قال صلى الله عليه وسلم

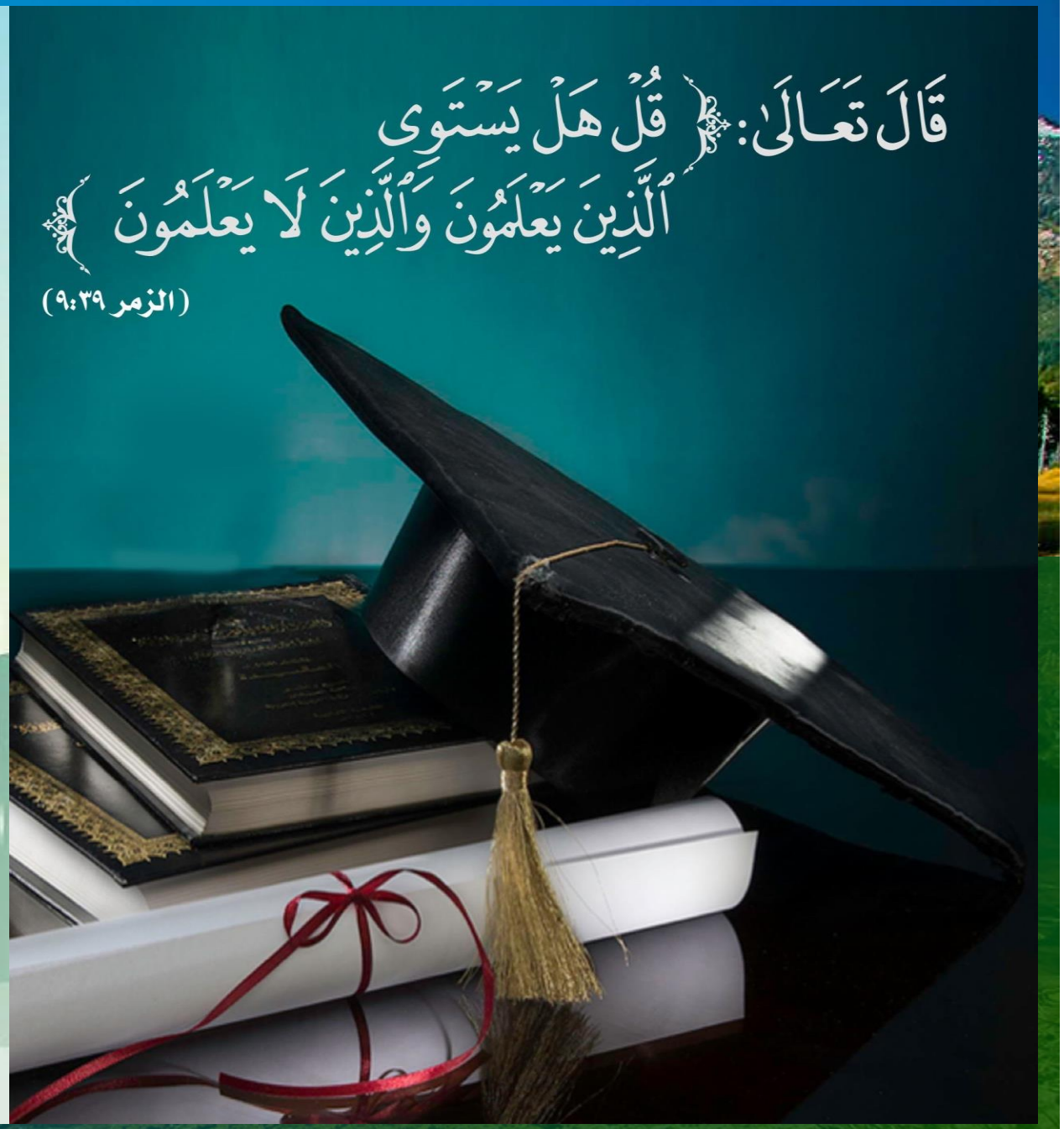
إنَّ اللَّهَ وملائِكتَهُ وأهلَ السَّماواتِ والأرضِ
حتَّى النَّملةَ في جُحرِها وحتَّى الحوتَ
ليصلُّونَ على

معلِّمِ النَّاسِ الخيرَ

رواه الترمذي وصححه الألباني

قَالَ تَعَالَىٰ: ﴿ قُلْ هَلْ يَسْتَوِي
ٱلَّذِينَ يَعْلَمُونَ وَٱلَّذِينَ لَا يَعْلَمُونَ ﴾

(الزمر ٣٩:٩)



