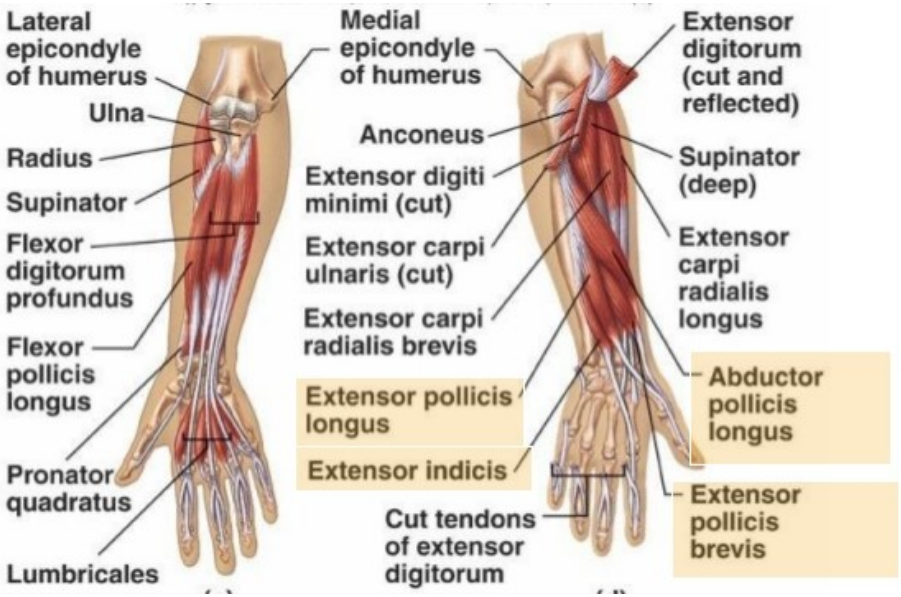
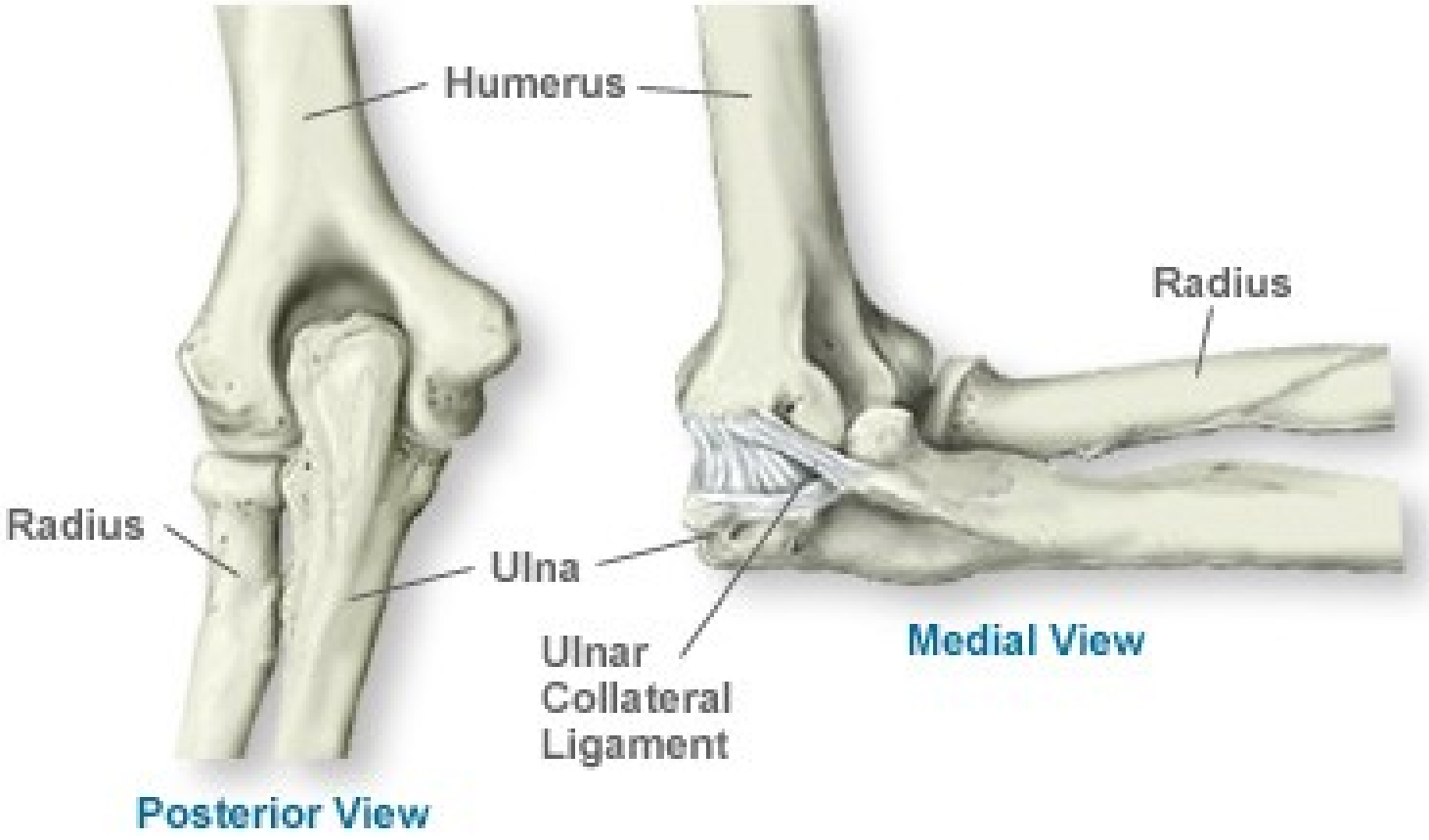
Examination Methods in Rehabilitation (2.11.2020)

Manual muscle test: Elbow, forearm, wrist, fingers

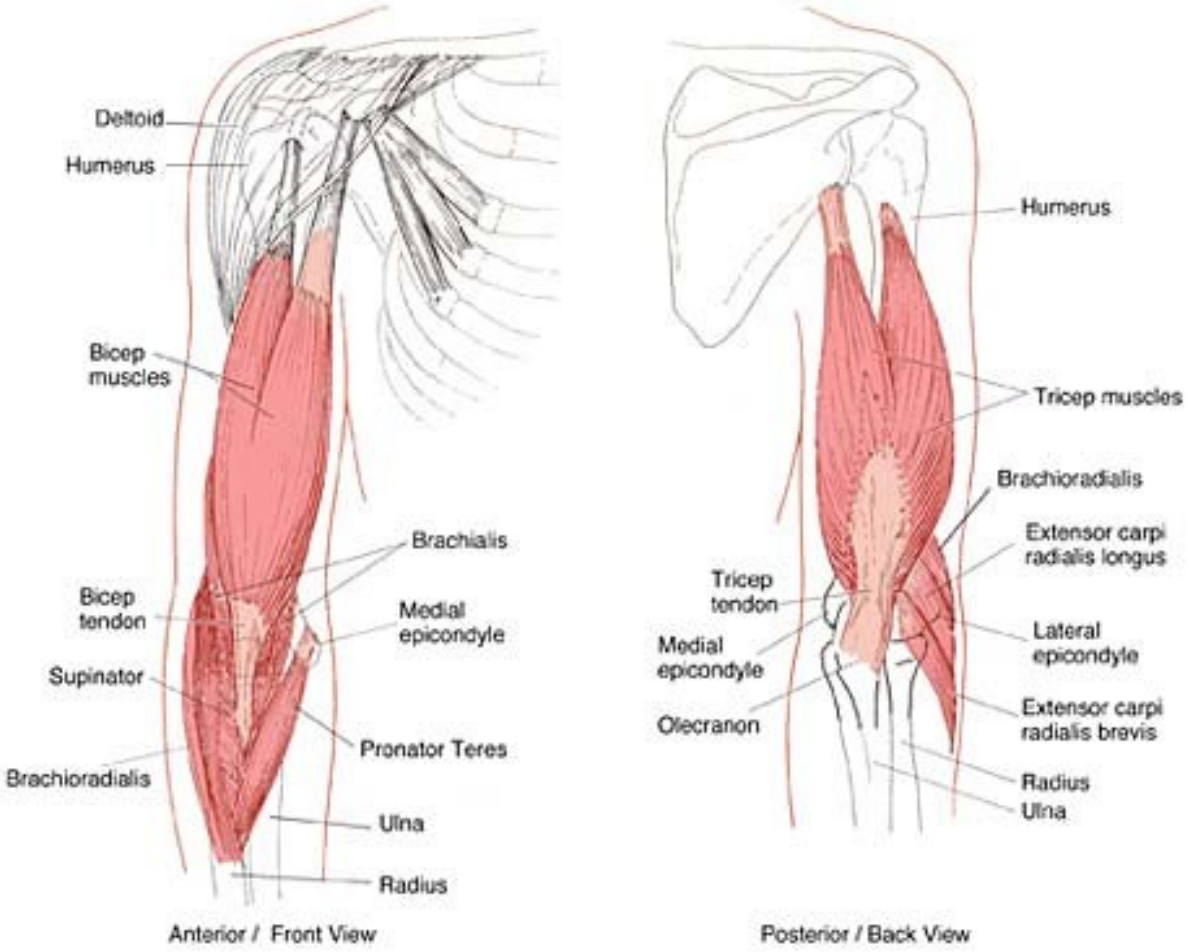


Mgr. Veronika Mrkvicová (physiotherapist)

