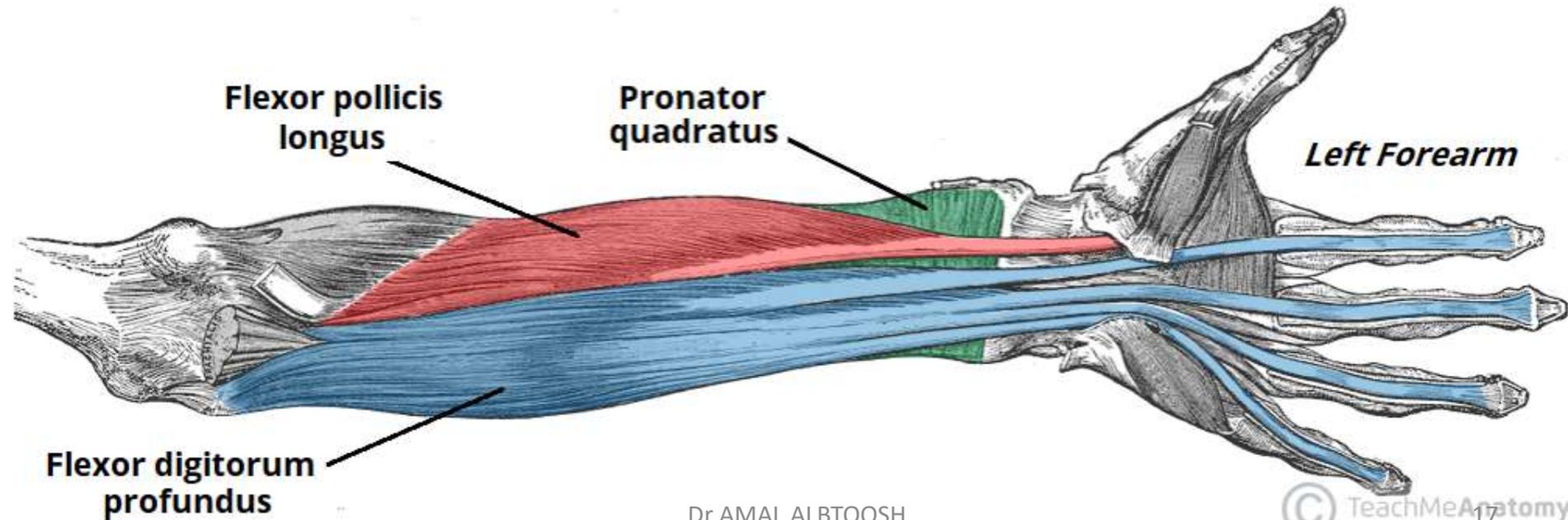
العَضَلَةُ الْمُثْنِيَّةُ الطَّوِيلَةُ لِإِبْهَامِ اليَدِ

- FLEXOR DIGITORUM PROFUNDUS MUSCLE.

العَضَلَةُ الْمُثْنِيَّةُ العَمِيقَةُ لِأَصَابِعِ

- PRONATOR QUADRATUS MUSCLE.

العَضَلَةُ الكَائِبَةُ المُرَبَّعَةُ



Flexor pollicis longus

ORIGIN: Anterior surface of shaft of radius

INSERTION: Distal phalanx of thumb

NERVE SUPPLY : Anterior interosseous branch of median nerve **C8; T1**

ACTION: Flexes distal phalanx of thumb



Flexor digitorum profundus

ORIGIN: Anteromedial surface of shaft of ulna

INSERTION: Distal phalanges of medial four fingers

NERVE SUPPLY: Ulnar (medial half) and median (lateral half) nerves

C8; T1

ACTION: Flexes distal phalanx of fingers; then assists in flexion of middle and proximal phalanges and wrist



FLEXOR DIGITORUM SUPERFICIALIS VS PROFUNDUS



M. flexor digitorum superficialis

M. flexor digitorum profundus

NERVE SUPPLY ?/ ACTION?