Goniometric Measurements and Manual Muscle Testing for the Wrist Joint

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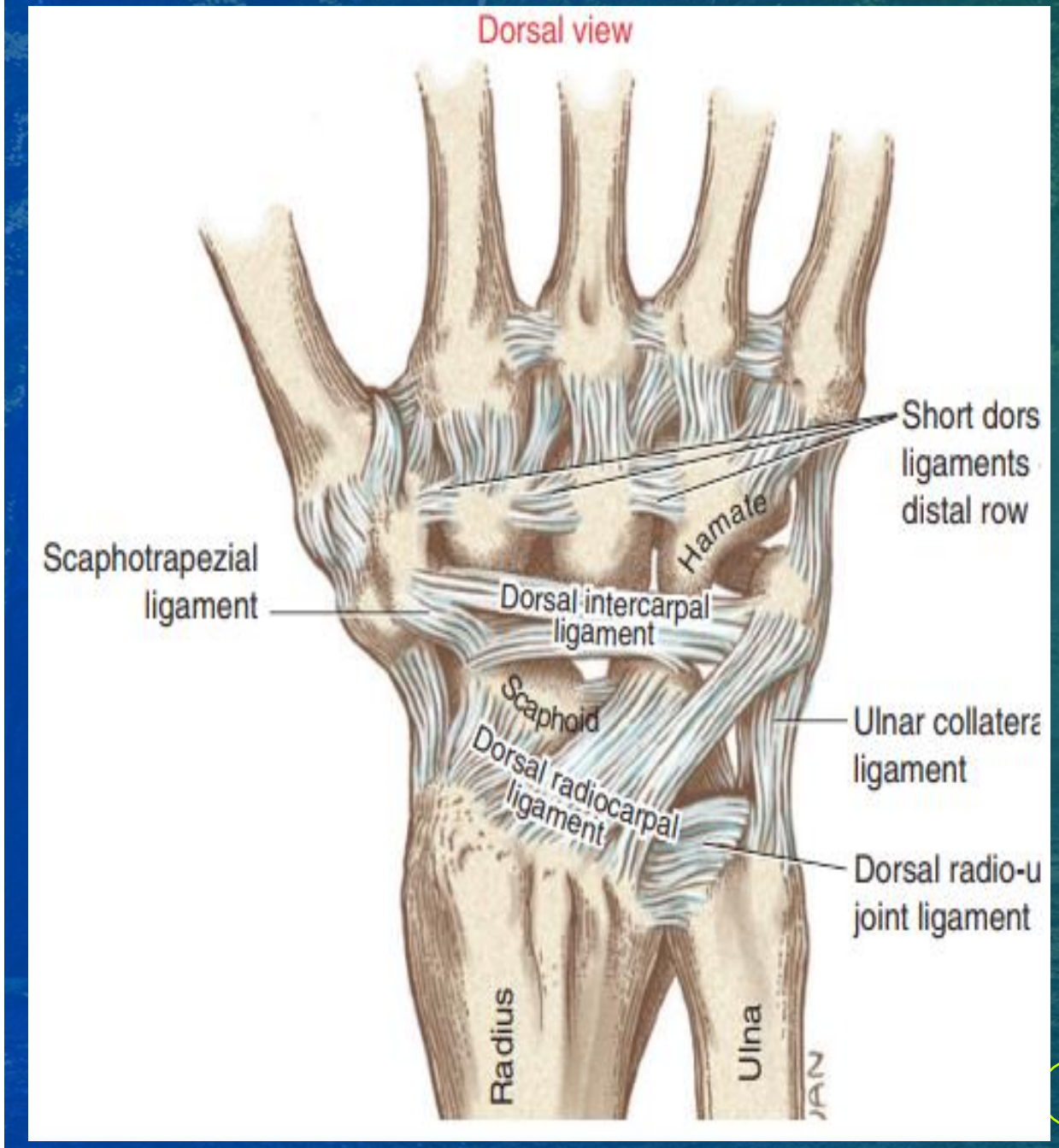
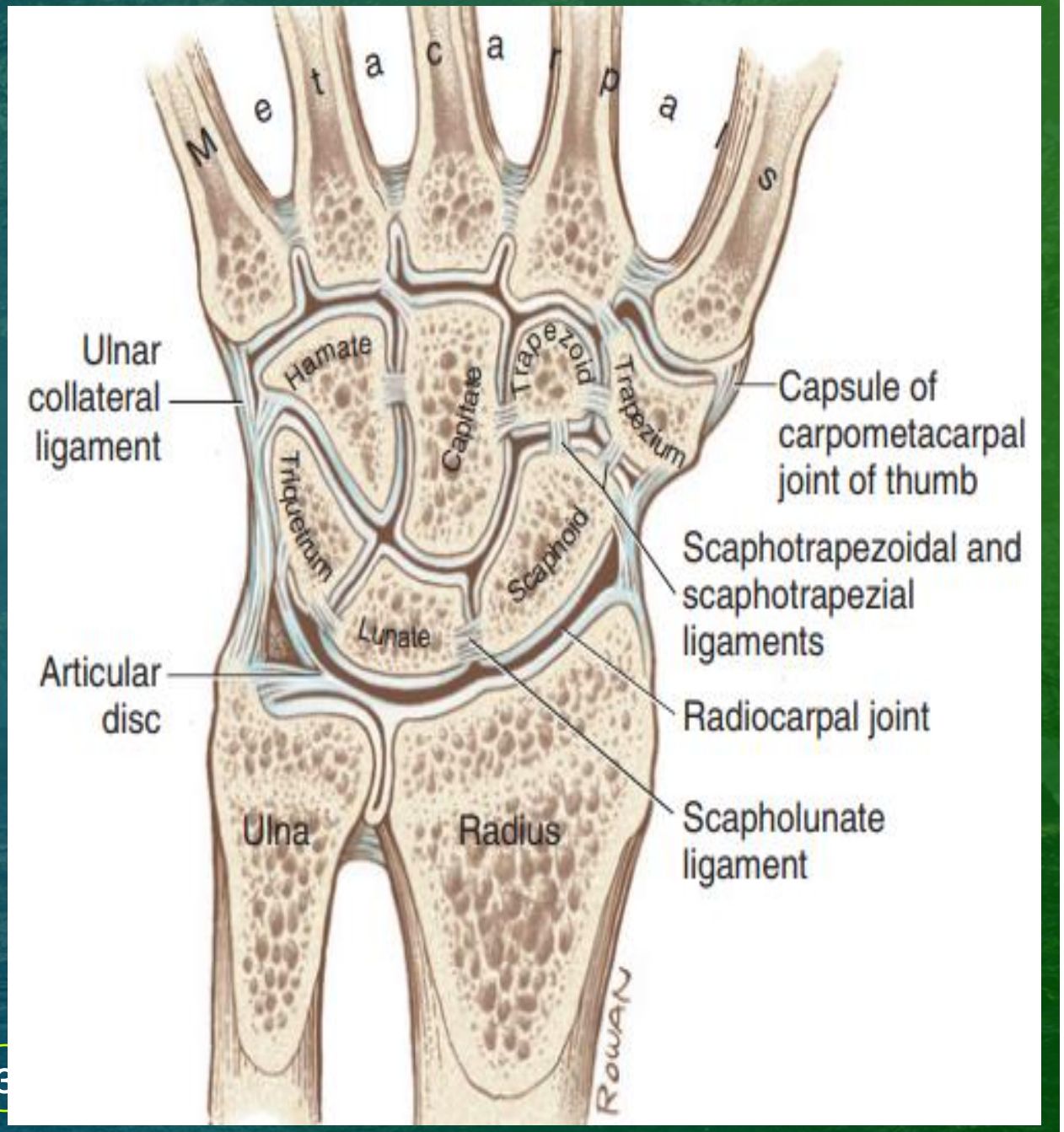
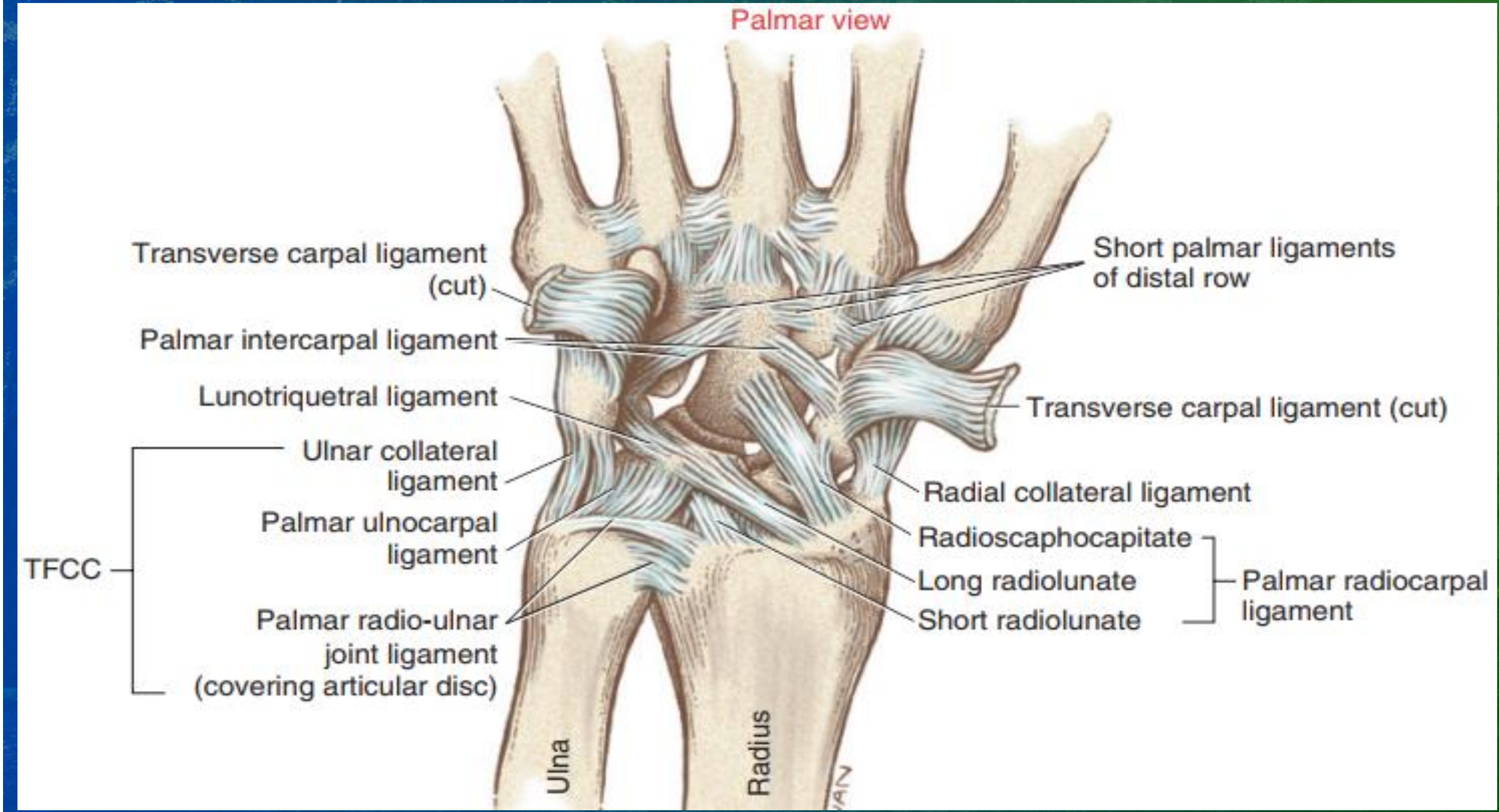

Dorsal view
Short dors ligaments distal row
Hamate
Scaphotrapezial ligament
Dorsal intercarpal ligament
Scaphoid
Dorsal radiocarpal ligament
Ulnar collatera ligament
Dorsal radio-u joint ligament
Radius
Ulna