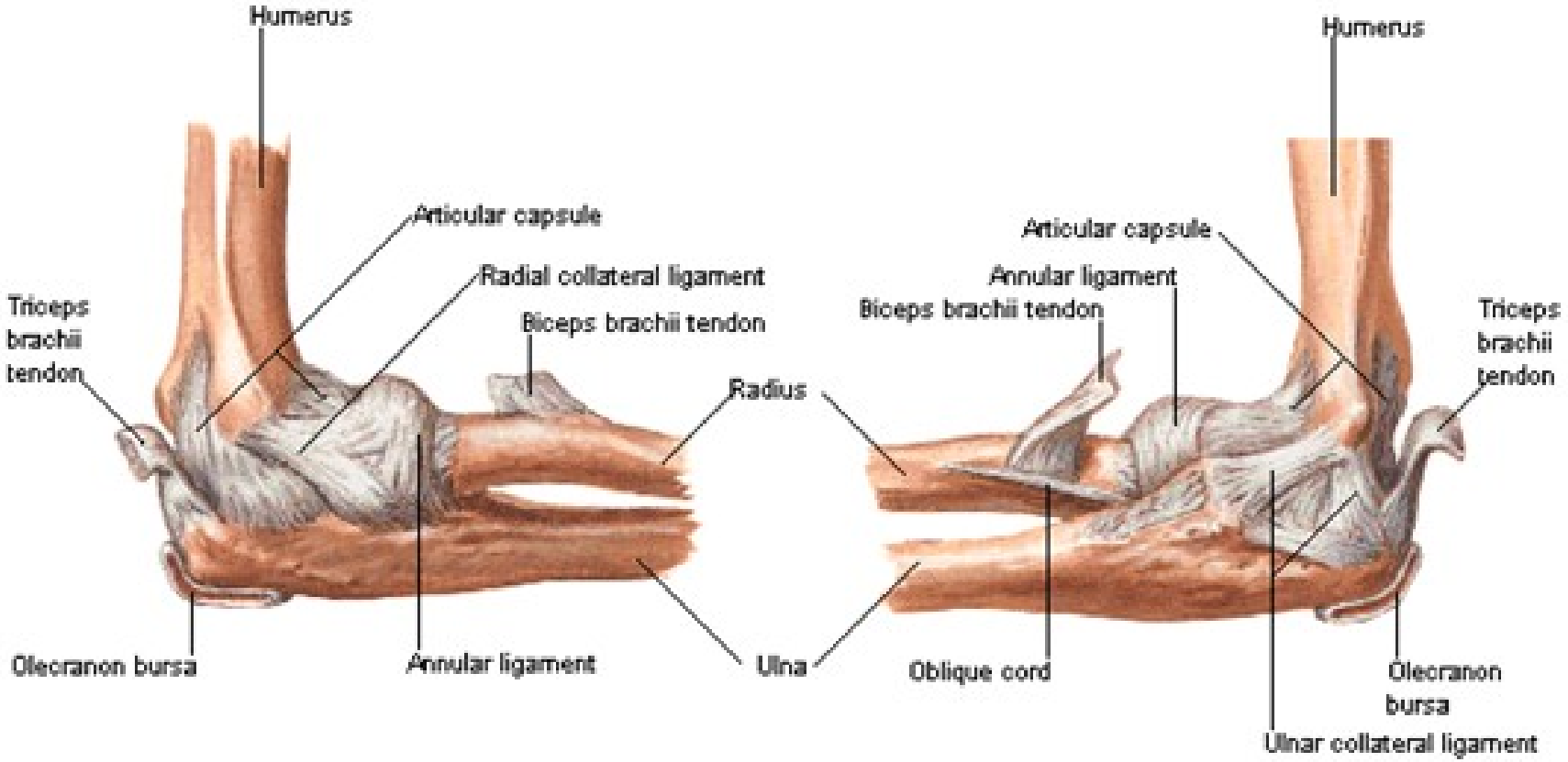
Elbow


Humerus
Radius
Radius
Ulna
Ulnar
Collateral
Ligament
Posterior View
Medial View

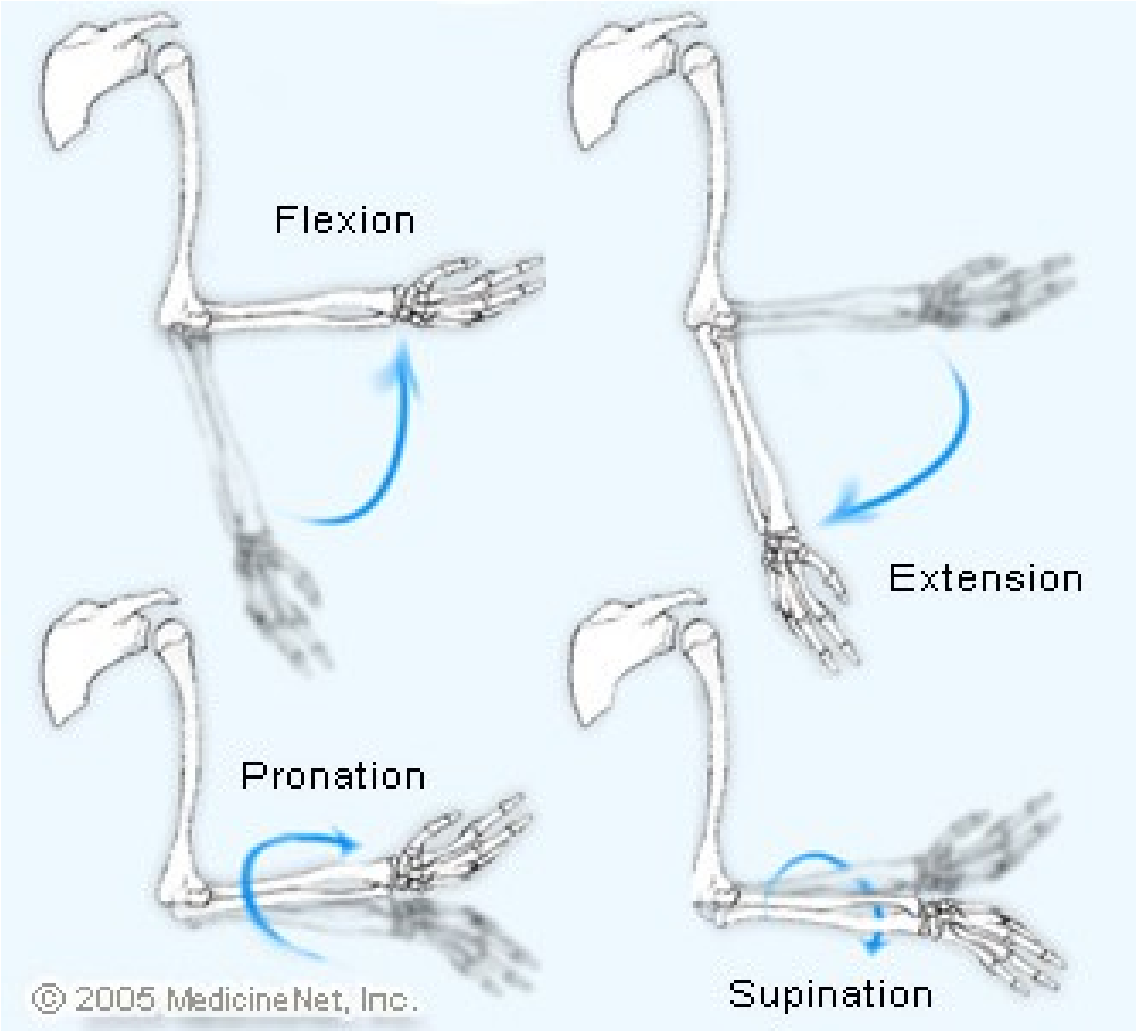
Muscles of the elbow



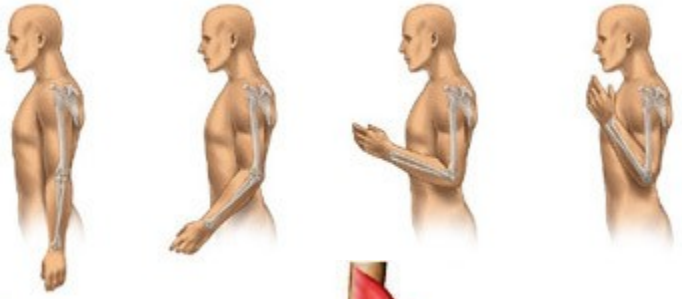
Ligaments and tendons of the elbow



Movements of the elbow



Elbow flexion



Biceps brachii

Brachialis

Brachioradialis

Biceps brachii

Origin

- Short head: tip of coracoid process of scapula;
- Long head: supraglenoid tubercle of scapula

Insertion

- Tuberosity of radius and fascia of forearm via bicipital aponeurosis

Action

- Supinates forearm and, when it is supine, flexes forearm

Innervation

- Musculocutaneous nerve (C5 and C6) (C5, C6)

Brachialis

Origin
- Distal half of anterior surface of humerus

Insertion
- Coronoid process and tuberosity of ulna

Action
- Major flexor of forearm - flexes forearm in all positions

Innervation
- Musculocutaneous nerve (C5 and C6) (C5, C6)

Brachioradialis

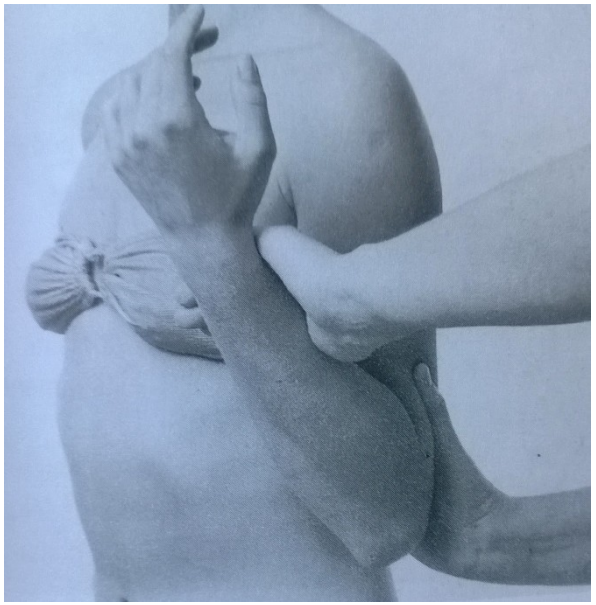
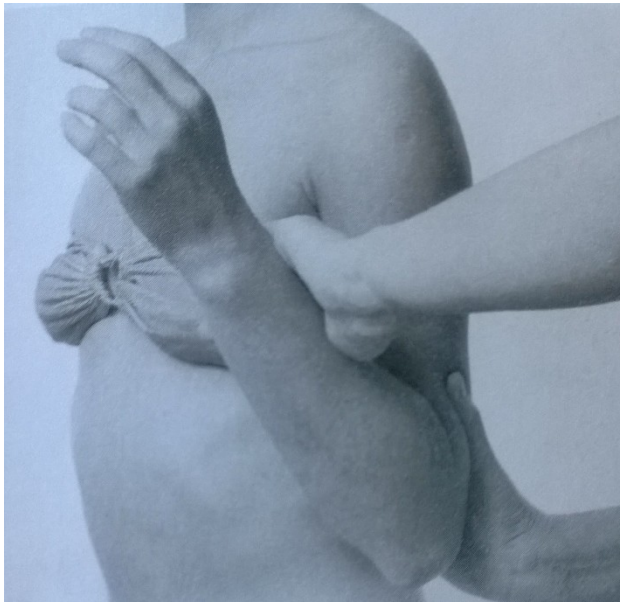
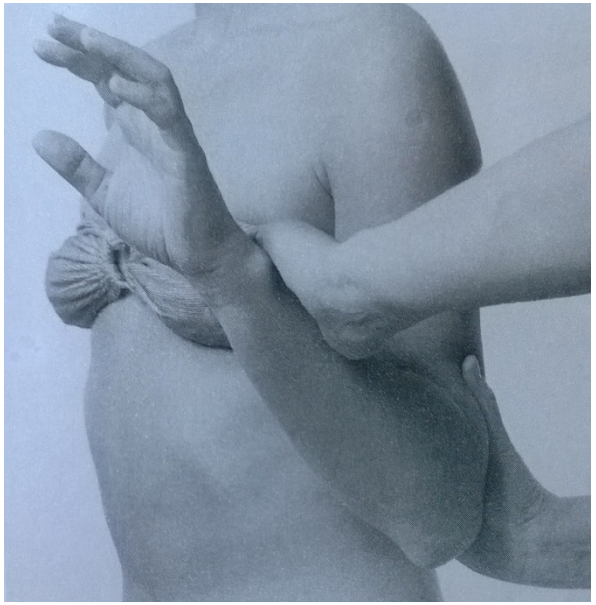
Origin
- Proximal 2/3 of lateral supracondyle ridge of humerus

Insertion
- Lateral surface of distal end of radius

Action
- Flexes forearm

Innervation
- Radial nerve (C5, C6 and C7) (C5, C6, C7)

Elbow flexion – grade 5,4

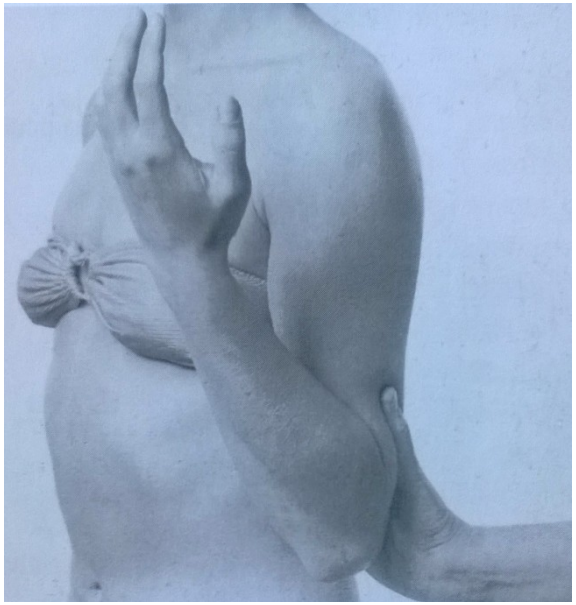
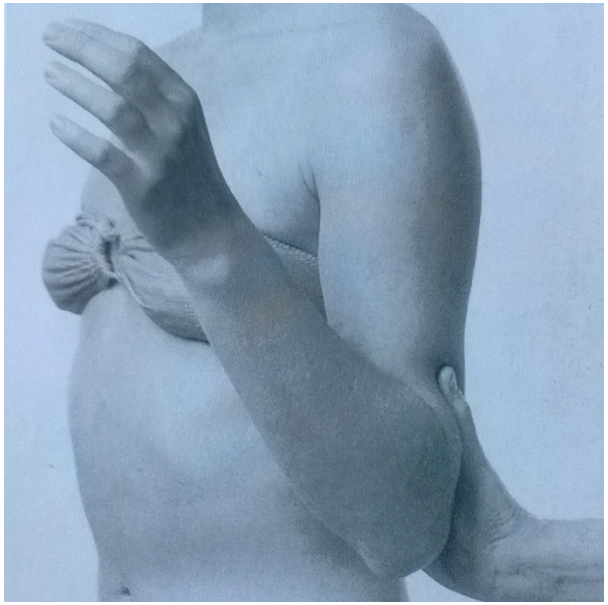
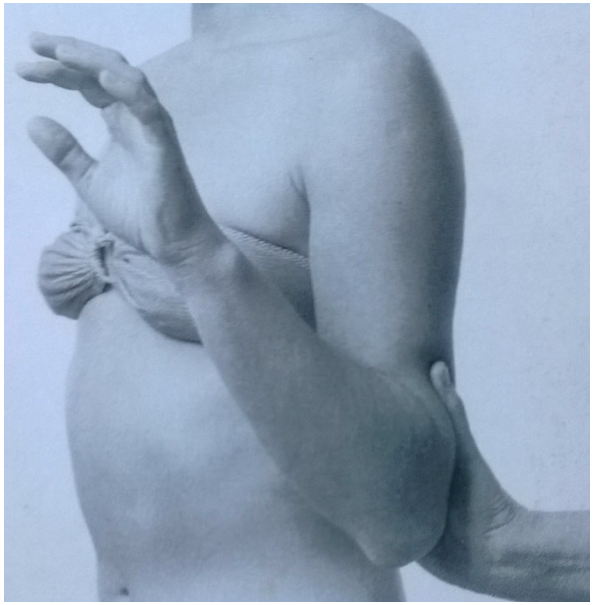
Position: patient sits, tested upper limb extended along body side, forearm: a. supine (m. biceps brachii), b. in central position (brachioradialis), c. prone (brachialis)

Fixation: lower part of the arm from behing

Movement: elbow flexion in full range of motion

Resistance: PT puts resistance on distal part of forearm (arched)