Flexor digitorum muscles: how they insert onto fingers

A little rhyme:

Superficialis **S**plits in **T**O **t**wo **T**o **P**ermit **P**rofundus **P**assing through

Flexor digitorum superficialis flexes at Proximal Inter Phalanges (PIP) joint

Flexor digitorum profundus flexes at Proximal Inter Phalanges (PIP) and Distal Inter Phalanges (DIP) joint

Pronator quadratus

ORIGIN: Anterior surface of shaft of ulna

INSERTION: Anterior surface of shaft of radius

NERVE SUPPLY: Anterior interosseous branch of median nerve

ACTION: Pronates forearm



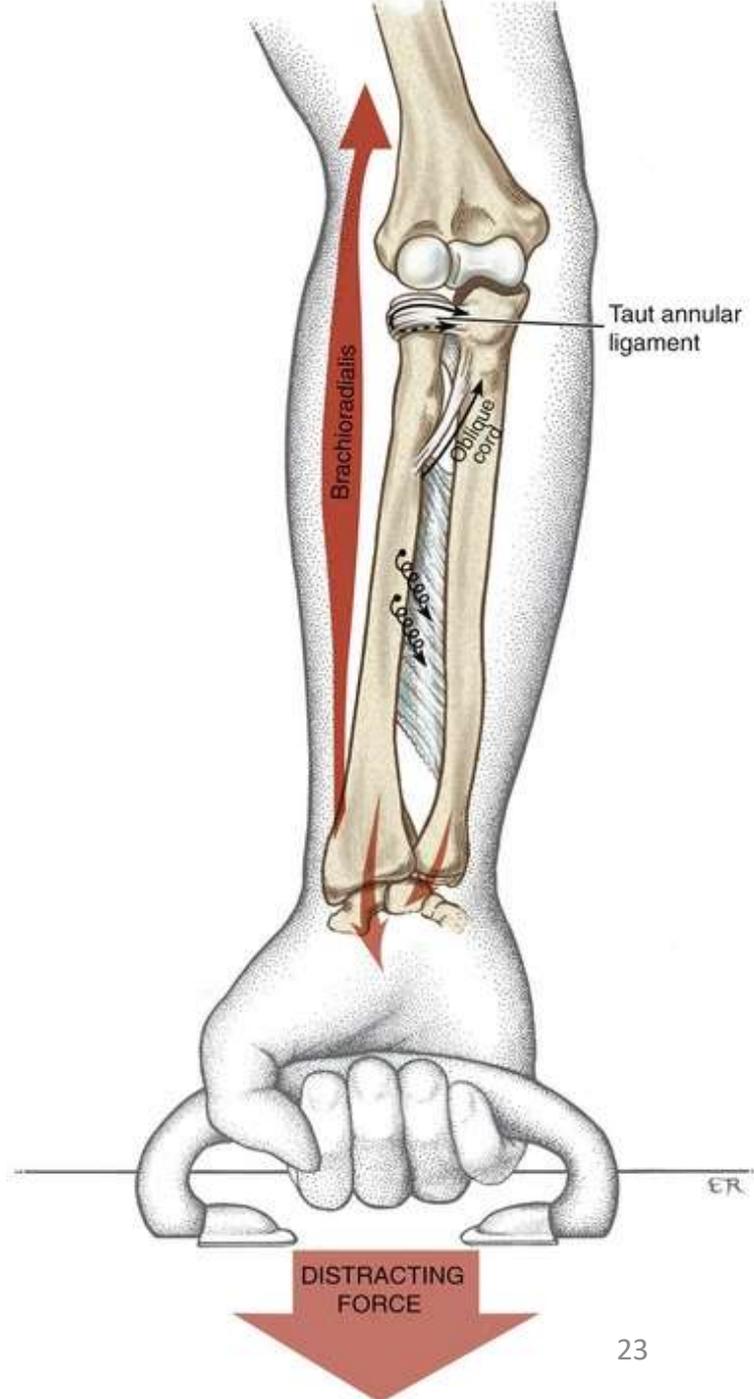
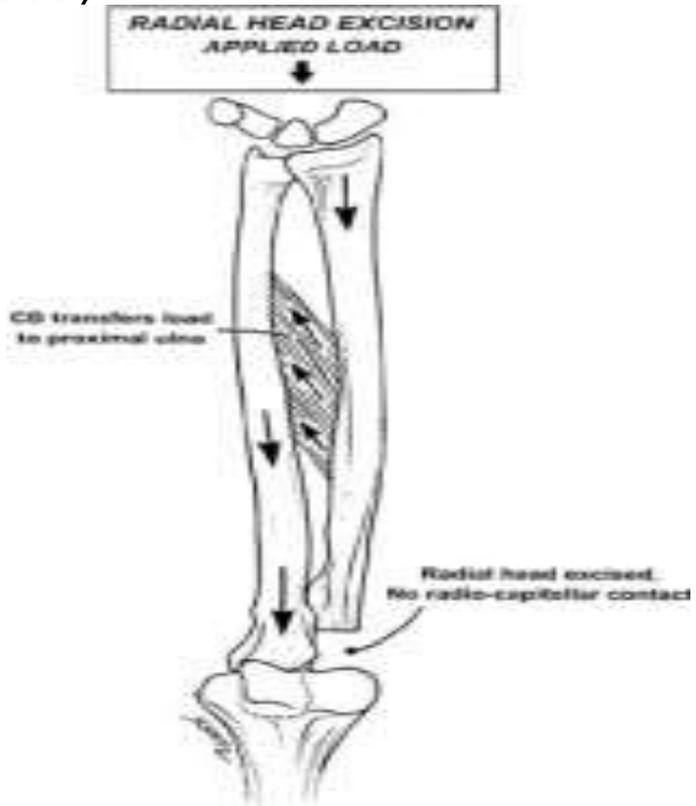
Interosseous Membrane