Metacarpals
Ulnar collateral ligament
Hamate
Capitate
Trapezoid
Trapezium
Capsule of carpometacarpal joint of thumb
Triquetrum
Scaphoid
Scaphotrapezoidal and scaphotrapezial ligaments
Lunate
Articular disc
Radiocarpal joint
Ulna
Radius
Scapholunate ligament


Palmar view
Transverse carpal ligament (cut)
Palmar intercarpal ligament
Lunotriquetral ligament
Ulnar collateral ligament
Palmar ulnocarpal ligament
Palmar radio-ulnar joint ligament (covering articular disc)
TFCC
Short palmar ligaments of distal row
Transverse carpal ligament (cut)
Radial collateral ligament
Radioscaphocapitate
Long radiolunate
Short radiolunate
Palmar radiocarpal ligament
Ulna
Radius

1) Wrist Joint Ranges of Motion:-

	Flexion	Extension	Radial Deviation	Ulnar Deviation
Articulation	Radiocarpal and Midcarpal	Midcarpal and Radiocarpal	Midcarpal and Radiocarpal	Radiocarpal (Predominant) and Midcarpal
Plane	Sagittal	Sagittal	Frontal	Frontal
Axis	Frontal	Frontal	Sagittal	Sagittal
Normal End Feel	Firm	Firm/Hard	Firm/Hard	Firm
Normal Active Range of Motion	0–80°	0–70°	0–20°	0–30°

	Flexion	Extension	Radial Deviation	Ulnar Deviation
Normal Limiting Factors	Tension in the posterior Radiocarpal ligament and posterior joint capsule	Tension in the anterior Radiocarpal ligament and anterior joint capsule; contact between the radius and the carpal bones	Tension in the ulnar collateral ligament, Ulnocarpal ligament, and ulnar portion of the joint capsule; contact between the radial styloid process and the scaphoid bone	Tension in the radial collateral ligament and radial portion of the joint capsule

1) Wrist Flexion-Extension:-

*__Start Position:__ The patient is sitting. The elbow is flexed, the forearm is resting on a table in pronation, the wrist is in a neutral position, and the hand is over the end of the table. The fingers are relaxed to avoid restriction of wrist flexion or extension due to stretch of the long finger extensors or flexors, respectively.

*__Stabilization:__ The therapist stabilizes the forearm.

*__Goniometer Axis:__ The axis is placed at the level of the ulnar styloid process.

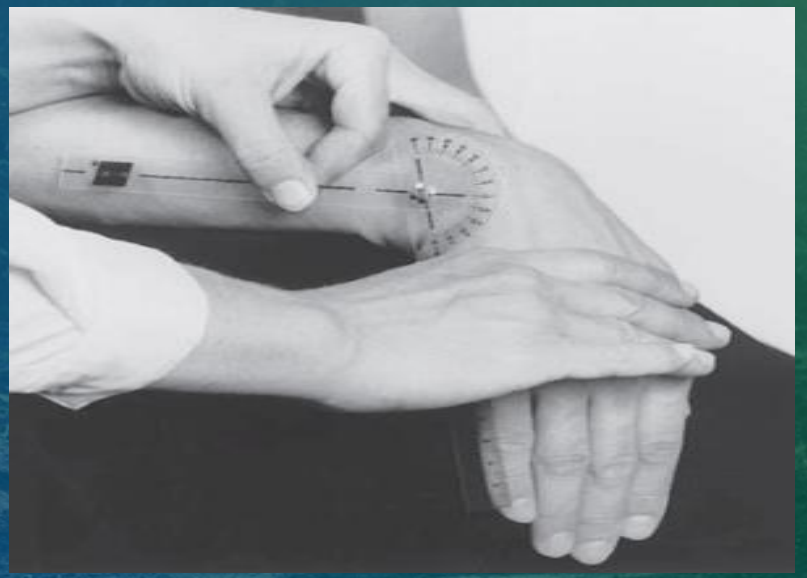
*__Stationary Arm:__ Parallel to the longitudinal axis of the ulna.

*__Movable Arm:__ Parallel to the longitudinal axis of the fifth metacarpal.

*__End Position:__ The wrist is moved in an anterior direction to the limit of wrist flexion (80°). The wrist is moved in a posterior direction to the limit of wrist extension (70°).

-For both movements, ensure that the mobile fourth and fifth metacarpals are not moved away from the start position throughout the assessment procedure, and ensure that no wrist deviation occurs if full range cannot be obtained.

Start position for wrist flexion and extension.



End position for wrist flexion.

End position for wrist extension.

2) Wrist Ulnar and Radial Deviation:-

***Start Position:** The patient is sitting. The elbow is flexed, the forearm is pronated, and the palmar surface of the hand is resting lightly on a table. The wrist remains in a neutral position and the fingers are relaxed to avoid restriction of wrist ulnar deviation due to finger constraints.

***Stabilization:** The therapist stabilizes the forearm.

***Goniometer Axis:** The axis is placed on the posterior aspect of the wrist joint over the capitate bone.

***Stationary Arm:** Along the midline of the forearm.

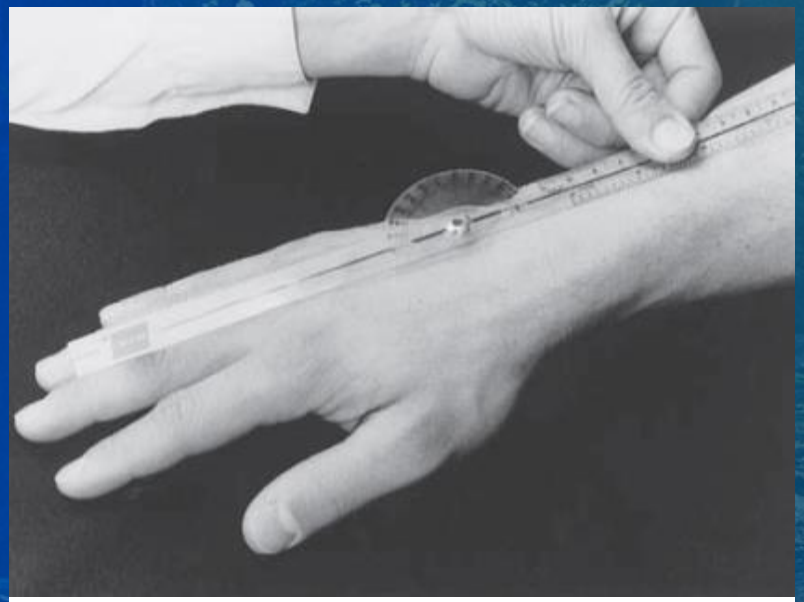
***Movable Arm:** Parallel to the longitudinal axis of the shaft of the third metacarpal.

*__End Position:__

-Ulnar deviation: the wrist is adducted to the ulnar side to the limit of ulnar deviation (30°).

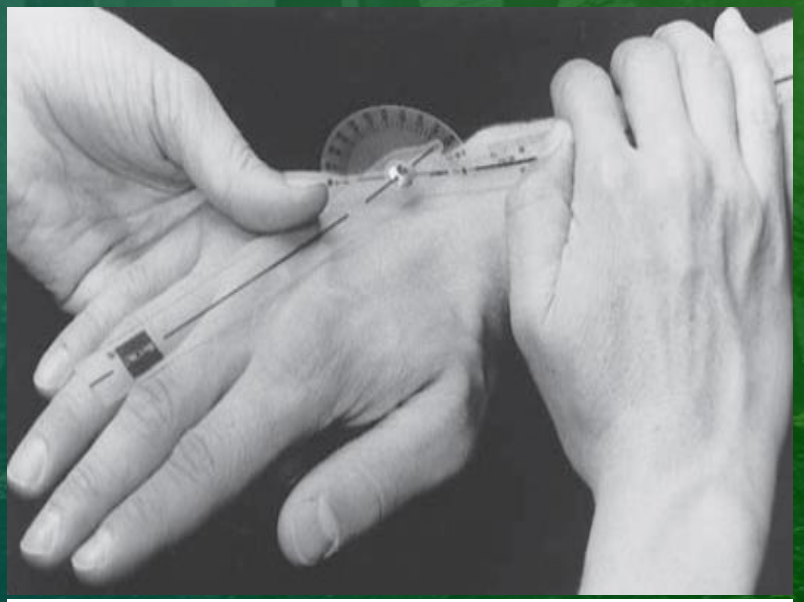
-Radial deviation: the wrist is abducted to the radial side to the limit of radial deviation (20°).