Elbow flexion – grade 3

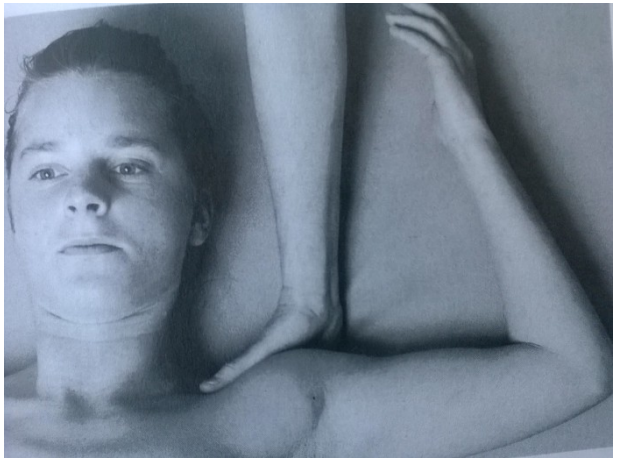
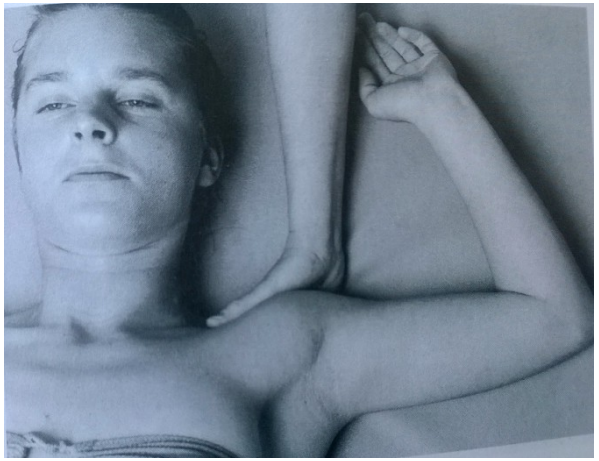
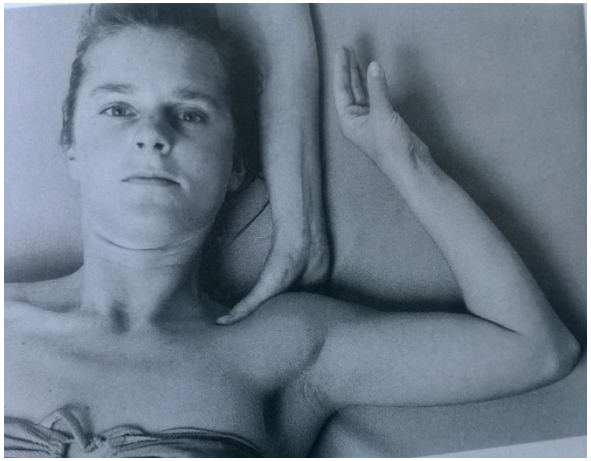




Position: patient sits, tested upper limb extended along body side, forearm: a. supine (m. biceps brachii), b. in central position (brachioradialis), c. prone (brachialis)

Fixation: lower part of the arm from behing, and scapula (by the other hand) if needed

Movement: elbow flexion in full range of motion

Elbow flexion – grade 2

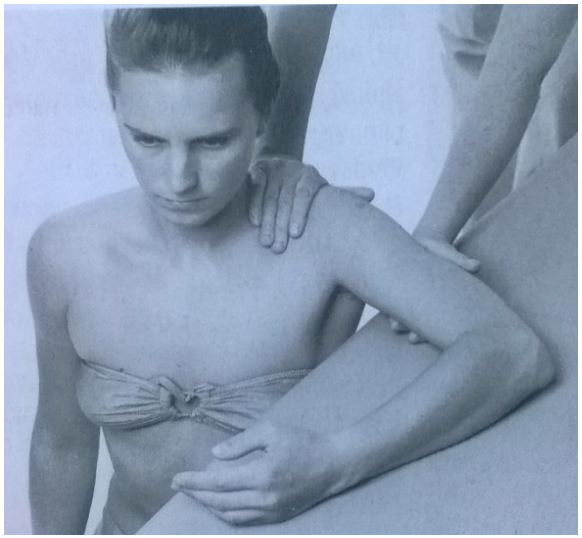
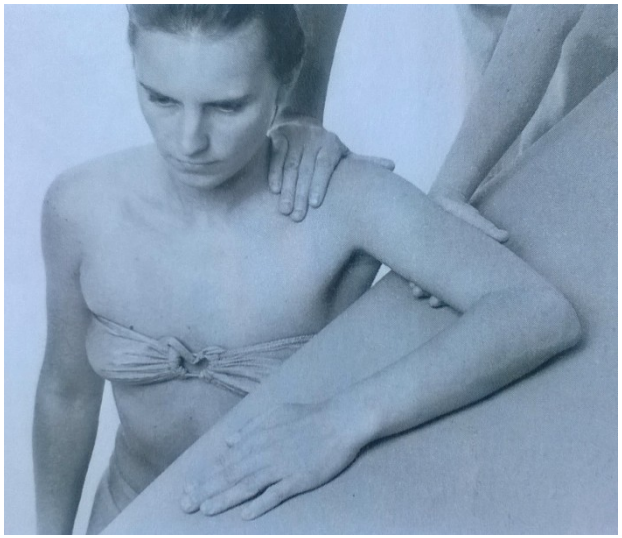
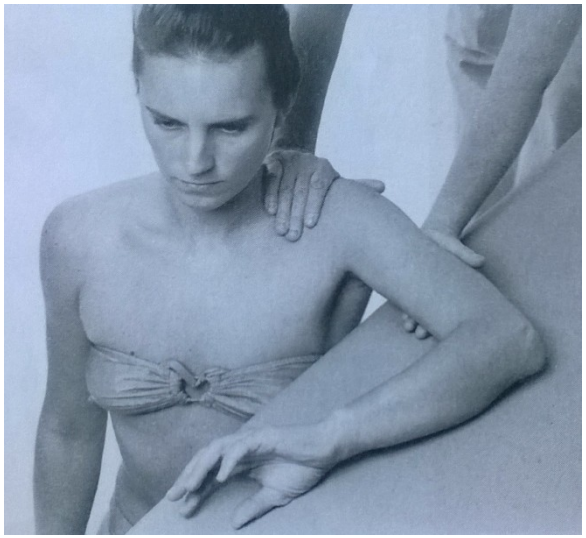




Position: lying supine, 90° shoulder abduction, external rotation, elbow extended, forearm on the table: a. radial side (biceps brachii), b. dorsal side (brachioradialis), c. ulnar side (brachialis)

Fixation: shoulder, or lower part of the arm if needed

Movement: elbow flexion in full range of motion

Elbow flexion – grade 2

Position: patient sits next to the table, 90° shoulder abduction, elbow extended, forearm on the table: a. ulnar side (biceps brachii), b. palm down (brachioradialis), c. radial side (brachialis)

Fixation: one hand on the scapula, the other hand at the middle part of the arm

Movement: elbow flexion in full range of motion, pushing the forearm on the table

Elbow flexion – grade 1,0



Position: lying supine, shoulder slightly abducted and external rotated, elbow in semiflexion, forearm: a. supine (biceps brachii), b. central position (brachioradialis), c. prone (brachialis)

Attempt to move: PT palpates a trace of contraction of the muscles

Elbow flexion – notes:

- Biceps brachii, brachialis, brachioradialis need to be tested separately
- Dont´ allow the patient to contract the muscles of the forearm (flexors and extensors of the wrist)
- Elbow should stay stable, but should move independently

Elbow extension

Triceps brachii

Triceps brachii

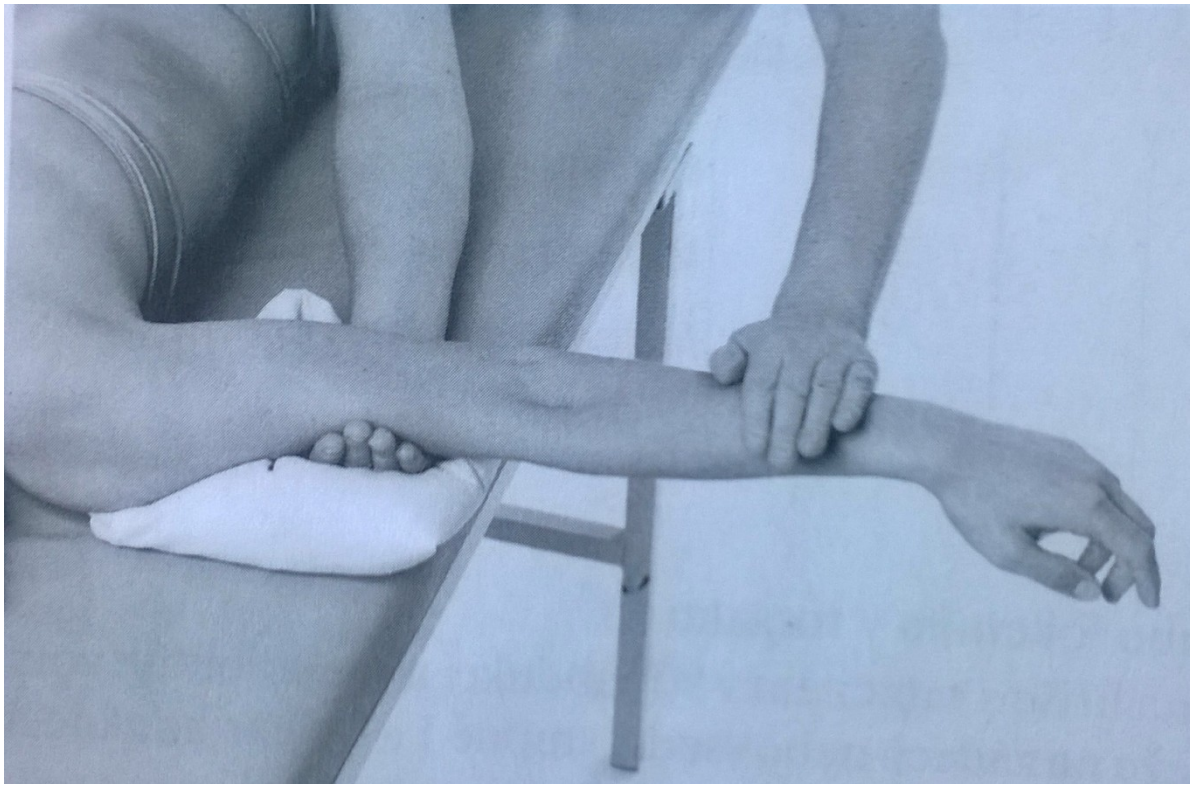
Origin
- Long head: infraglenoid tubercle of scapula;
- Lateral head: posterior surface of humerus, superior to radial groove
- Medial head: posterior surface of humerus, inferior to radial groove

Insertion
- Proximal end of olecranon process of ulna and fascia of forearm

Action
- Chief extensor of forearm
- long head steadies head of abducted humerus

Innervation
- Radial nerve (C6, C7 and C8) (C6, C7, C8)

Elbow extension – grade 5,4



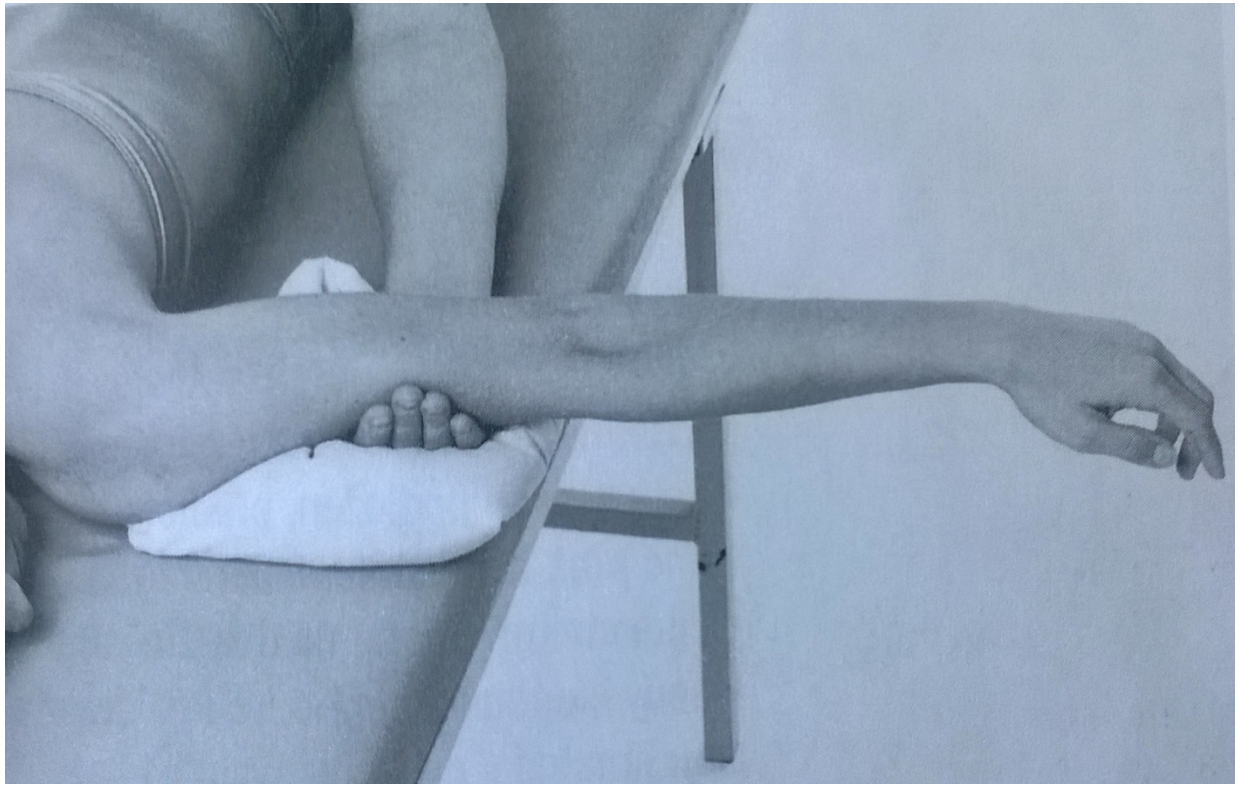
Position: lying prone, head on the forehead, tested upper limb in 90° shoulder abduction, forearm hanging relaxed down the table