- is a strong membrane that unites the shafts of the radius and the ulna
- it is attached to their interosseous borders.
- Its fibers are taut [stretched or pulled tight مشدود] when the forearm is in the midprone position—that is, the position of function.
- The interosseous membrane provides attachment for neighbouring muscles. (Snell 383)



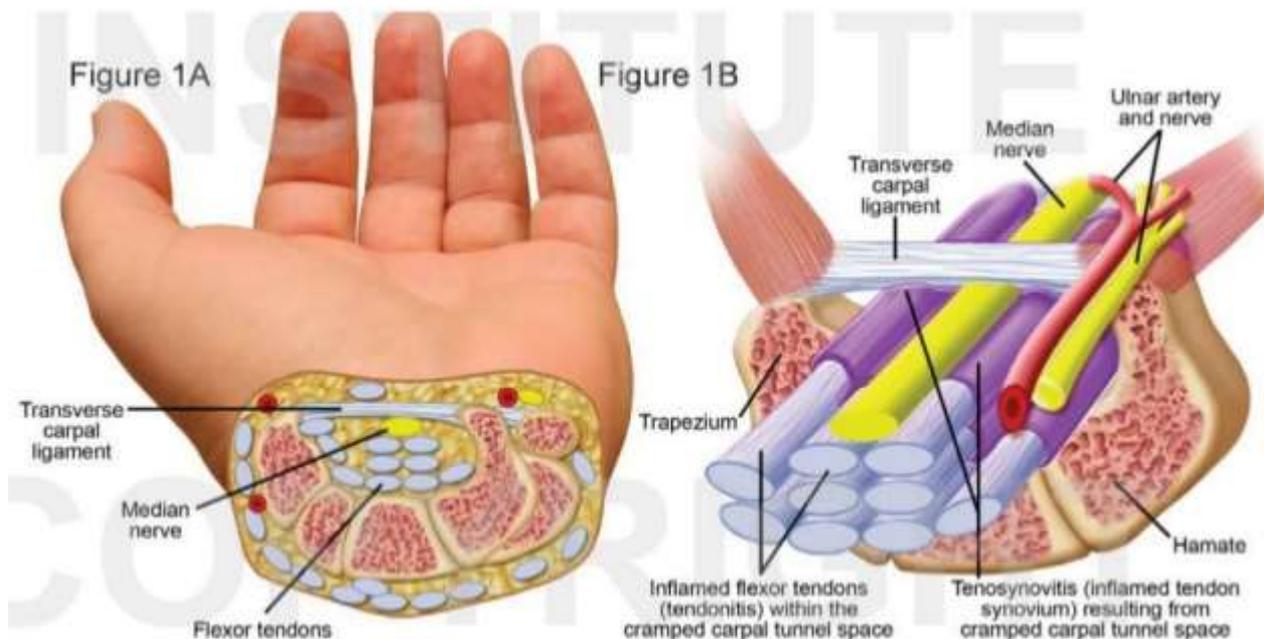
Interosseous Membrane

➤ Its fibers run obliquely downward and medially so that a force applied to the lower end of the radius (e.g., falling on the outstretched hand) is transmitted from the radius to the ulna and from there to the humerus and scapula. (Snell 383)