-Ensure the wrist is not moved into flexion or extension.

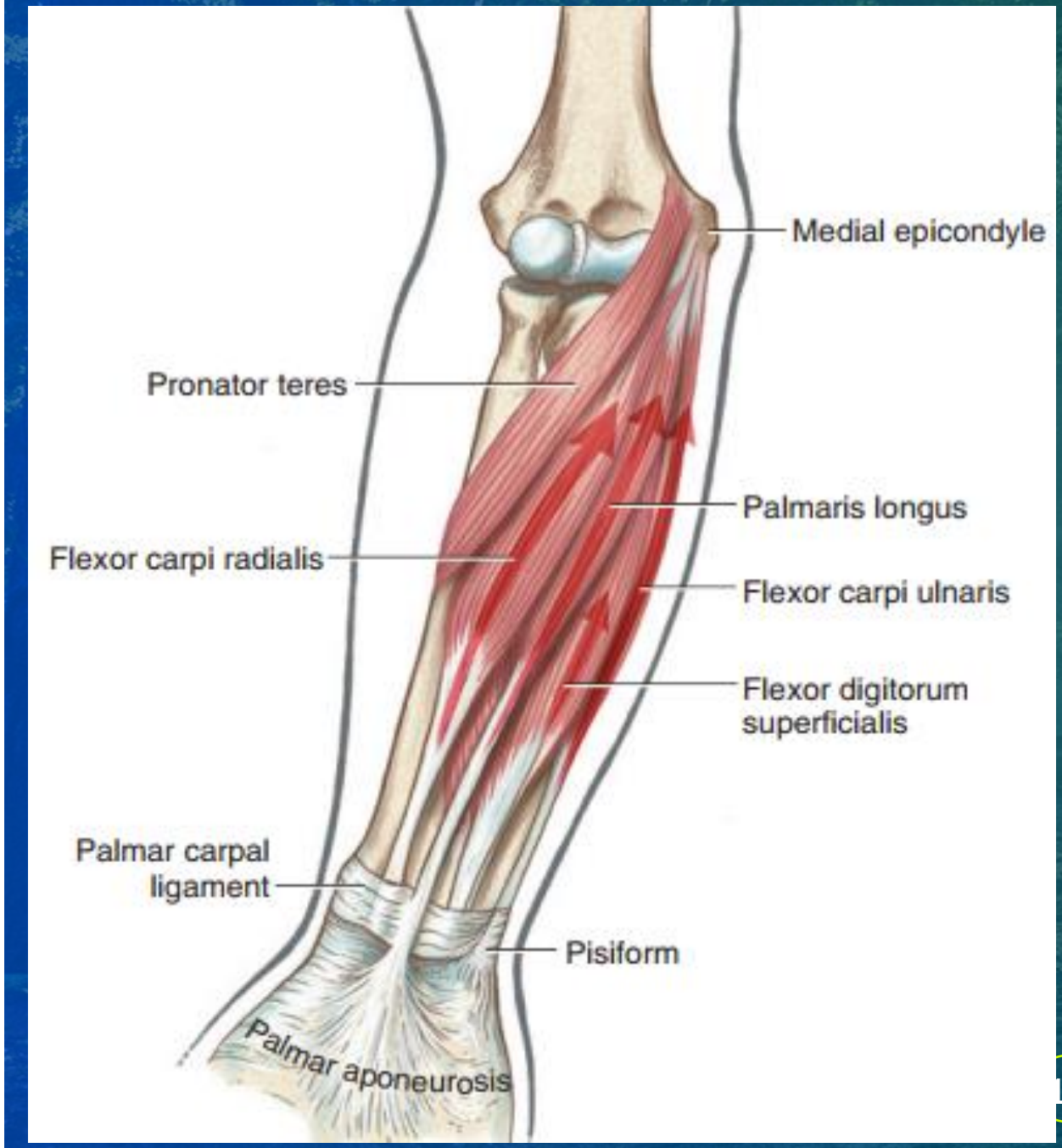


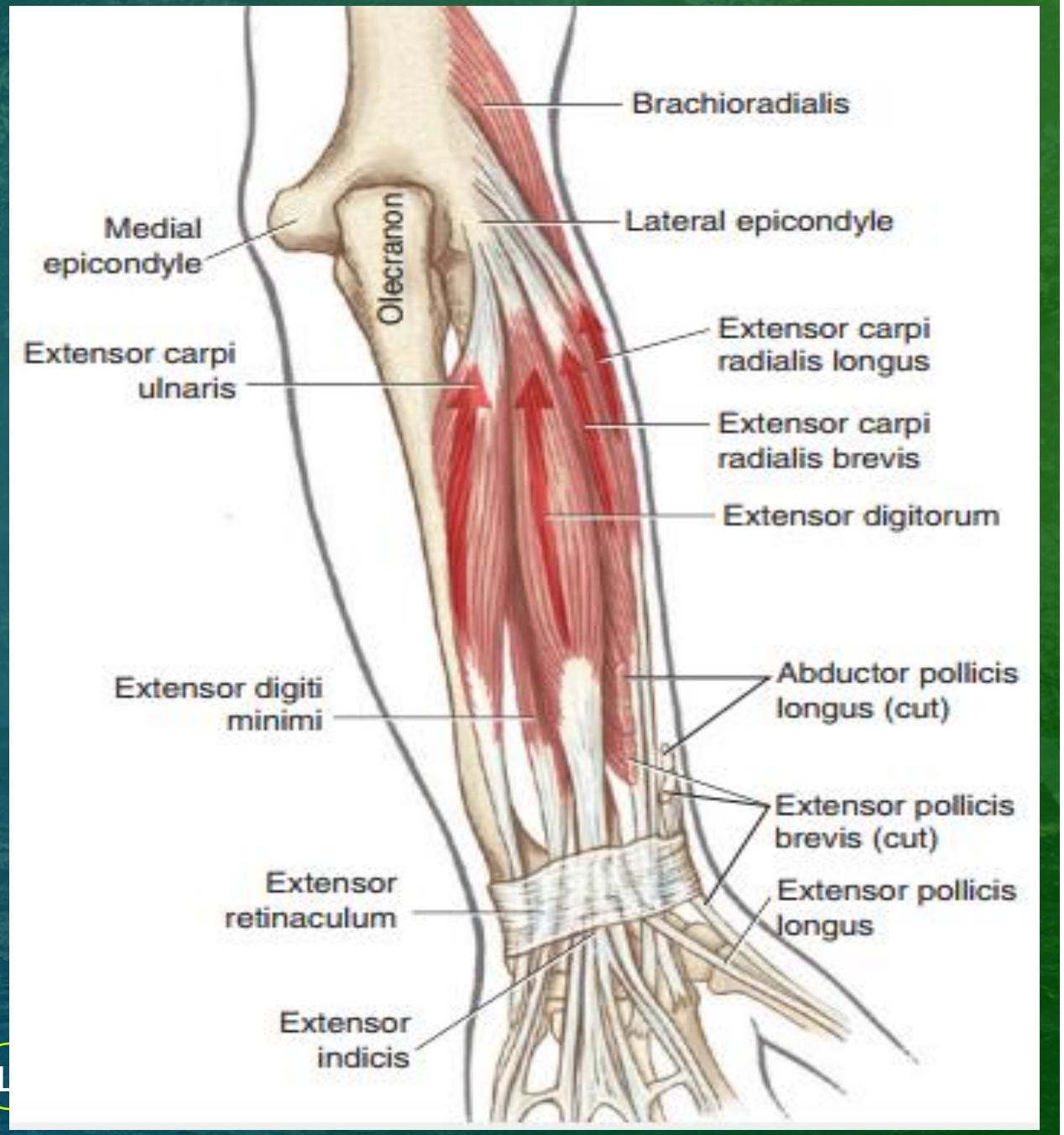
Start position for ulnar and radial deviation