Fixation: distal part of the arm from ventral side

Movement: elbow extension

Resistance: on the distal part of forearm (arched)

Elbow extension – grade 3



Position: lying prone, head on the forehead, tested upper limb in 90° shoulder abduction, forearm hanging relaxed down the table

Fixation: distal part of the arm from ventral side

Movement: elbow extension

Elbow extension – grade 2

Position A: lying supine, tested upper limb in 90° shoulder abduction and external rotation, elbow in 90° flexion, forearm supine

Fixation: arm and the scapula

Movement: elbow extension by pushing the forearm on the table

Position A: sitting next to the table, tested upper limb in 90° shoulder abduction, elbow in 90° flexion, forearm in the central position

Fixation: arm and the scapula

Movement: elbow extension by pushing the forearm on the table

Elbow extension – grade 1,0

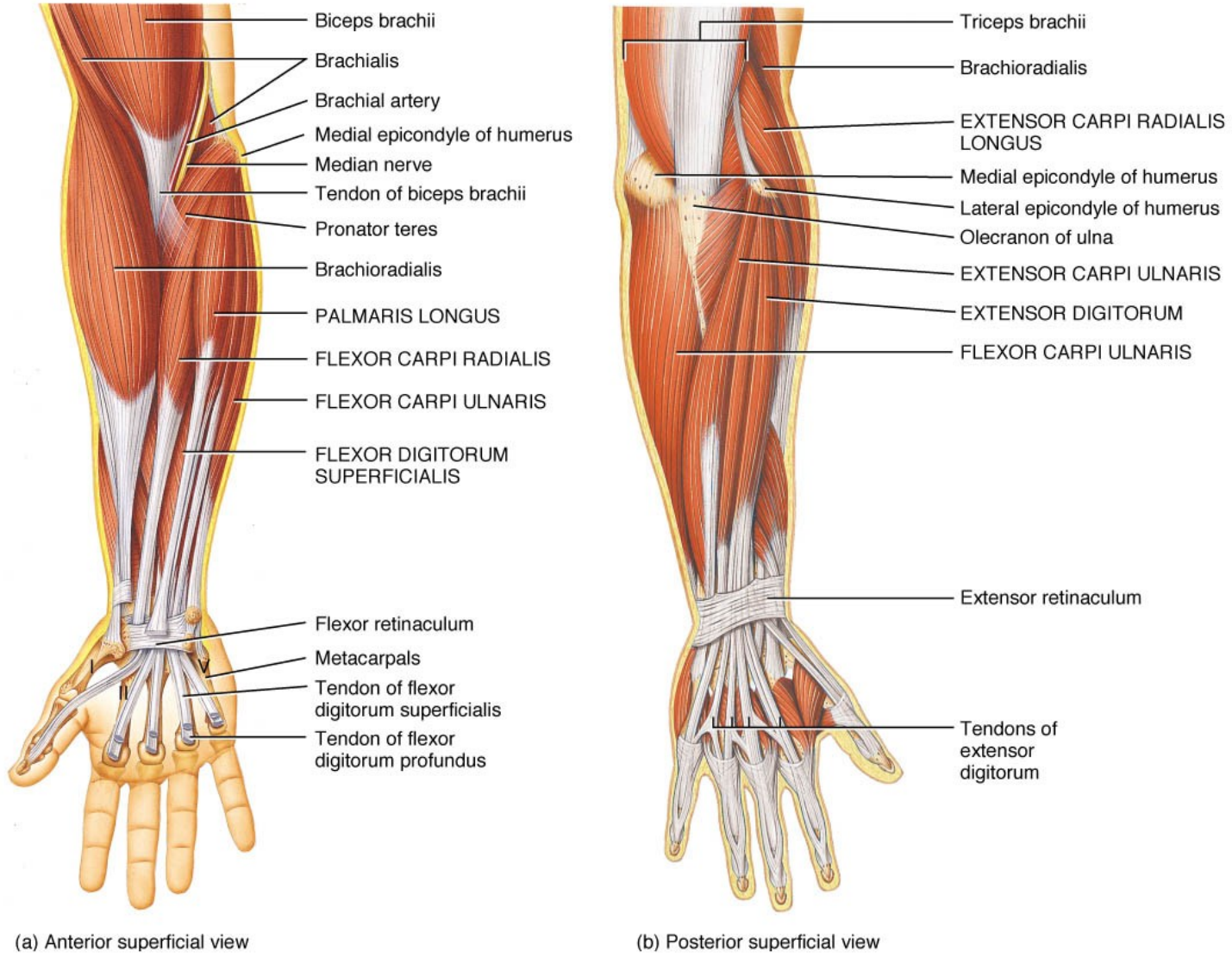
Position: lying prone, head lying rotated to the tested side, tested upper limb in 90° shoulder abduction, forearm hanging relaxed down the table, 90° elbow flexion

Attempt to move: PT palpates the trace of contraction of triceps

Elbow extension – notes:

- Dont´ allow the patient to use extensors of the wrist
- No protraction of the shoulder should be allowed

Forearm



(a) Anterior superficial view

(b) Posterior superficial view

Supination

Supinator

Biceps brachii

Supinator

Origin

- Lateral epicondyle of humerus, radial collateral and annular ligaments, supinator fossa and crest of ulna

Insertion

- Lateral, posterior and anterior surfaces of proximal 1/3 of radius

Action

- Supinates forearm (i.e., rotates radius to turn palm anteriorly)

Innervation

- Deep branch of radial nerve (C5 and C6) (C5, C6)

Biceps brachii

Origin

- Short head: tip of coracoid process of scapula;
- Long head: supraglenoid tubercle of scapula

Insertion

- Tuberosity of radius and fascia of forearm via bicipital aponeurosis

Action

- Supinates forearm and, when it is supine, flexes forearm

Innervation

- Musculocutaneous nerve (C5 and C6) (C5, C6)

Supination – grade 5,4

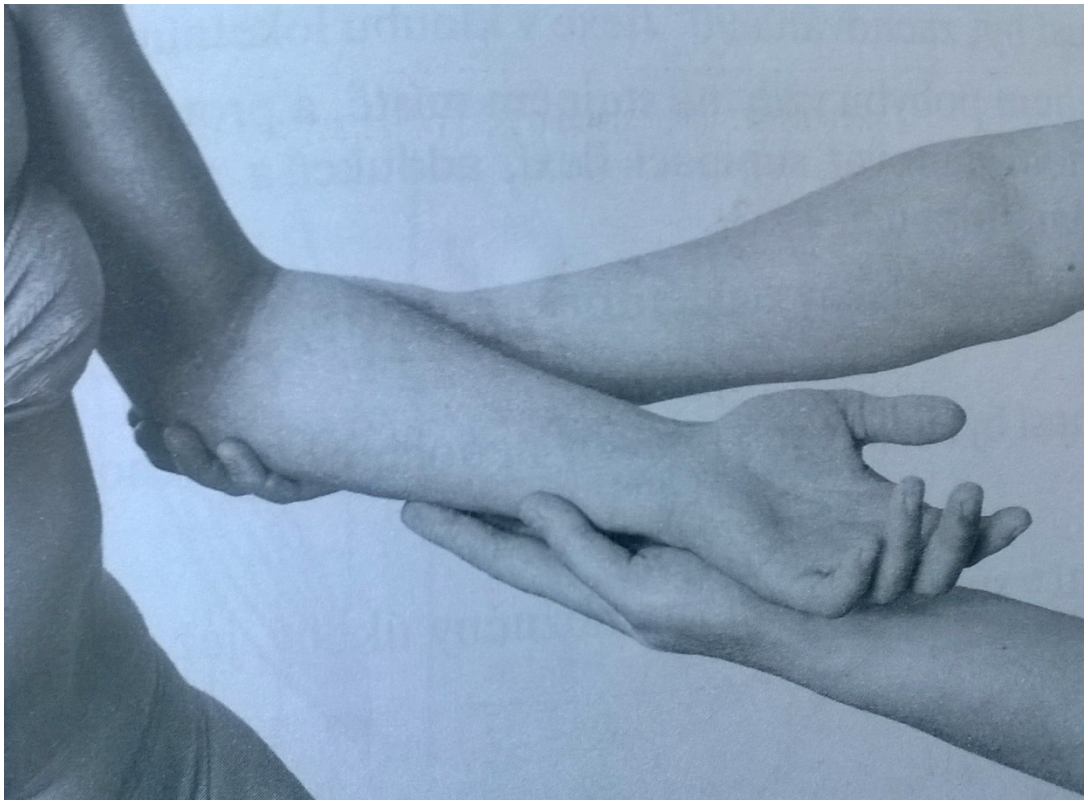
Position: patient sits, arms relaxed along body side, tested upper limb 90° flexed, forearm in prone position, muscles of the wrist and fingers relaxed

Fixation: lower part of the arm

Movement: supination in full range of motion

Resistance: PT puts resistance against the movement, holding patients hand like at the picture (main resistance by using PTs´ point finger on the patients´ processus styloideus ulnae)

Supination – grade 3

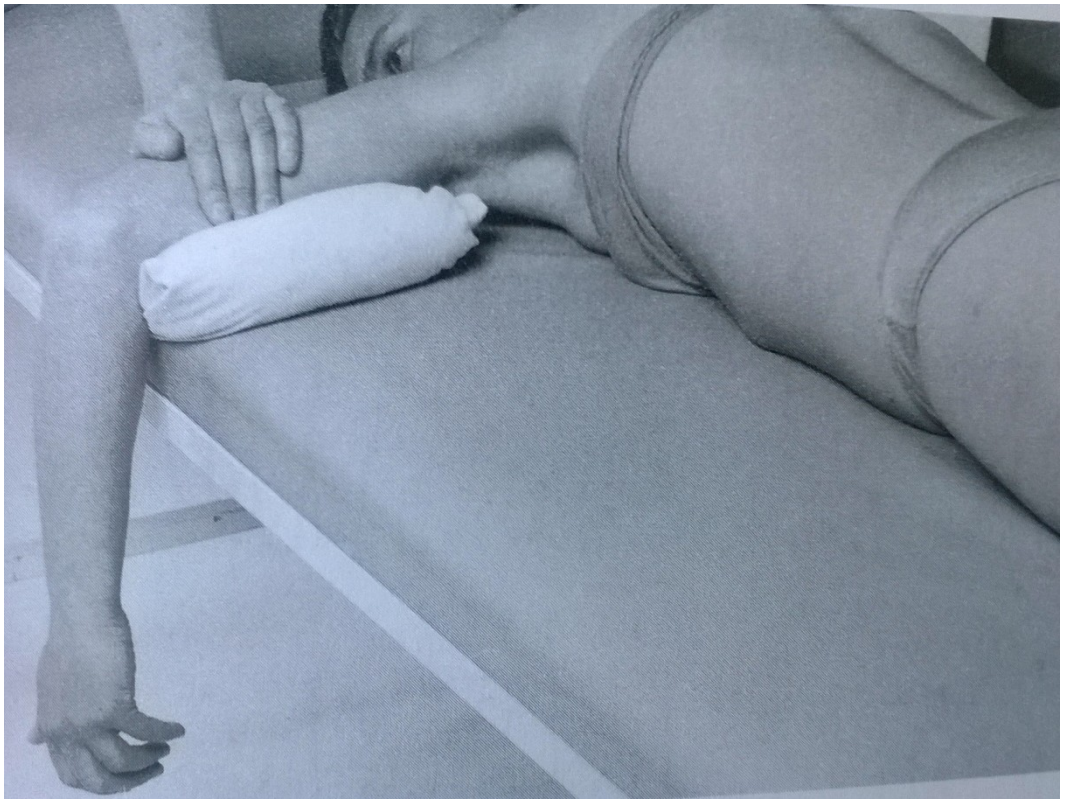


Position: patient sits, arms relaxed along body side, tested upper limb 90° flexed, forearm in prone position, muscles of the wrist and fingers relaxed

Fixation: at the lower part of patients´ arm and support the forearm by the other hand