Flexor Retinaculum [transverse carpal ligament]

- ❑ The flexor retinaculum [مشبك - قيد] is a thickening of deep fascia
- ❑ It holds the long flexor tendons in position at the wrist.
- ❑ It stretches across the front of the wrist and converts the concave anterior surface of the hand into an osteofascial tunnel, the **carpal tunnel** → for the passage of the median nerve and the flexor tendons of the thumb and fingers



Flexor Retinaculum

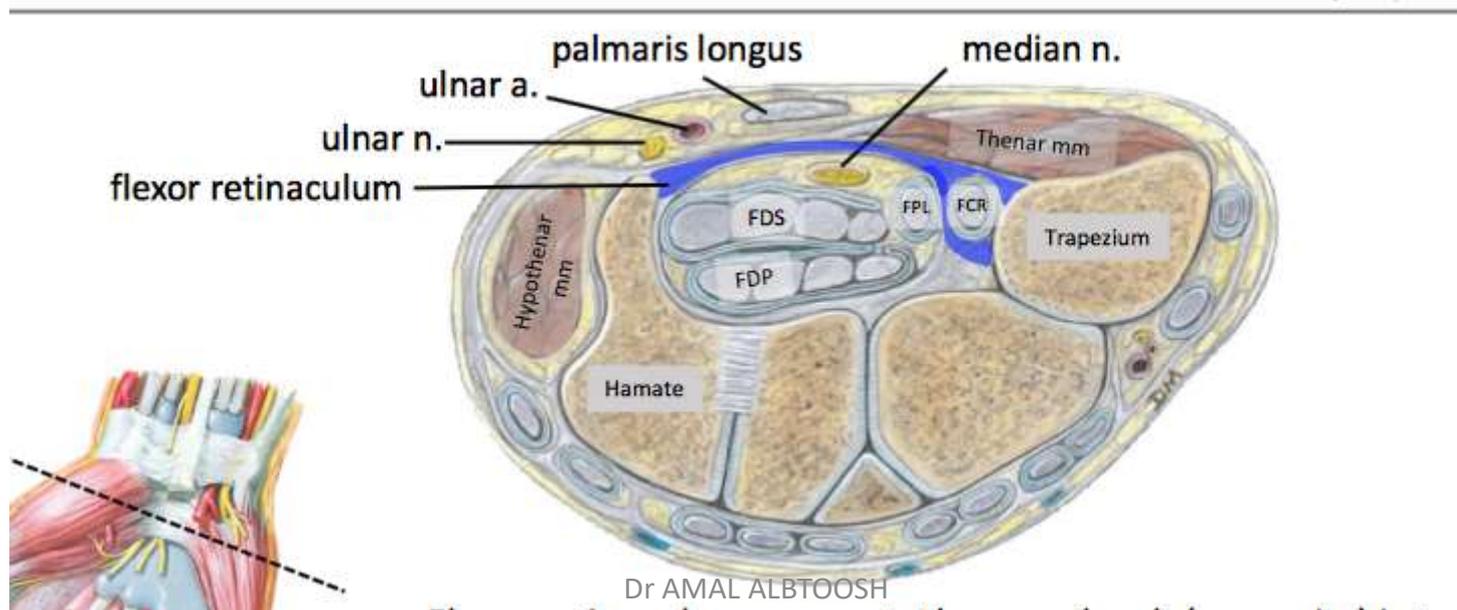
Attachment:

MEDIALY :to the Pisiform bone and the hook of the Hamate

LATERALLY: to the tubercle of the scaphoid and the trapezium bones.