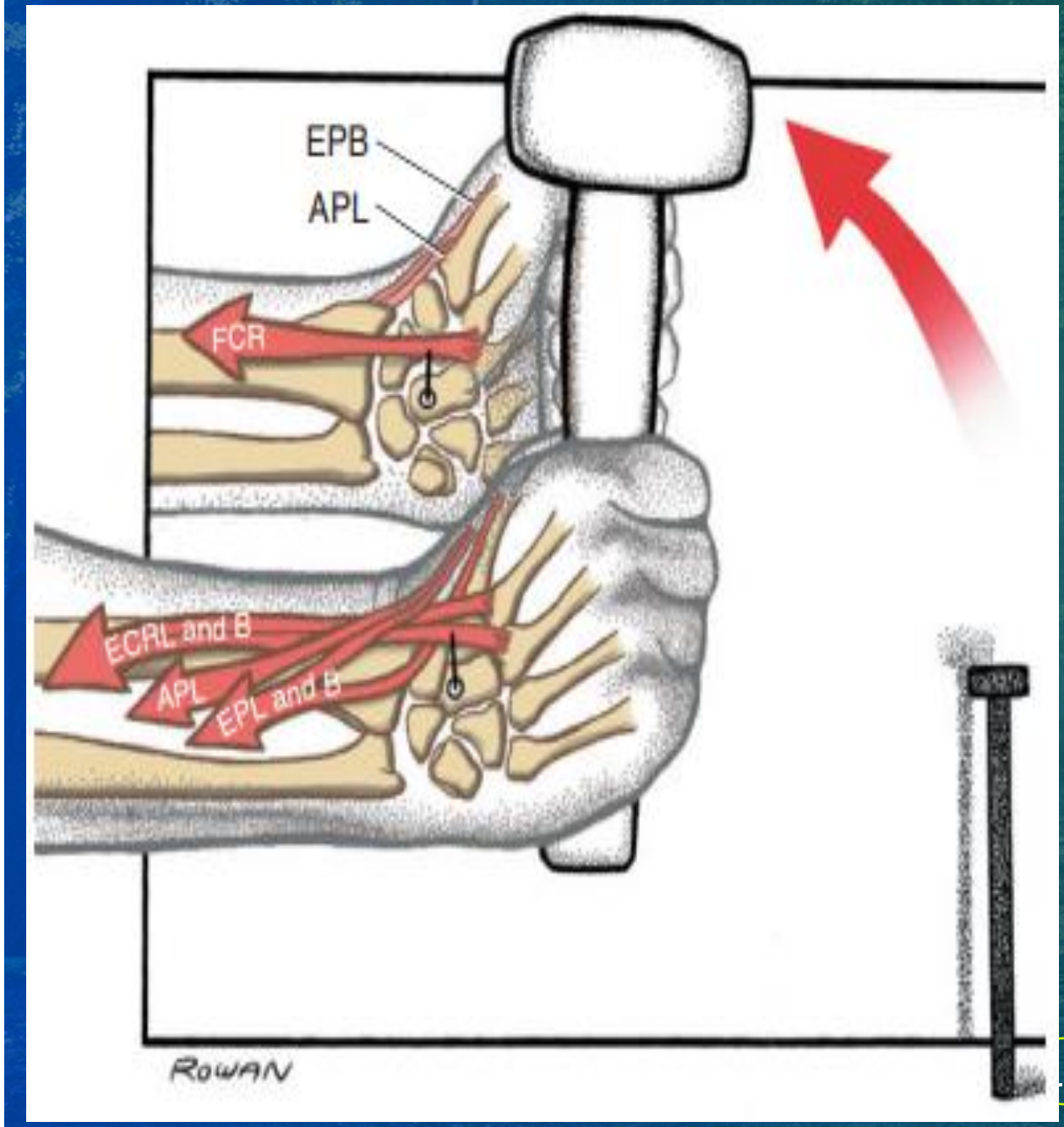
End position: ulnar deviation.

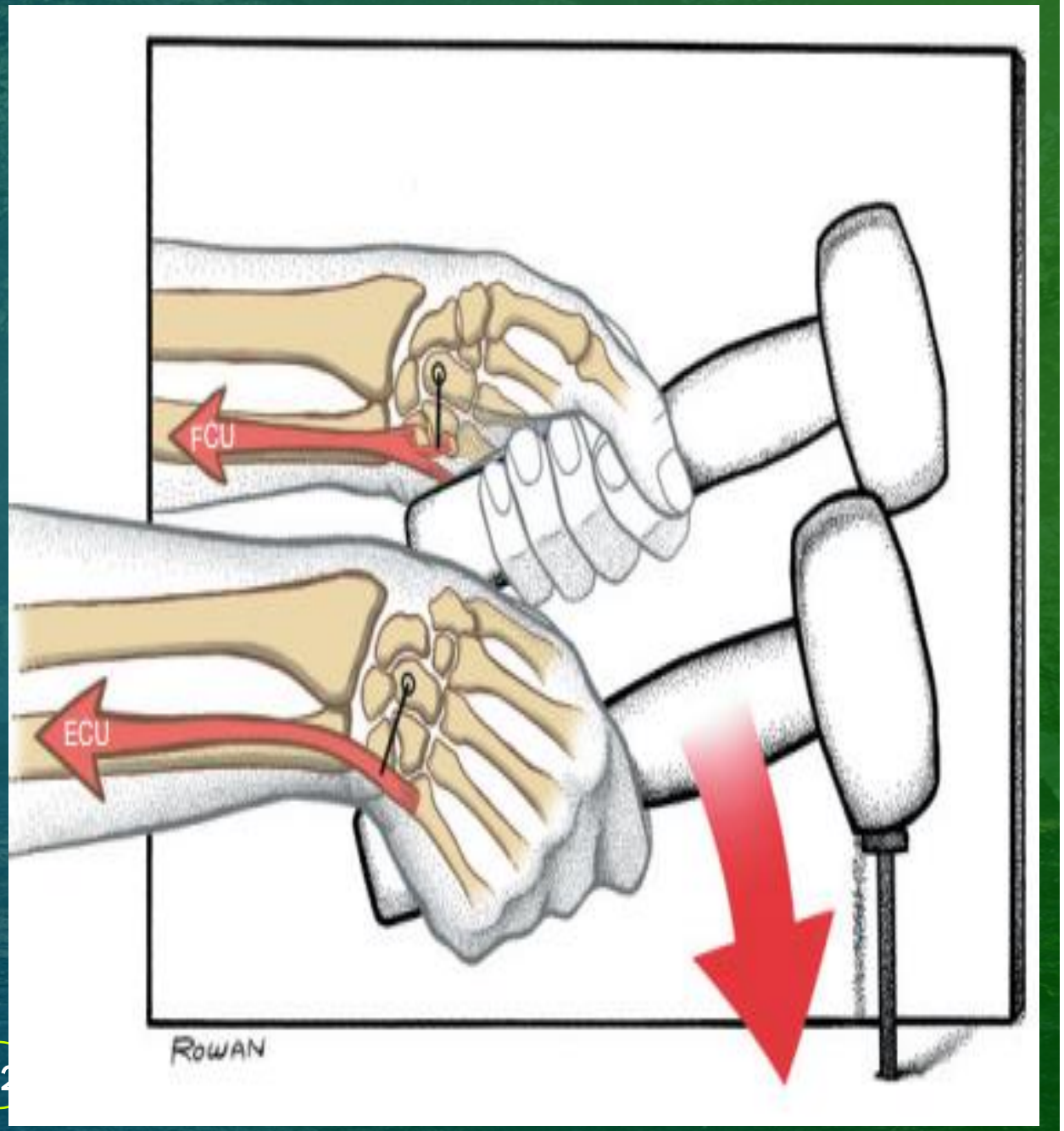


End position: radial deviation.