Movement: supination in full range of motion

Supination – grade 2

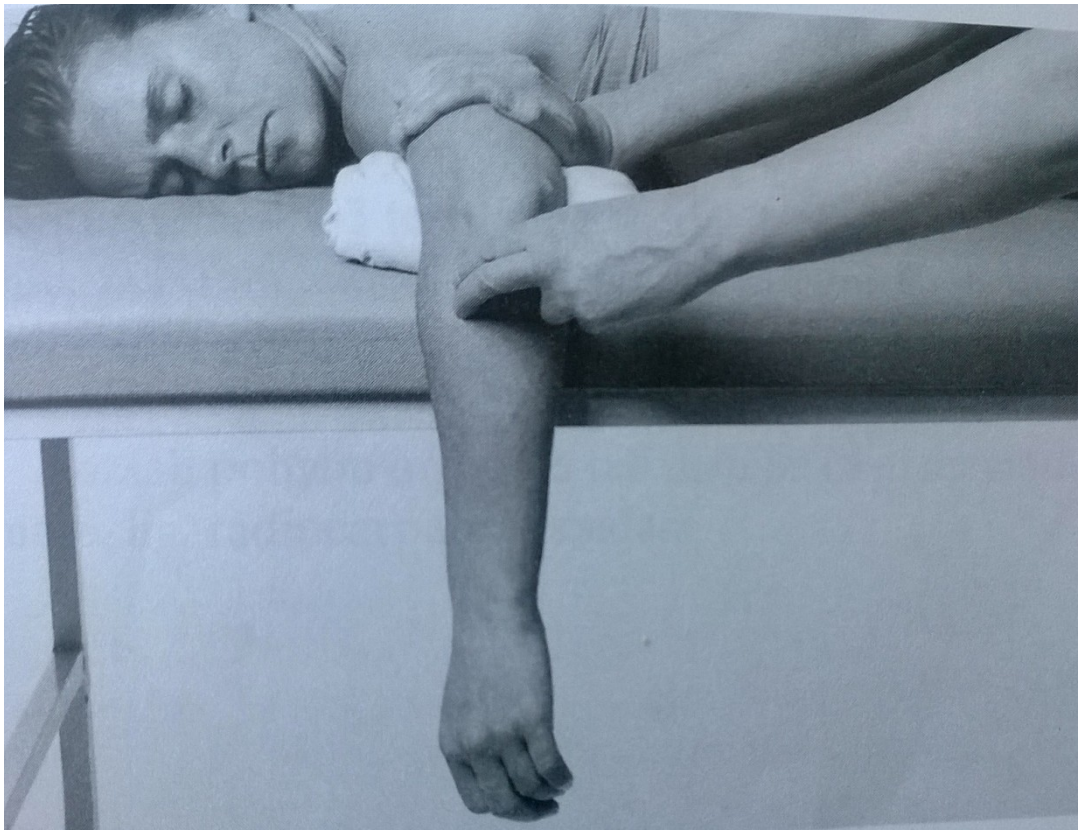


Position: lying prone, 90° shoulder abduction, 90° elbow flexion, forearm prone hanging from the table, muscle of the wrist and fingers relaxed

Fixation: the lower part of the arm

Movement: supination in full range of motion

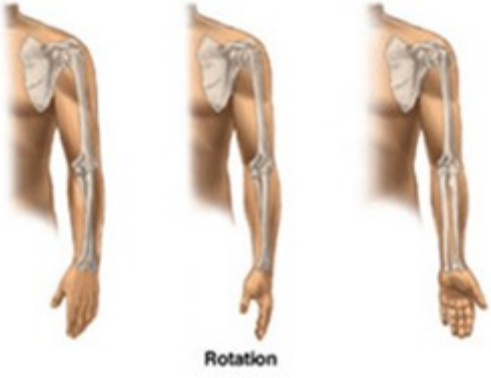
Supination – grade 1,0



Position: lying prone, 90° shoulder abduction, 90° elbow flexion, forearm prone hanging from the table, muscle of the wrist and fingers relaxed

Attempt to move: PT palpates the trace of contraction of supinator and biceps during patients´ attempt to supinate the forearm

Pronation



Pronator quadratus

Pronator teres

Pronator quadratus

Origin
- Distal 1/4 of anterior surface of ulna

Insertion
- Distal 1/4 of anterior surface of radius

Action
- Pronates forearm; deep fibers bind radius and ulna together

Innervation
- Anterior interosseous nerve from median nerve (C8 and T1) (C8, T1)

Pronator teres

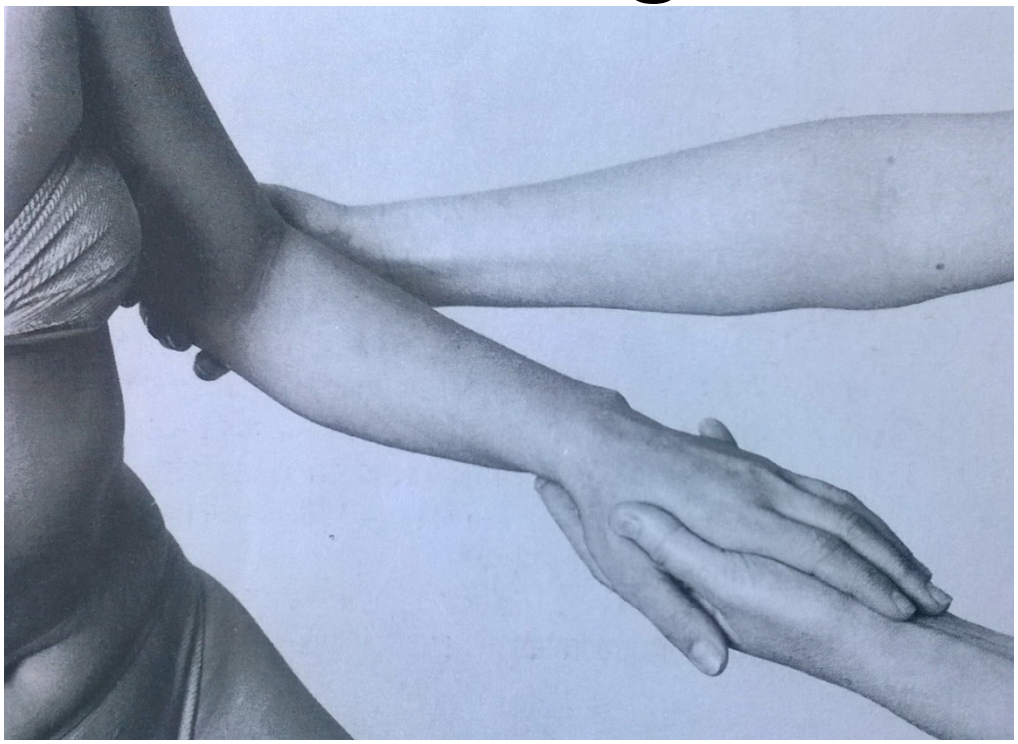
Origin
- Medial epicondyle of humerus and coronoid process of ulna

Insertion
- Middle of lateral surface of radius

Action
- Pronates and flexes forearm (at elbow)

Innervation
- Median nerve (C6 and C7) (C6, C7)

Pronation – grade 5,4



Position: patient sits, arms relaxed along body side, tested upper limb 90° flexed, forearm in prone position, muscles of the wrist and fingers relaxed

Fixation: lower part of the arm

Movement: pronation in full range of motion

Resistance: PT puts resistance against the movement, holding patients hand like at the picture (main resistance by using PTs´ point finger and middle finger on the patients´ processus styloideus radii)

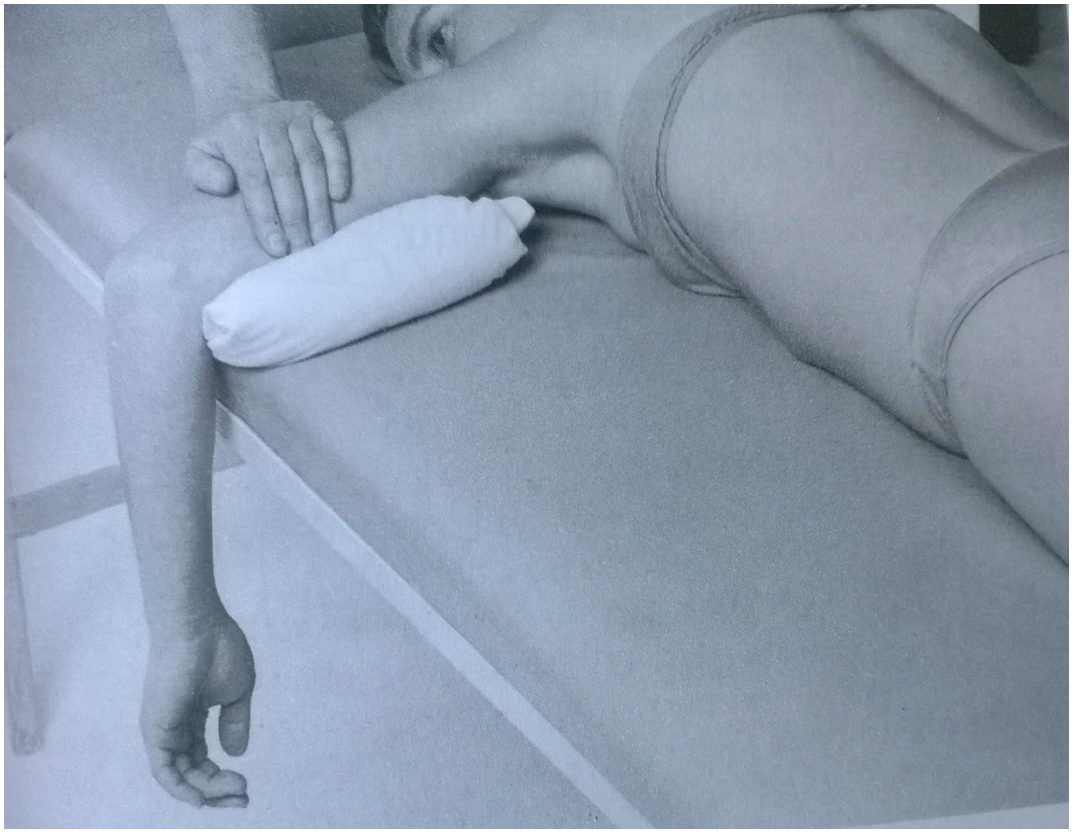
Pronation – grade 3

Position: patient sits, arms relaxed along body side, tested upper limb 90° flexed, forearm in prone position, muscles of the wrist and fingers relaxed

Fixation: lower part of the arm, support the forearm by the other hand

Movement: pronation in full range of motion

Pronation – grade 2

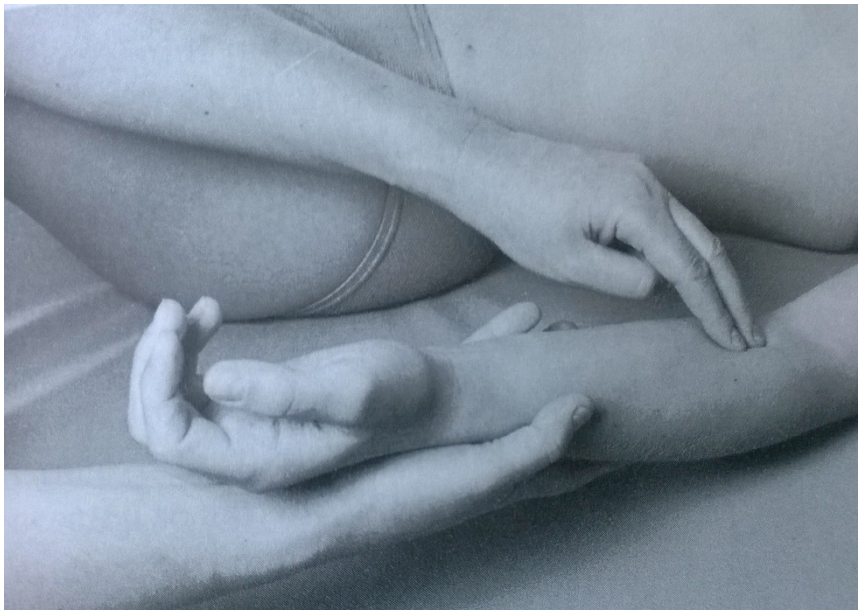


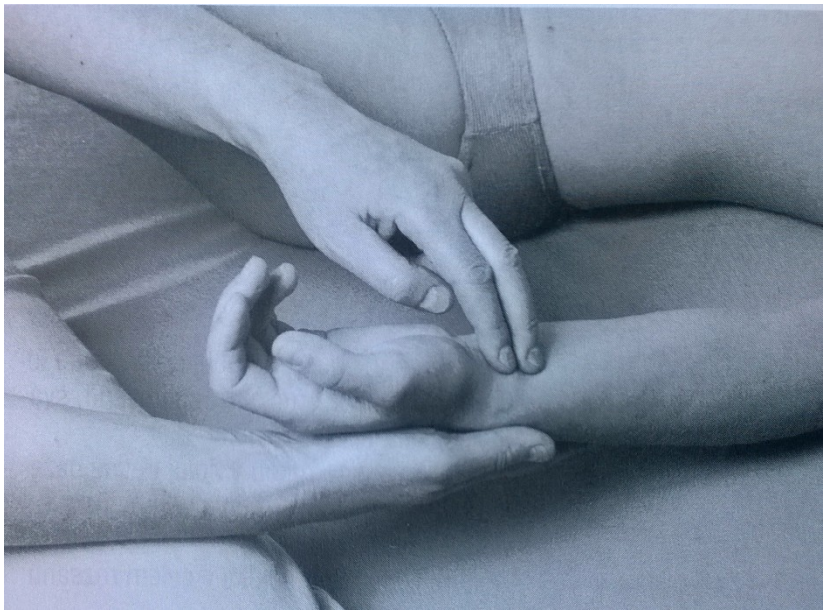
Position: lying prone, 90° shoulder abduction, 90° elbow flexion, forearm supine hanging from the table, muscle of the wrist and fingers relaxed