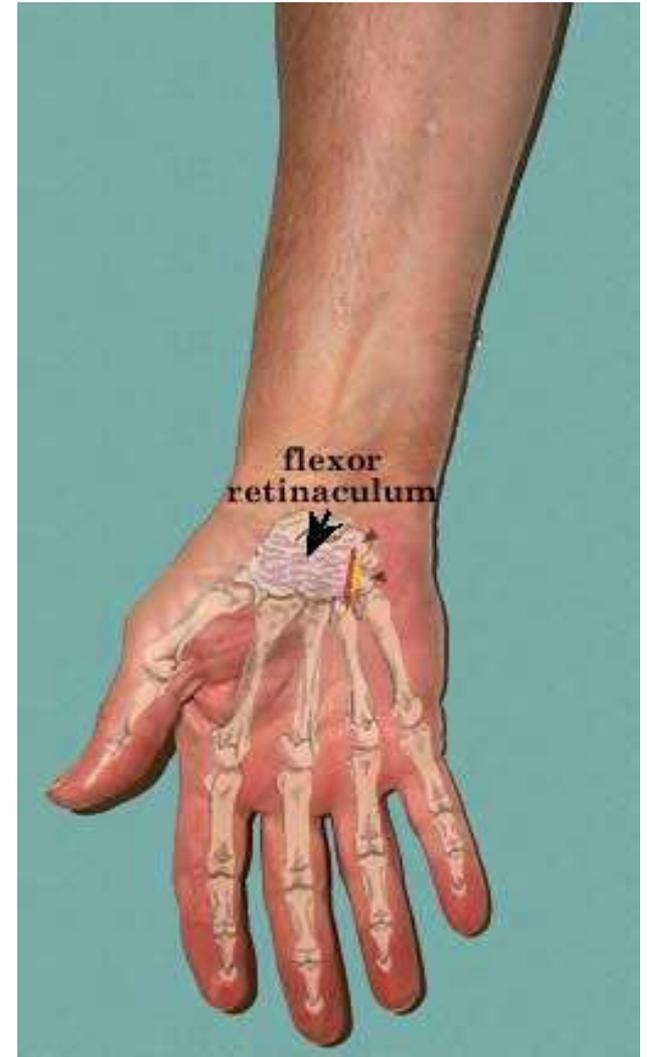
The attachment to the trapezium

➤consists of superficial and deep parts and forms a synovial lined tunnel for passage of the tendon of the flexor carpi radialis



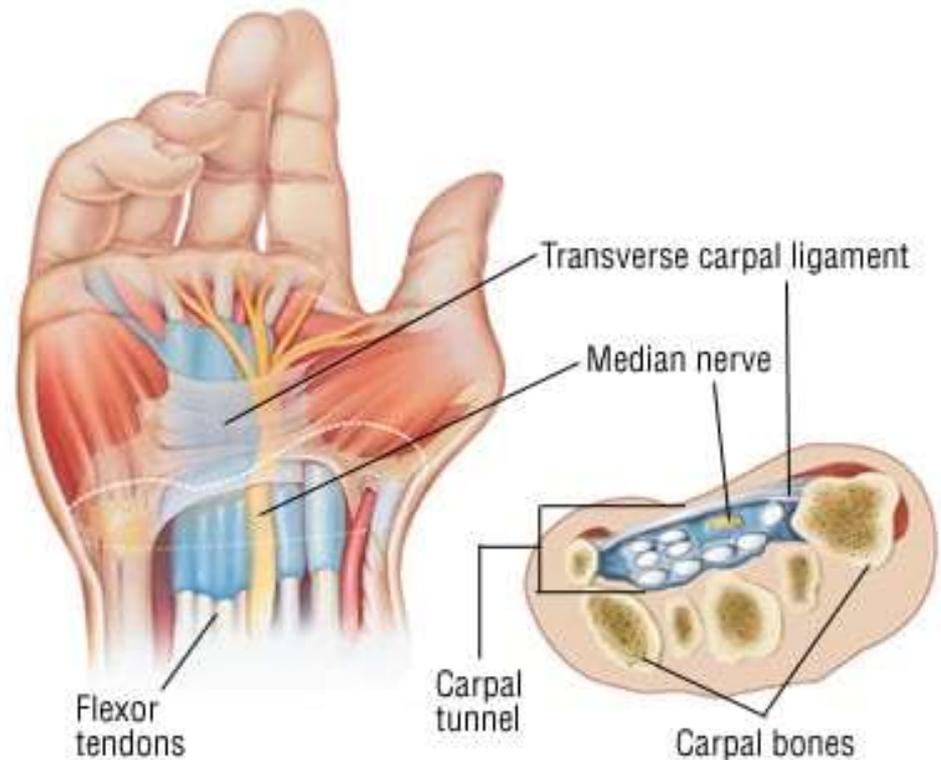
Flexor Retinaculum

- The UPPER BORDER of the retinaculum corresponds to the distal transverse skin crease [مُتَجَعَّد/ثَنِيَّة] in front of the wrist and is continuous with the deep fascia of the forearm.
- The LOWER BORDER is attached to the palmar aponeurosis [وتر عريض]