Medial epicondyle
Pronator teres
Palmaris longus
Flexor carpi radialis
Flexor carpi ulnaris
Flexor digitorum superficialis
Palmar carpal ligament
Pisiform
Palmar aponeurosis


Brachioradialis
Medial epicondyle
Olecranon
Lateral epicondyle
Extensor carpi ulnaris
Extensor carpi radialis longus
Extensor carpi radialis brevis
Extensor digitorum
Extensor digiti minimi
Abductor pollicis longus (cut)
Extensor pollicis brevis (cut)
Extensor retinaculum
Extensor pollicis longus
Extensor indicis


EPB
APL
FCR
ECRL and B
APL
EPL and B
ROWAN


FCU
ECU
ROWAN

1) Wrist Flexion:-

Muscle	Primary Muscle Action	Muscle Origin	Muscle Insertion	Peripheral Nerve	Nerve Root
Flexor carpi radialis	Wrist flexion and Wrist radial deviation	Common flexor origin on the medial epicondyle of the humerus	Palmar surface of the base of the second metacarpal and a slip to the base of the third metacarpal	Median nerve	C 6,7
Palmaris longus	Anchors palmar skin and fascia and Wrist flexion	Common flexor origin on the medial epicondyle of the humerus	Distal palmar aspect of the Flexor retinaculum; the palmar aponeurosis; skin and fascia of distal palm and webs of fingers	Median nerve	C 7,8
Flexor carpi	Wrist flexion and Wrist ulnar	a. Humeral head: common flexor origin on the medial epicondyle of	Pisiform bone; sends slips to the hook of the hamate	Ulnar nerve	C 7,8 - T1

1) Wrist Flexion and Radial Deviation:-

*__Primary muscles:__ flexor carpi radialis.

*__Accessory muscles:__ flexor carpi ulnaris and Palmaris longus.

*__Against Gravity:__ __Start Position:__ The patient is sitting or supine. If sitting, the forearm is supinated and supported on a table. The wrist is extended and in ulnar deviation and the fingers and thumb are relaxed.

*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.

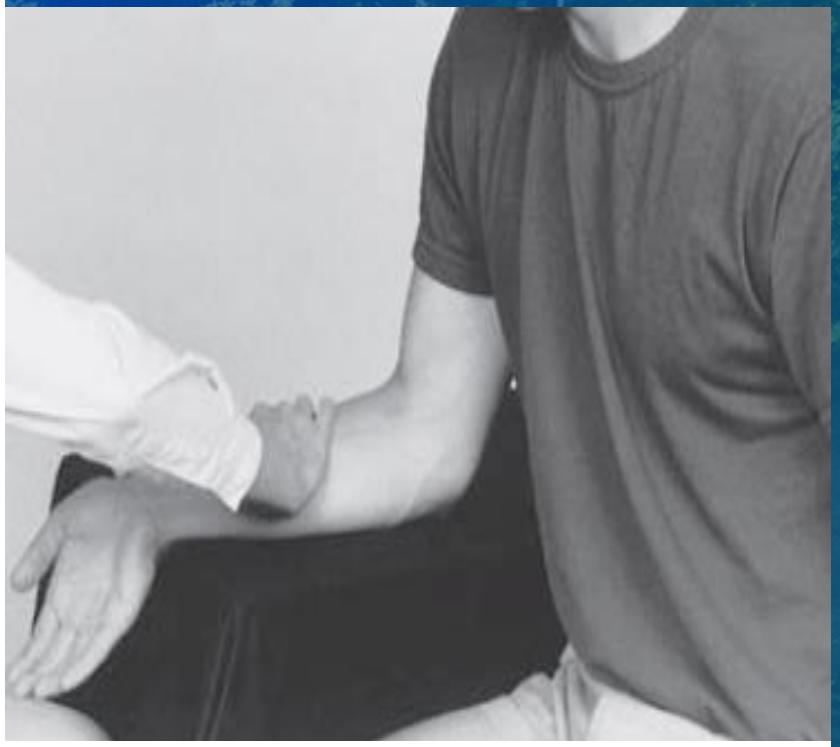
*__Movement:__ The patient flexes and radially deviates the wrist. The patient should be instructed to keep the fingers and thumb relaxed.

*__Palpation:__ Anterolateral aspect of the wrist in line with the second web space, on the radial side of palmaris longus.

*__Substitute Movement:__ The patient may flex the wrist with palmaris longus and flexor carpi ulnaris. Using flexor carpi ulnaris alone, the patient will flex with ulnar deviation. If the patient flexes the fingers, the flexor digitorum superficialis and profundus may substitute for the wrist flexors when movement is initiated.

*__Resistance Location:__ Applied distal to the wrist over the thenar eminence or the lateral aspect of the palm.

*__Resistance Direction:__ Wrist extension and ulnar deviation.



Start position: flexor carpi radialis.

Screen position: flexor carpi radialis.

Resistance: flexor carpi radialis.

*Gravity Eliminated: flexor carpi radialis.

*Start Position: The patient is sitting or supine. The forearm is in slight pronation and supported on a table or powder board. The wrist is extended and in ulnar deviation and the fingers and thumb are relaxed.

Start position: flexor carpi radialis.

*Stabilization: The therapist stabilizes the forearm proximal to the wrist.

*End Position: The patient fl exes and radially deviates the wrist through full ROM.

*Substitute Movement: Flexor carpi ulnaris, palmaris longus, and flexor digitorum superficialis and profundus. As the patient flexes the wrist from the anatomical position, forearm pronation and thumb abduction through the action of abductor pollicis longus may be attempted.

End position: flexor carpi radialis.

2) Wrist Flexion and Ulnar Deviation:-

*__Primary muscles:__ flexor carpi ulnaris.

*__Accessory muscles:__ flexor carpi radialis and Palmaris longus.

*__Against Gravity:__ __Start Position:__ The patient is sitting or supine. If sitting, the forearm is supinated and supported on a table. The wrist is extended and in radial deviation, and the fingers and thumb are relaxed.

*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.

*__Movement:__ The patient flexes and ulnarly deviates the wrist through full ROM.

*__Palpation:__ Anteromedial aspect of the wrist proximal to the pisiform bone.

*__Substitute Movement:__ Flexor carpi radialis, palmaris longus, and flexor digitorum superficialis and profundus. Using flexor carpi radialis alone, the patient will flex with radial deviation..

*__Resistance Locations:__ Applied over the hypothenar eminence.

*__Resistance Direction:__ Wrist extension and radial deviation.

Start position: flexor carpi ulnaris.

Screen position: flexor carpi ulnaris.

Resistance: flexor carpi ulnaris.

*Gravity Eliminated: flexor carpi ulnaris

*Start Position: The patient is sitting or supine. The forearm is in slight supination and supported on a table or powder board. The wrist is extended and in radial deviation, and the fingers and thumb are relaxed.

*Stabilization: The therapist stabilizes the forearm proximal to the wrist.

*End Position: The patient flexes the wrist with ulnar deviation through full ROM.

*Substitute Movement: Flexor carpi radialis, palmaris longus, and flexor digitorum superficialis and profundus.

Start position: flexor carpi ulnaris.

End position: flexor carpi ulnaris.

3) Pure Wrist Flexion:-

*__Primary muscles:__ flexor carpi radialis and flexor carpi ulnaris.
*__Accessory muscles:__ Palmaris longus.

*__Against Gravity:__ __Start Position:__ The patient is sitting or supine. If sitting, the forearm is supinated and supported on a table. The wrist is extended and the fingers and thumb are relaxed
.
*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.
*__Movement:__ The patient flexes the wrist through full ROM..

*__Palpation:__ -Flexor carpi radialis: Anterolateral aspect of the wrist in line with the second web space, on the radial side of palmaris longus.
-Flexor carpi ulnaris: Anteromedial aspect of the wrist proximal to the pisiform.

*__Substitute Movement:__ Flexor digitorum superficialis and profundus.

*__Resistance Locations:__ Applied over the palm of the hand.

*__Resistance Direction:__ Wrist extension.

*__Gravity Eliminated:__ flexor carpi radialis and flexor carpi ulnaris.

*__Start Position:__ The patient is sitting or supine. The forearm is in mid-position and supported on a table or powder board. The wrist is extended and the fingers and thumb are relaxed.

*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.