Fixation: the lower part of the arm

Movement: pronation in full range of motion

Pronation – grade 1,0





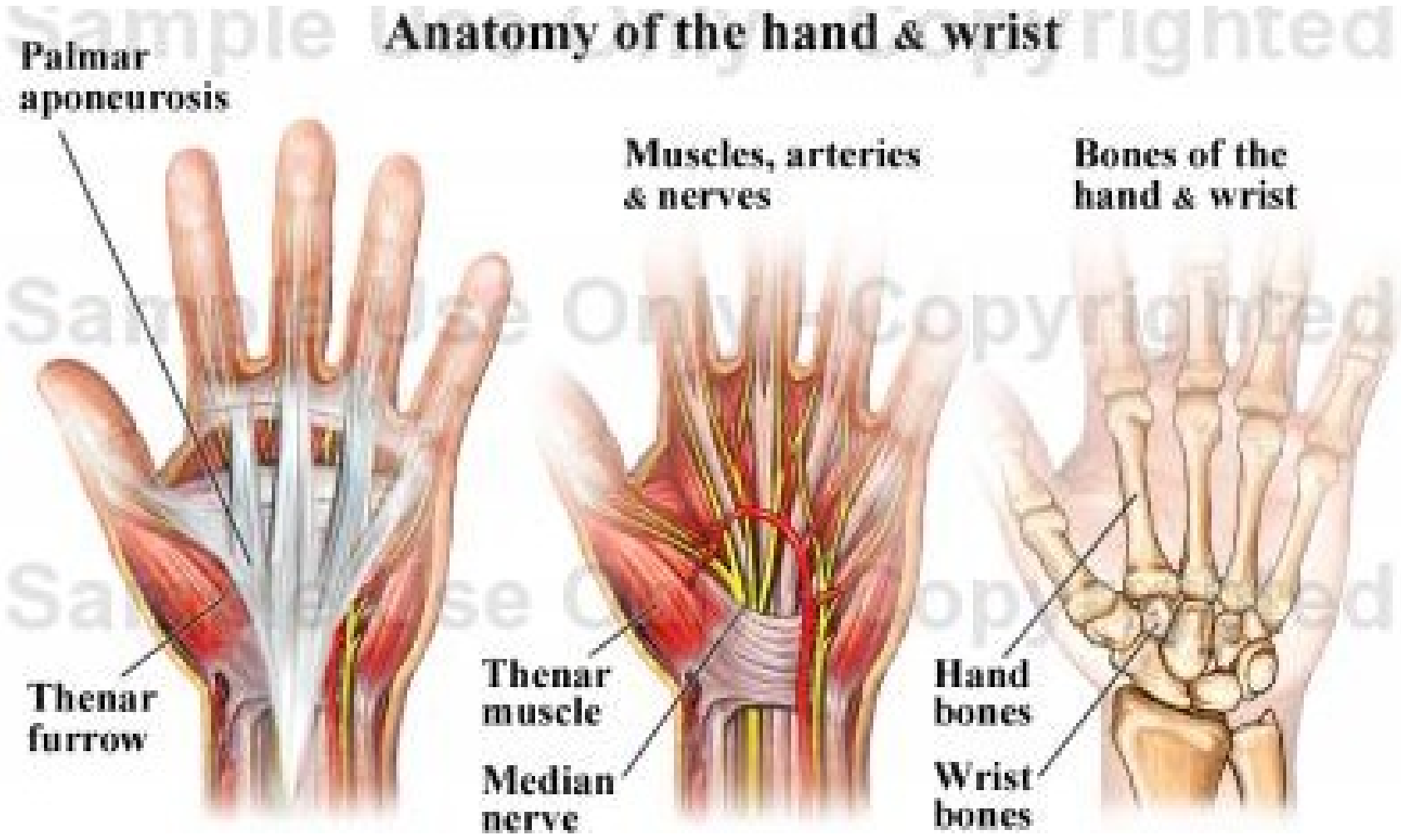
Position: lying supine, elbow slightly flexed and supinated

Attempt to move: PT palpates the trace of contraction of pronator teres and pronator quadratus during patients´ attempt to pronate the forearm

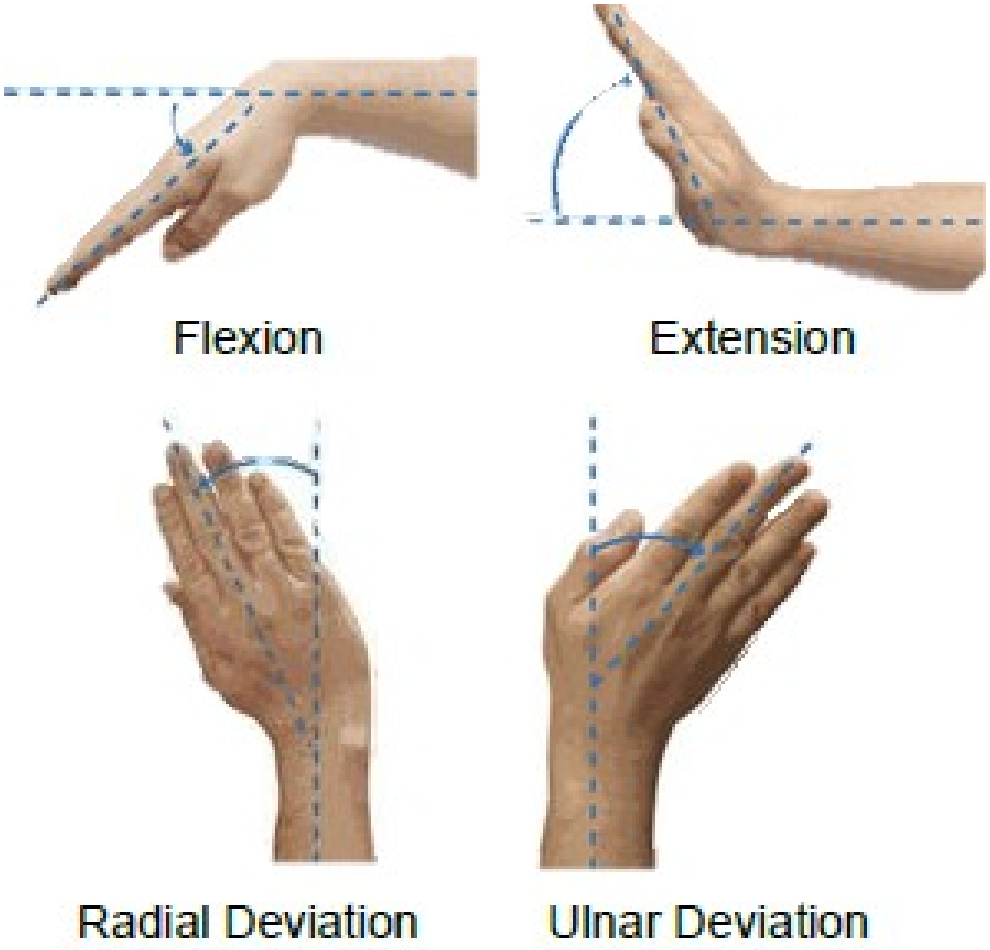
Pronation and supination – notes:

- Elbow should stay in 90° flexion during whole tested movement
- No movement of the shoulder should be allowed – fix the arm properly
- No activity of muscles of the wrist and fingers
- Proper grip of the hand
- Palpation of cotraction of supinator, pronator teres and pronator quadratus muscle is difficult

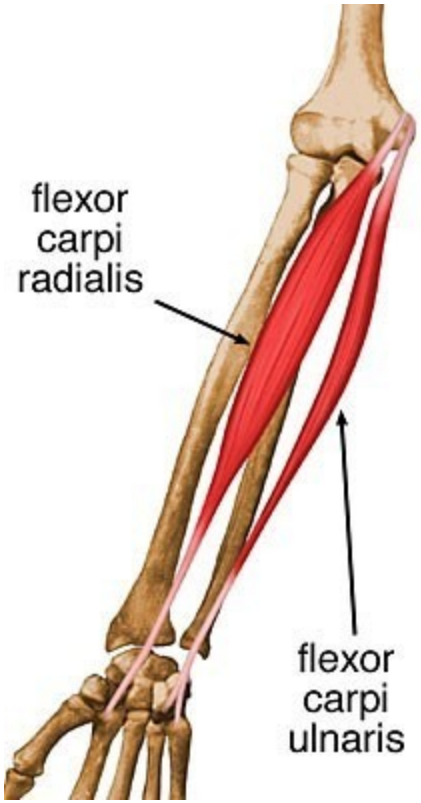
Wrist


Anatomy of the hand & wrist
Palmar aponeurosis
Thenar furrow
Muscles, arteries & nerves
Thenar muscle
Median nerve
Bones of the hand & wrist
Hand bones
Wrist bones

Movements of the wrist joint



Wrist flexion



Flexor carpi radialis

Flexor carpi ulnaris

Flexor carpi radialis

Origin
- Medial epicondyle of humerus

Insertion
- Base of 2nd metacarpal

Action
- Flexes and abducts hand (at wrist)

Innervation
- Median nerve (C6 and C7) (C6, C7)

Flexor carpi ulnaris

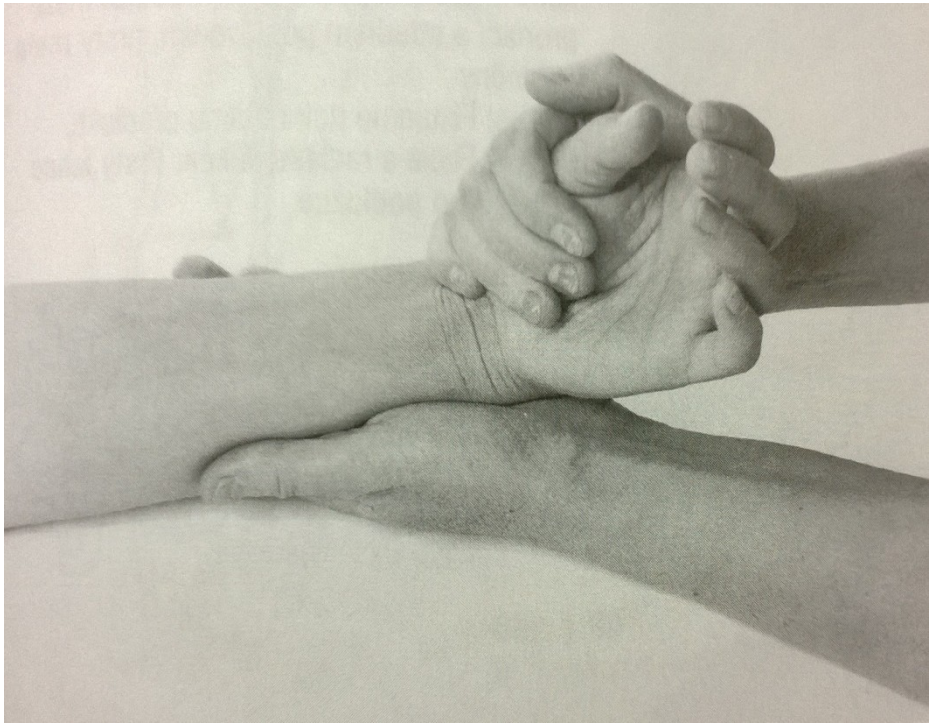
Origin
- Humeral head: medial epicondyle of humerus;
- Ulnar head: olecranon and posterior border of ulna

Insertion
- Pisiform bone, hook of hamate bone, and 5th metacarpal bone

Action
- Flexes and adducts hand (at wrist)

Innervation
- Ulnar nerve (C7 and C8) (C7, C8)