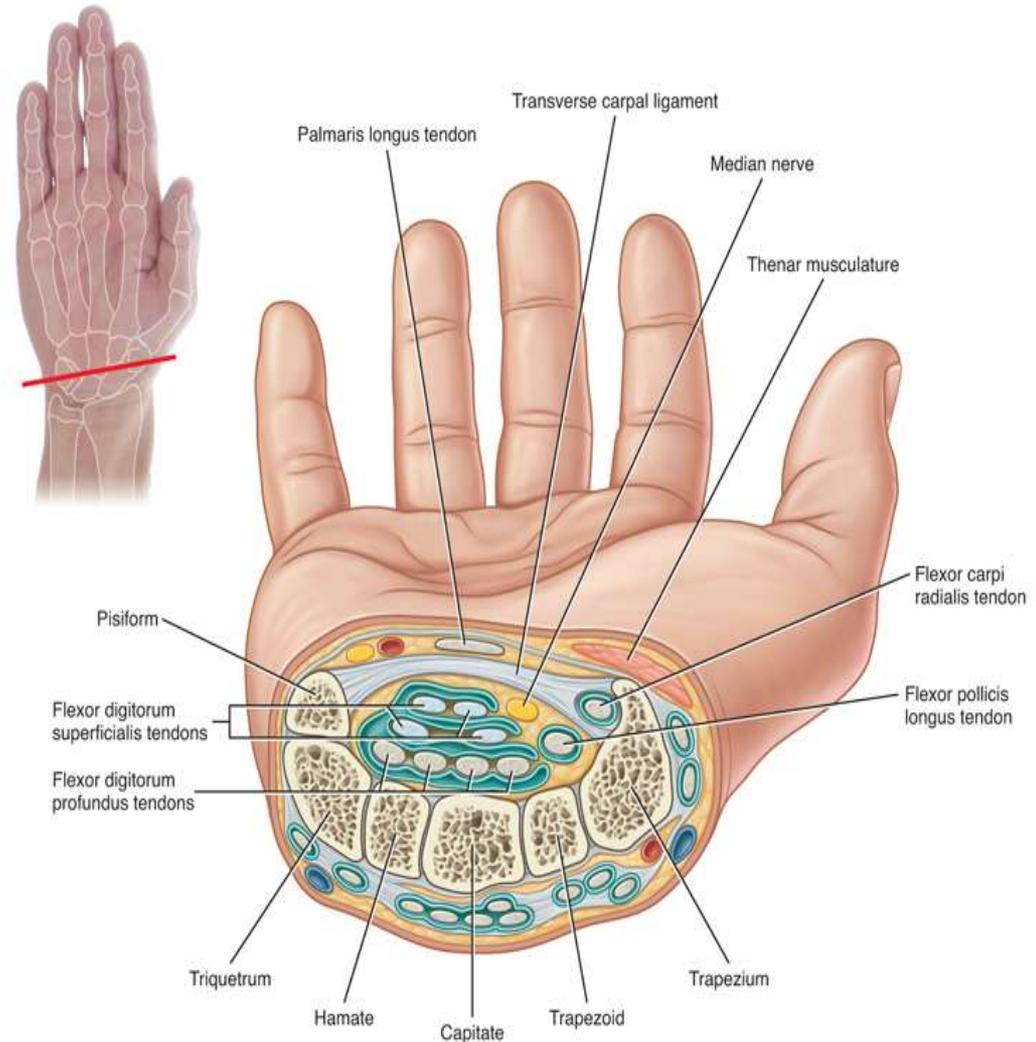


Carpal Tunnel

- ❖ The carpus is deeply concave on its anterior surface and forms a bony gutter مزراب .
- ❖ The gutter is converted into a tunnel نفق by **the flexor retinaculum**
- ❖ The long flexor tendons to the fingers and thumb pass through the tunnel and are accompanied by the median nerve
- ❖ The median nerve lies in a **restricted space between the tendons of the flexor digitorum superficialis** and the **flexor carpi radialis** muscles.