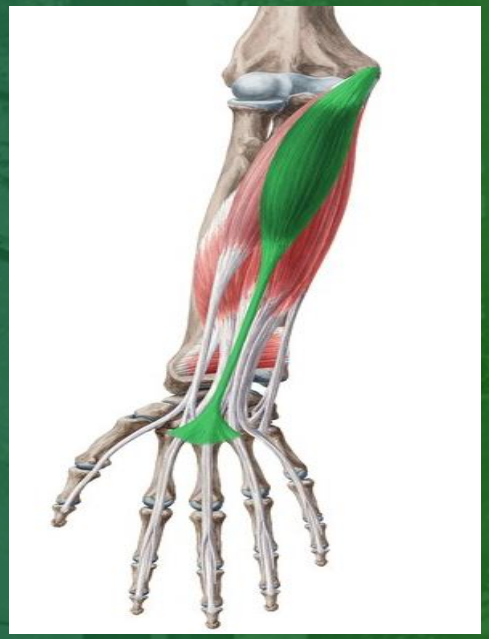
*__End Position:__ The patient fl exes the wrist through full ROM.

*__Substitute Movement:__ Flexor digitorum superficialis and profundus.

*Palmaris Longus:

-Palmaris longus is a weak flexor of the wrist and is not isolated for individual muscle testing.

-It can be palpated on the midline of the anterior aspect of the wrist during testing of flexor carpi radialis and ulnaris.



-The presence of palmaris longus can be established through flexing the wrist and cupping the fingers and palm of the hand.

-The muscle tendon stands out boldly when present.

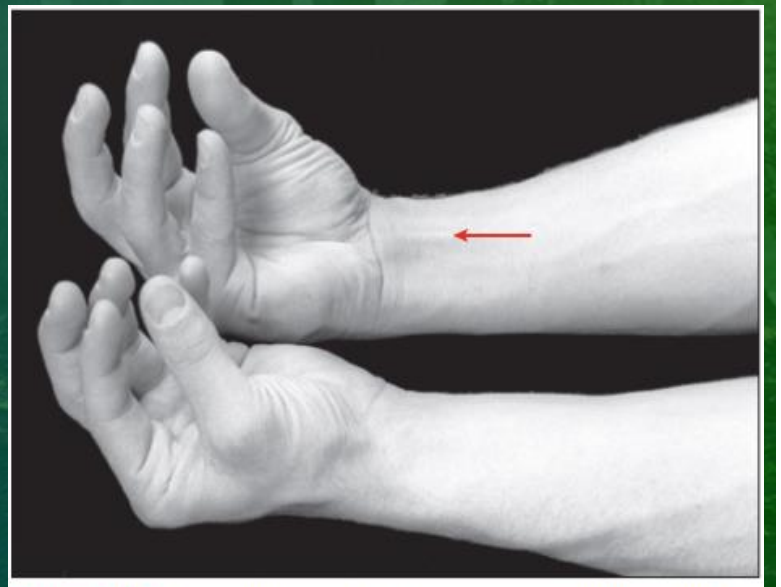


Figure 5-105 Palmaris longus: the muscle is present in the right arm (observe the tendon at the wrist). The muscle is absent in the left arm.

-However, palmaris longus is a vestigial muscle in about 13% of subjects. A decrease of grip or pinch strength is not associated with the absence of palmaris longus

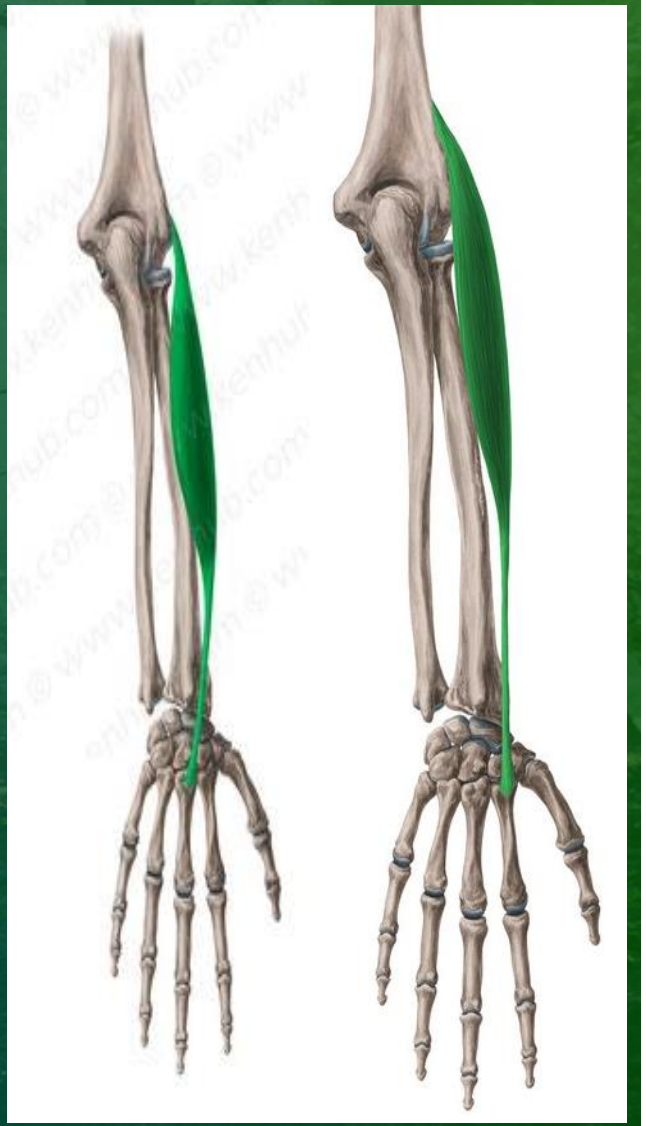
2) Wrist Extension:-

Muscle	Primary Muscle Action	Muscle Origin	Muscle Insertion	Peripheral Nerve	Nerve Root
Extensor carpi radialis longus	Wrist extension and Wrist radial deviation	Lower one third of the lateral supracondylar ridge of the humerus; common extensor origin on the lateral epicondyle of the humerus	Dorsal surface of the base of the second metacarpal bone	Radial nerve	C 6,7
Extensor carpi radialis brevis	Wrist extension and Wrist radial deviation	Common extensor origin on the lateral epicondyle of the humerus; radial collateral ligament of the elbow joint	Dorsal surface of the base of the third metacarpal bone	Posterior Interosseous (Radial) nerve	C 7,8
Extensor carpi ulnaris	Wrist extension and Wrist ulnar deviation	Common extensor origin on the lateral epicondyle of the humerus; aponeurosis on the	Tubercle on the ulnar aspect of the base of the fifth metacarpal bone	Posterior Interosseous (Radial) nerve	C 7,8

1) Wrist Extension and Radial Deviation:-

*__Primary muscles:__ extensor carpi radialis longus & extensor carpi radialis brevis.

*__Accessory muscles:__ extensor carpi ulnaris.



*__Against Gravity:__ __Start Position:__ The patient is sitting or supine. In sitting, the forearm is pronated and supported on a table. The wrist is flexed and in ulnar deviation and the fingers and thumb are slightly flexed.

*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.

*__Movement:__ The patient extends and radially deviates the wrist through full ROM. The patient should be instructed to keep the thumb and fingers relaxed.

*__Palpation:__ -Extensor carpi radialis longus: dorsal aspect of the wrist at the base of the second metacarpal.
-Extensor carpi radialis brevis: base of the third metacarpal.

*__Substitute Movement:__ The long finger extensors (extensor digitorum communis, extensor indicis, extensor digiti minimi). The patient may extend using extensor carpi ulnaris. Using only this muscle, the patient will extend with ulnar deviation..

*__Resistance Location:__ Applied on the dorsal aspect of the hand over the second and third metacarpals.

*__Resistance Direction:__ Wrist flexion and ulnar deviation.

Start position: extensor carpi radialis longus and brevis.

Screen position: extensor carpi radialis longus and brevis.

Resistance: extensor carpi radialis longus and brevis.

*Gravity Eliminated: extensor carpi radialis L & B.

*Start Position: The patient is sitting or supine. The forearm is slightly supinated and supported on a table or powder board. The wrist is flexed in ulnar deviation. The fingers and thumb are slightly flexed.

*Stabilization: The therapist stabilizes the forearm proximal to the wrist.

*End Position: The patient extends the wrist with simultaneous radial deviation through full ROM.