Wrist flexion with radial duction – grade 5,4



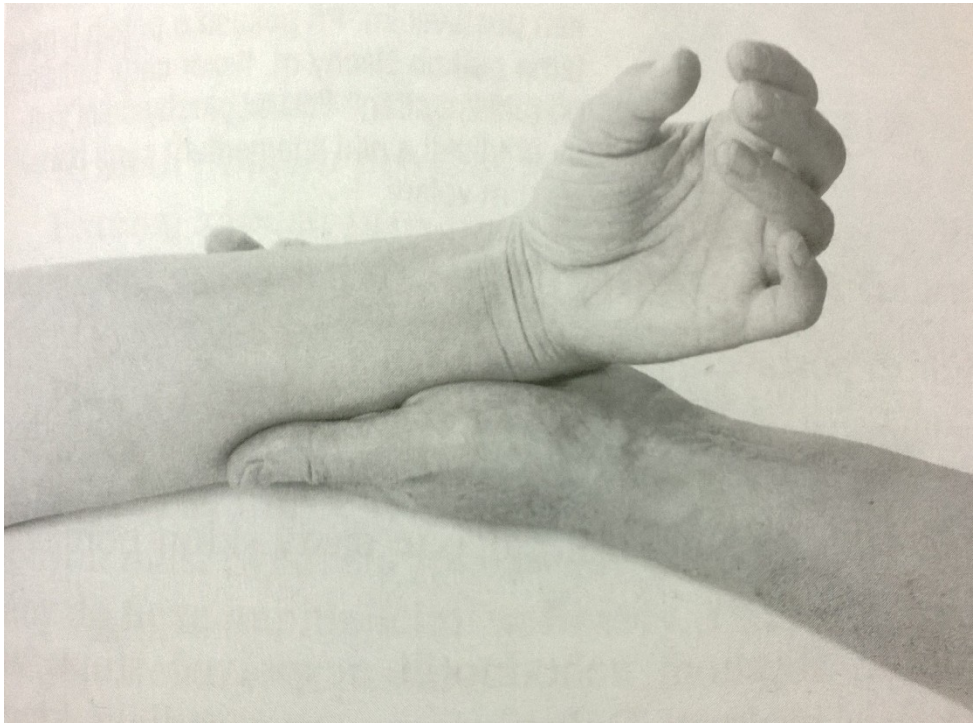
Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between supination and pronation, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm (dont´t touch the main muscle)

Movement: flex and abduct the wrist (both together), fingers relaxed

Resistance: PT puts resistance on the thenar against the movement

Wrist flexion with radial duction – grade 3

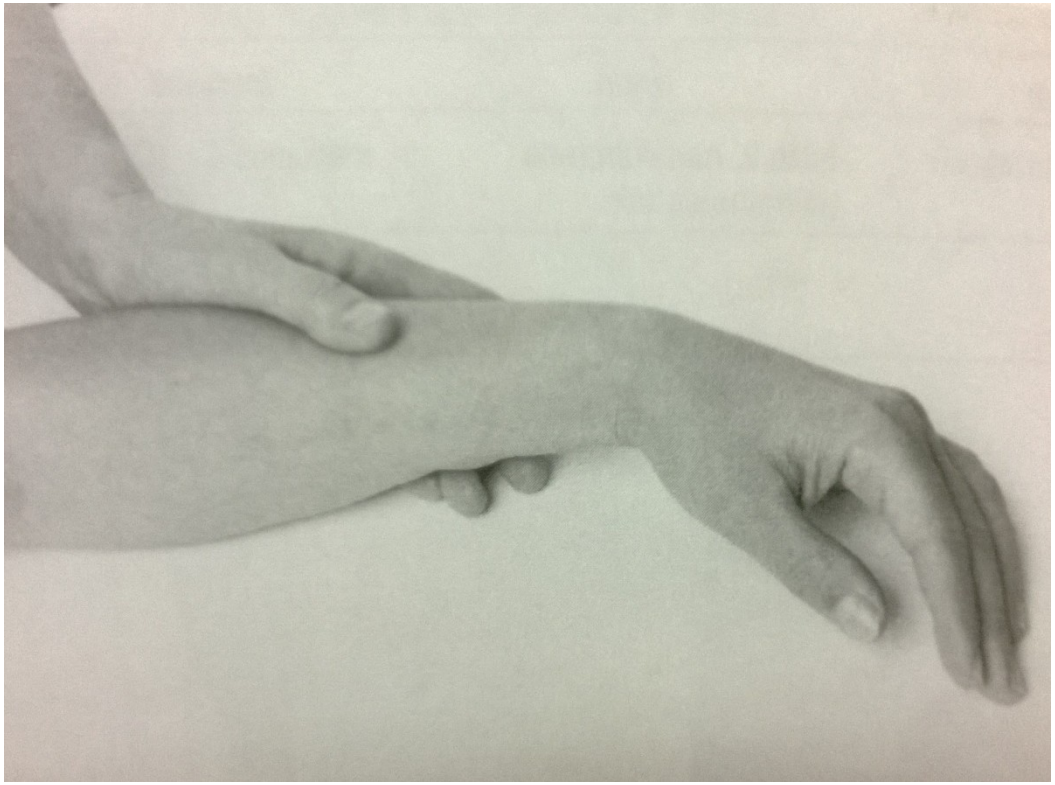


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between supination and pronation, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm (dont´t touch the main muscle)

Movement: flex and abduct the wrist (both together), fingers relaxed

Wrist flexion with radial duction – grade 2

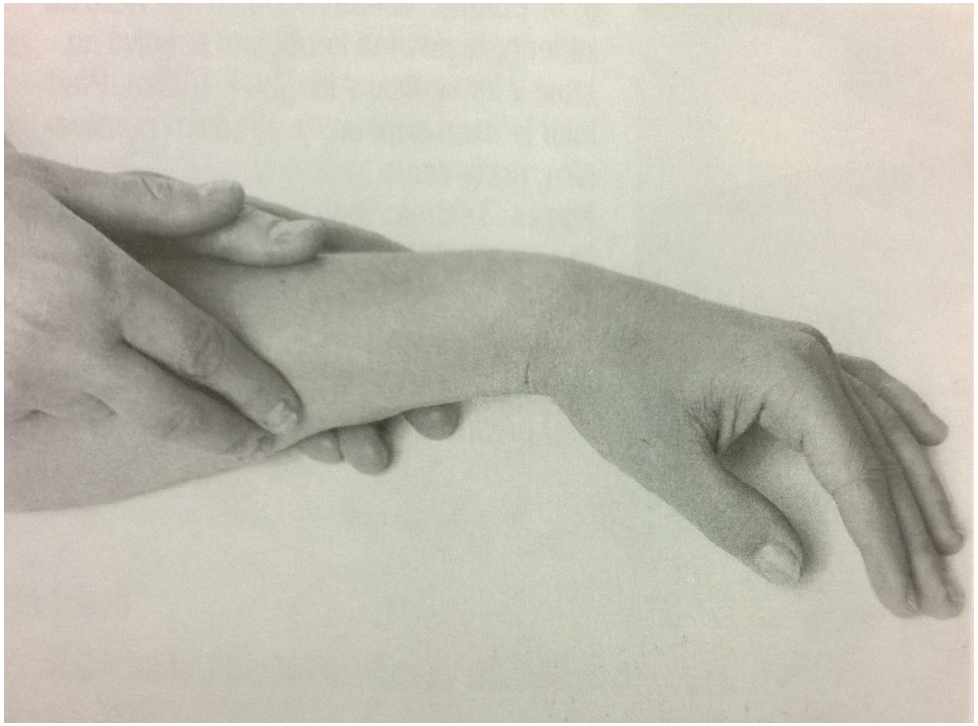


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between supination and pronation, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm (dont´t touch the main muscle)

Movement: flex and radial duction of the wrist (both together) by pushing the hand on the ulnar side, fingers relaxed

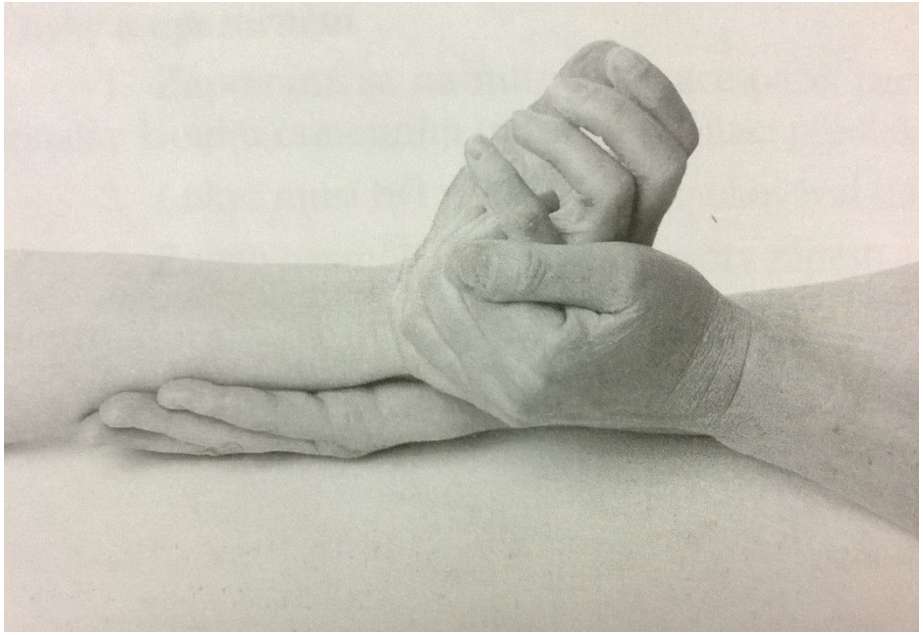
Wrist flexion with radial duction – grade 1,0



Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between supination and pronation, wrist in the central position, fingers relaxed

Attempt to move: PT palpates the trace of contraction of the flexor carpi radialis during patients attempt to do flexion and abduction of the wrist

Wrist flexion with ulnar duction – grade 5,4



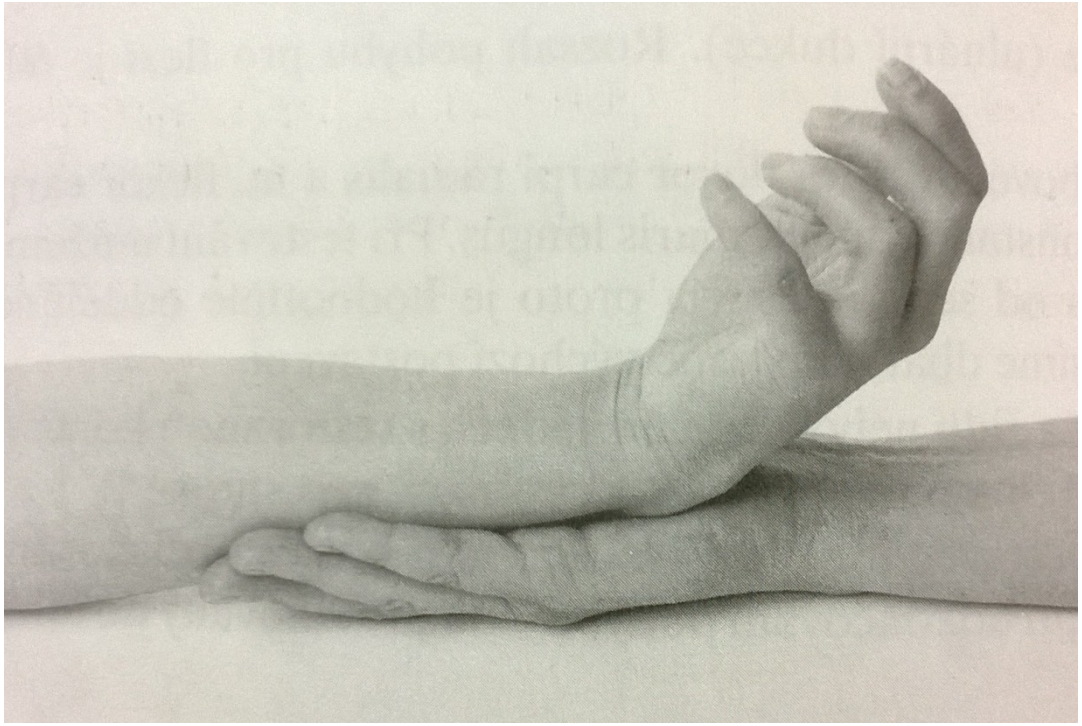
Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm supinated, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm (dont´t touch the main muscle)

Movement: flex and adduct the wrist (both together), fingers relaxed

Resistance: PT puts resistance on the hypotenar against the movement

Wrist flexion with ulnar duction – grade 3

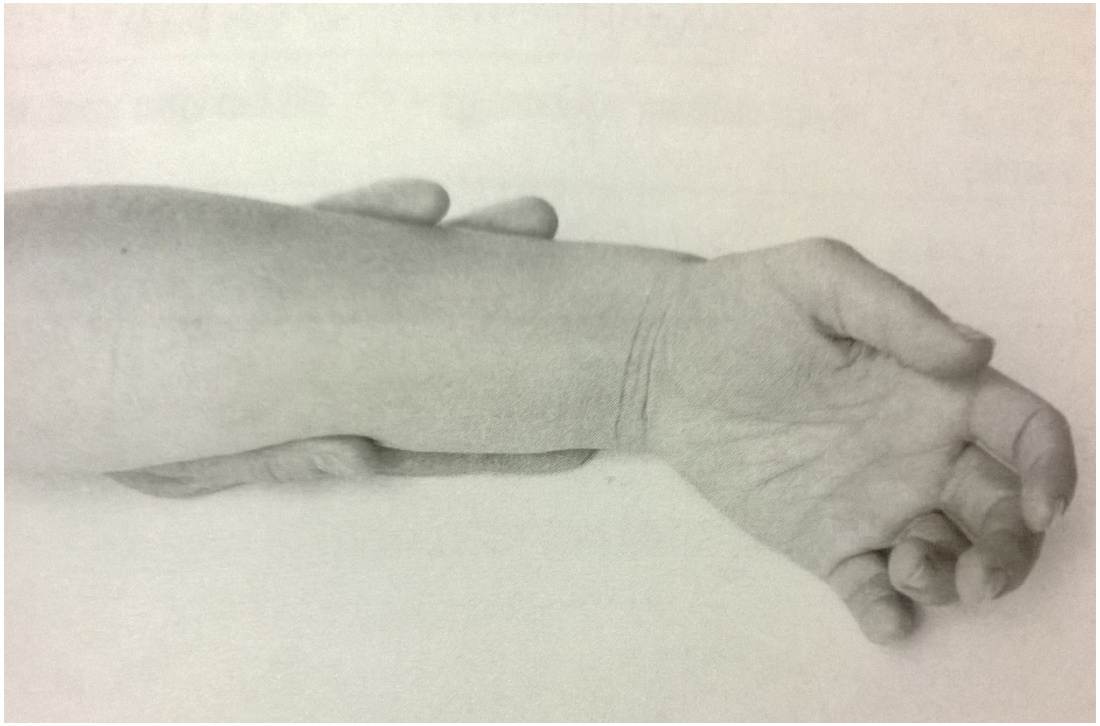


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm supinated, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm (dont´t touch the main muscle)