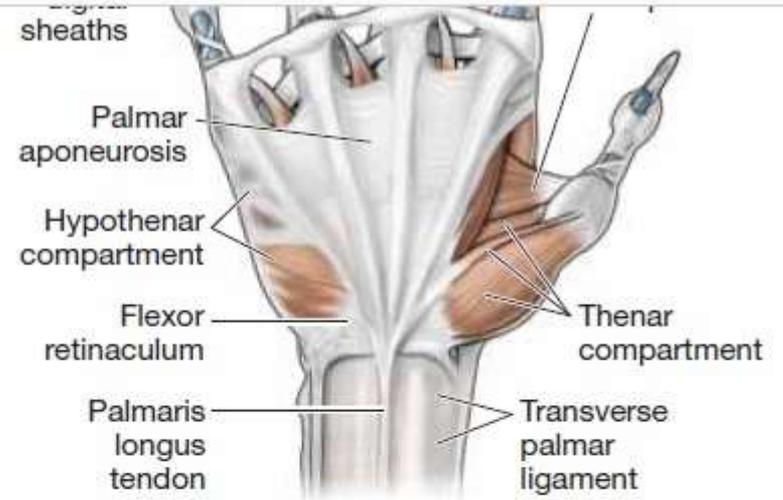


- ❖ The four separate tendons of the flexor digitorum superficialis muscle are arranged in anterior and posterior rows, those to the **middle** and **ring** fingers lying **in front** of those to the **index** and **little** fingers.
- ❖ At the lower border of the flexor retinaculum, the four tendons diverge and become arranged on the same plane .
- ❖ The tendons of the flexor digitorum profundus muscle are on the same plane and lie behind the superficialis tendons.

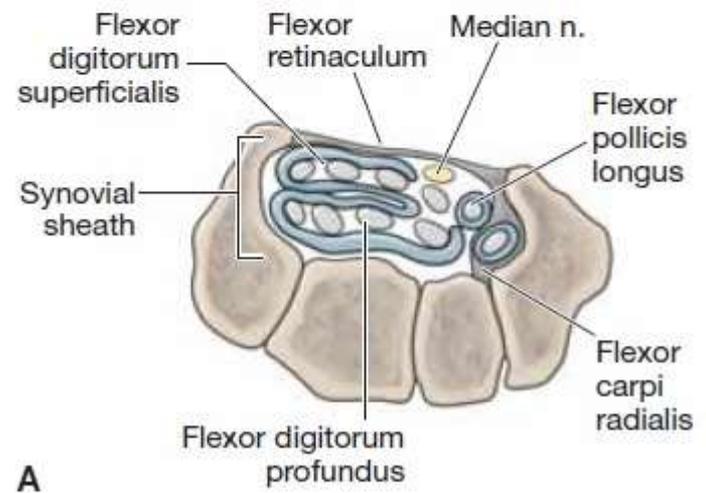


Modified from Drake, R: Gray's atlas of anatomy, ed 2, Philadelphia, 2015, Churchill Livingstone.

- ❖ All eight tendons of the flexor digitorum superficialis and profundus invaginate [يَغْتَلِفُ يَنْغَلِفُ] a common synovial sheath from the lateral side.
- ❖ This allows the arterial supply to the tendons to enter them from the lateral side.
- ❖ The tendon of the Flexor Pollicis Longus muscle runs through the lateral part of the tunnel in its own synovial sheath.