*Substitute Movement: The long finger extensors (extensor digitorum communis, extensor indicis, and extensor digiti minimi). Extensor carpi ulnaris..

Start position: extensor carpi radialis longus and brevis.

End position: extensor carpi radialis longus and brevis.

2) Wrist Extension and Ulnar Deviation:-

*__Primary muscles:__ extensor carpi ulnaris.

*__Accessory muscles:__ extensor carpi radialis longus and brevis.

*__Against Gravity:__ __Start Position:__ The patient is sitting or supine. If sitting, the forearm is pronated and supported on a table. The wrist is flexed and in radial deviation, and the fingers are slightly flexed.

*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.

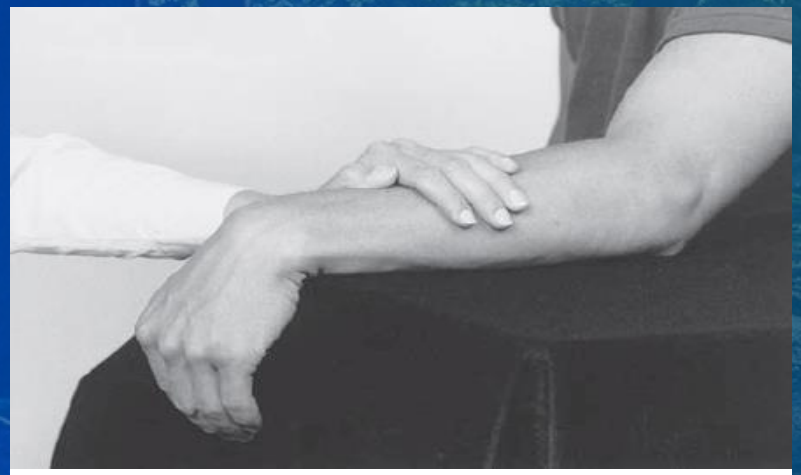
*__Movement:__ The patient extends and ulnarly deviates the wrist through full ROM. The patient should be instructed to keep the fingers relaxed.

*__Palpation:__ On the dorsal aspect of the wrist proximal to the fifth metacarpal and distal to the ulnar styloid process.

*__Substitute Movement:__ The long finger extensors (extensor digitorum communis, extensor indicis, extensor digiti minimi). The patient may extend and radially deviate from the wrist through the action of the extensor carpi radialis longus and brevis.

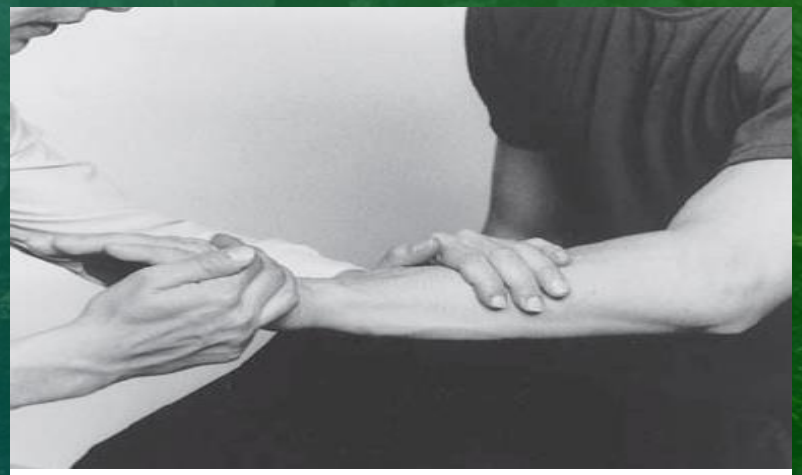
*__Resistance Locations:__ Applied on the dorsal aspect of the hand over the fourth and fifth metacarpals.

*__Resistance Direction:__ Wrist flexion and radial deviation.



Start position: extensor carpi ulnaris.

Screen position: extensor carpi ulnaris.



Resistance: extensor carpi ulnaris.

*Gravity Eliminated: extensor carpi ulnaris.

*Start Position: The patient is sitting or supine. The forearm is in slight pronation and supported on a table or powder board. The wrist is flexed in radial deviation. The fingers and thumb are flexed.

*Stabilization: The therapist stabilizes the forearm proximal to the wrist.

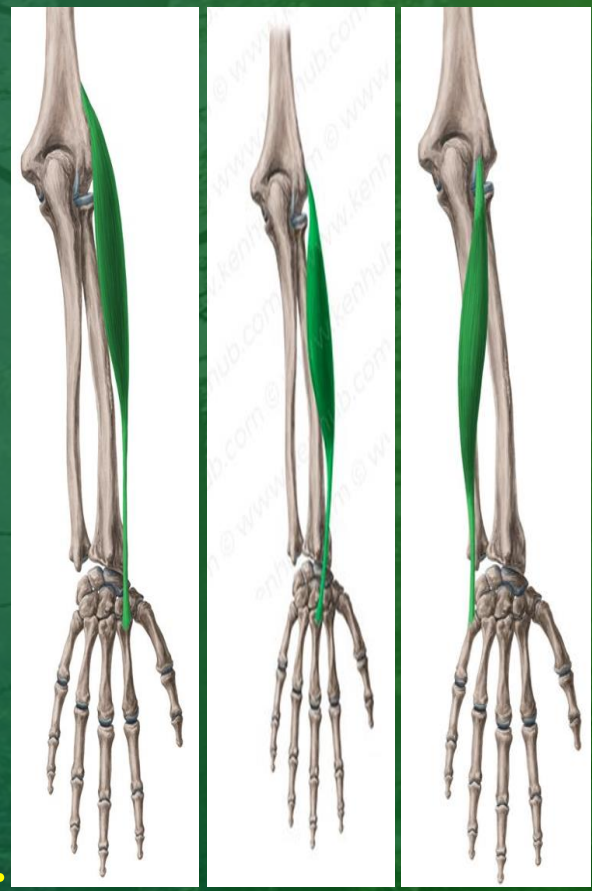
*End Position: The patient extends the wrist with simultaneous ulnar deviation through full ROM.

*Substitute Movement: The long finger extensors (extensor digitorum communis, extensor indicis, extensor digiti minimi). Extensor carpi radialis longus and brevis.

Start position: extensor carpi ulnaris.

End position: extensor carpi ulnaris.

3) Pure Wrist Extension:-



*__Primary muscles:__ Extensor Carpi Radialis Longus, Extensor Carpi Radialis Brevis, and Extensor Carpi Ulnaris.

*__Against Gravity:__ __Start Position:__ The patient is sitting or supine. If sitting, the forearm is pronated and supported on a table. The wrist is flexed, and the fingers and t are relaxed.

*__Stabilization:__ The therapist stabilizes the forearm proximal to the wrist.

*__Movement:__ The patient extends the wrist through full ROM. The patient should be instructed to keep the thumb and fingers relaxed.

*__Palpation:__ -Extensor carpi radialis longus: dorsal aspect of the wrist at the base of the second metacarpal.

-Extensor carpi radialis brevis: base of the third metacarpal.

-Extensor carpi ulnaris: on the dorsal aspect of the wrist proximal to the fifth metacarpal and distal to the ulnar styloid process.

***Substitute Movement:** Extensor digitorum communis, extensor digiti minimi, and extensor indicis if the fingers are extended.

***Resistance Locations:** Applied on the dorsal aspect of the hand over the metacarpals.

***Resistance Direction:** Wrist flexion.

***Gravity Eliminated:** Extensor Carpi Radialis Longus, Extensor Carpi Radialis Brevis, and Extensor Carpi Ulnaris.

***Start Position:** The patient is sitting or supine. The forearm is in mid-position and supported on a table. The wrist is flexed, and fingers are relaxed.

***Stabilization:** The therapist stabilizes the forearm proximal to the wrist.

***End Position:** The patient extends the wrist through full ROM.

***Substitute Movement:** Extensor digitorum, extensor digiti minimi, and extensor indicis.


Thanks


سُبْحَانَكَ اللَّهُمَّ وَبِحَمْدِكَ
أَشْهَدُ أَنْ لَا إِلَهَ إِلَّا أَنْتَ
أَسْتَغْفِرُكَ وَأَتُوبُ إِلَيْكَ