Carpal tunnel contents:



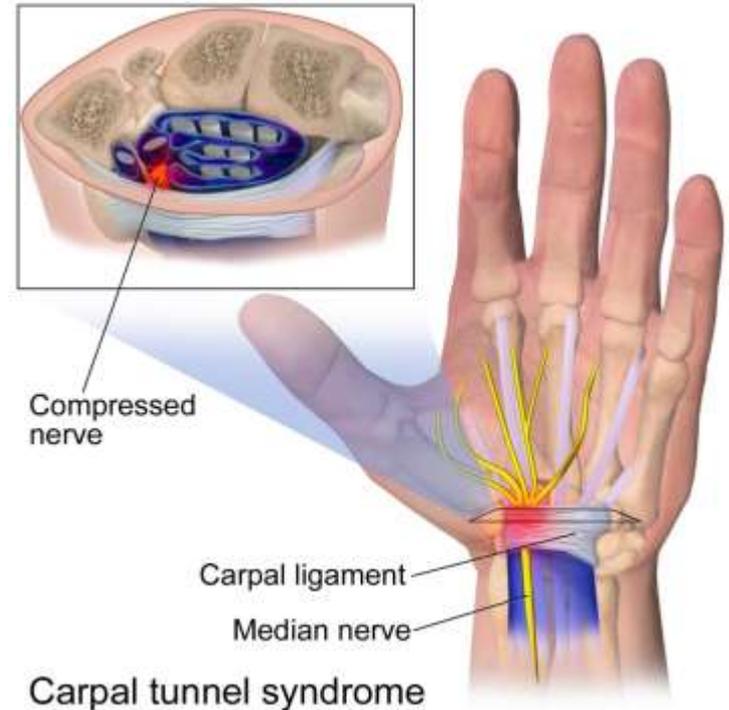
A

Carpal Tunnel Syndrome

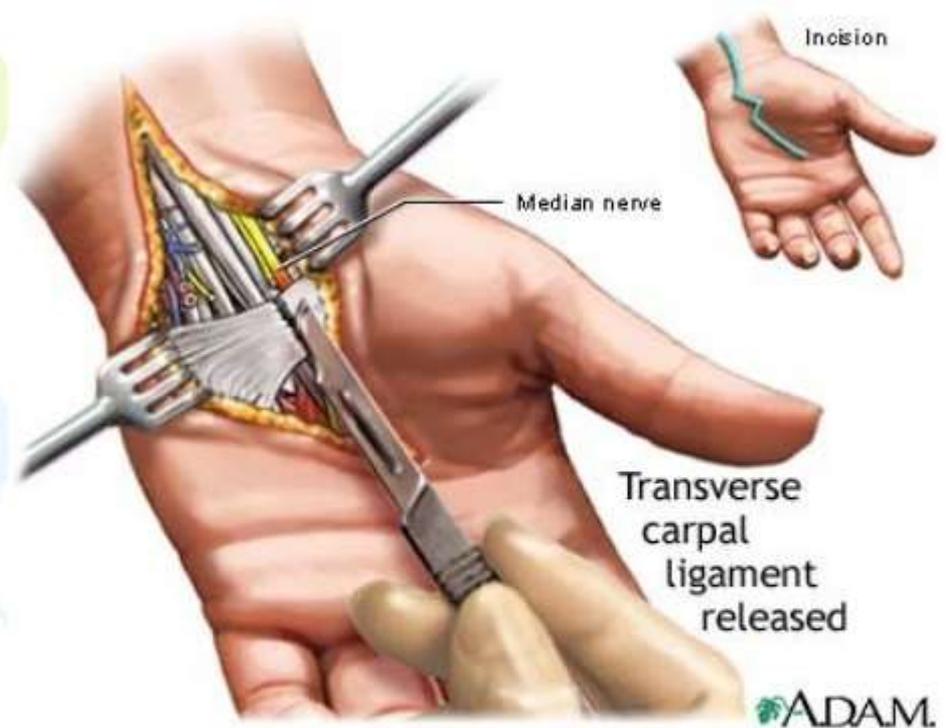
❖ Clinically, the syndrome consists of a burning pain [مبرح] or “pins and needles” along the distribution of the median nerve to the lateral three and a half fingers and weakness of the thenar muscles.

❖ The exact cause of the compression is difficult to determine, but

- ✓ thickening of the synovial sheaths of the flexor tendons or
- ✓ arthritic changes in the carpal bones are thought to be responsible in many cases.



- ❖ NO PARESTHESIA التنميل occurs over the **thenar eminence** because this area of skin is supplied by the palmar cutaneous branch of the median nerve, which passes **superficially** to the flexor retinaculum.
- ❖ The condition is dramatically relieved by decompressing [تخفيف ضغط] the tunnel by making a longitudinal incision [شق طولي] through the flexor retinaculum.



Take care to release all components of the flexor retinaculum.