Movement: flex and adduct the wrist (both together), fingers relaxed

Wrist flexion with ulnar duction – grade 2

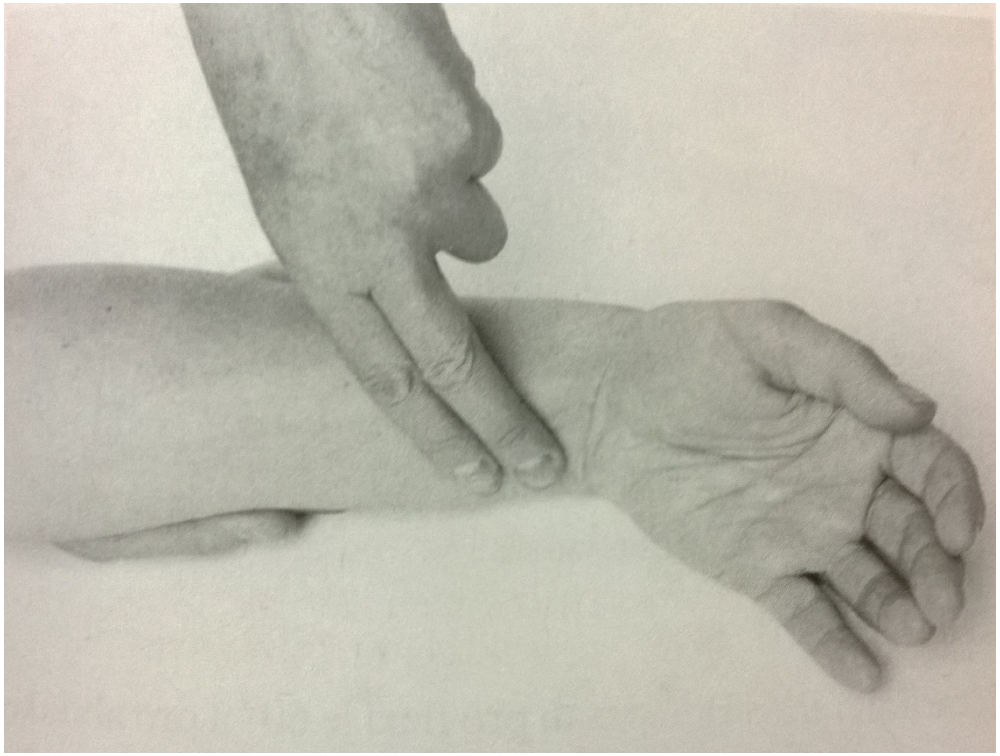


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between supination and pronation, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm (dont´t touch the main muscle)

Movement: flex and adduct the wrist (both together) by pushing the hand on the ulnar side, fingers relaxed

Wrist flexion with ulnar duction – grade 1,0



Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between supination and pronation, wrist in the central position, fingers relaxed

Attempt to move: PT palpates the trace of contraction of the flexor carpi ulnaris during patients attempt to do flexion and adduction of the wrist

Wrist flexion – notes:

- Initial position of the wrist should be maintained
- Relaxation of the fingers is necessary as a prevention of substitution
- Palpate the trace of contraction of the muscles properly

Wrist extension

Extensor carpi radialis brevis

Extensor carpi radialis longus

Extensor carpi ulnaris

Extensor carpi radialis brevis

Origin
- Lateral epicondyle of humerus

Insertion
- Base of 3rd metacarpal

Action
- Extend and abduct hand at wrist joint

Innervation
- Deep branch of radial nerve (C7 and C8) (C7, C8)

Extensor carpi radialis longus

Origin
- Lateral supracondyle ridge of humerus

Insertion
- Base of 2nd metacarpal

Action
- Extend and abduct hand at wrist joint

Innervation
- Radial nerve (C6 and C7) (C7, C6)

Extesor carpi ulnaris

Origin

- Lateral epicondyle of humerus and posterior border of ulna

Insertion

- Base of 5th metacarpal

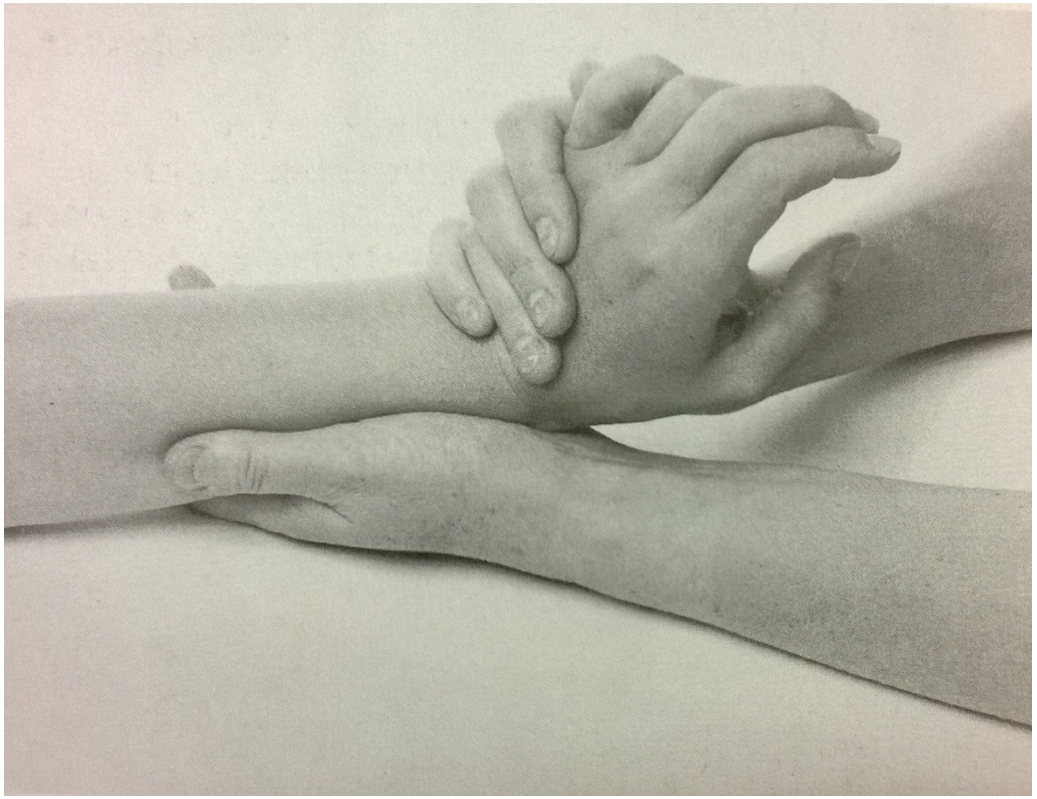
Action

- Extends and adducts hand at wrist joint

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

Wrist extension with ulnar duction – grade 5,4



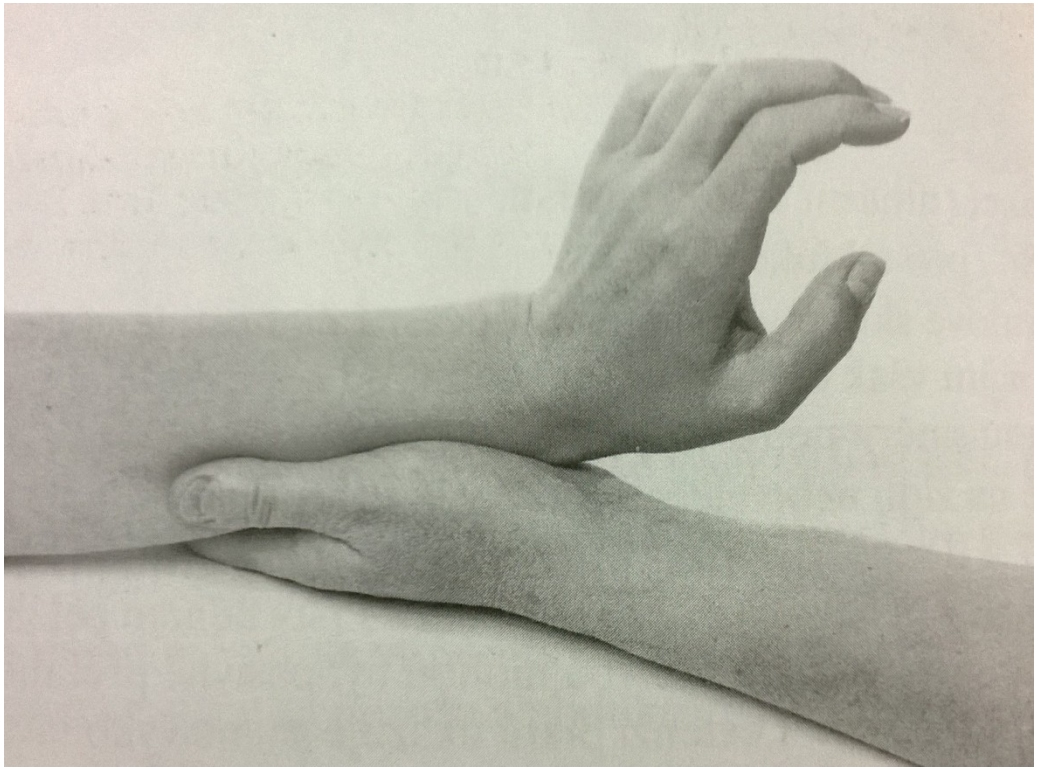
Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm pronated, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm from the palmar side (dont´t touch the main muscle)

Movement: extension and ulnar duction of the wrist (both together), fingers relaxed

Resistance: PT puts resistance on the back of the hand (V. metatars) against the movement

Wrist extension with ulnar duction – grade 3

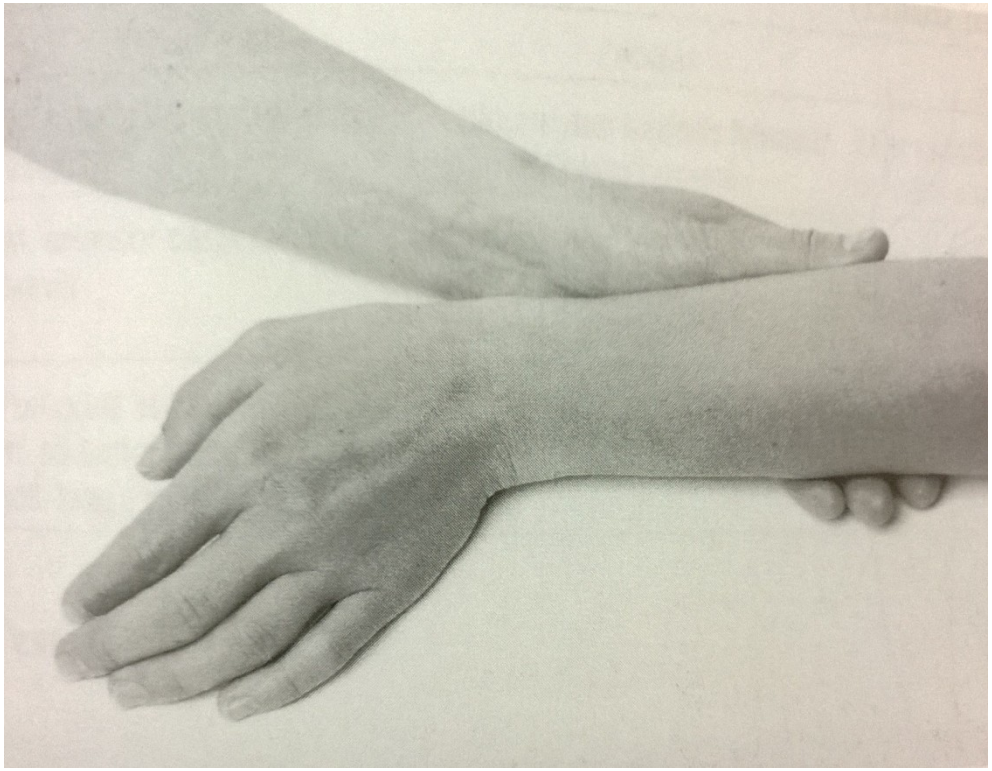


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm pronated, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm from the palmar side (dont´t touch the main muscle)

Movement: extension and ulnar duction of the wrist (both together), fingers relaxed

Wrist extension with ulnar duction – grade 2

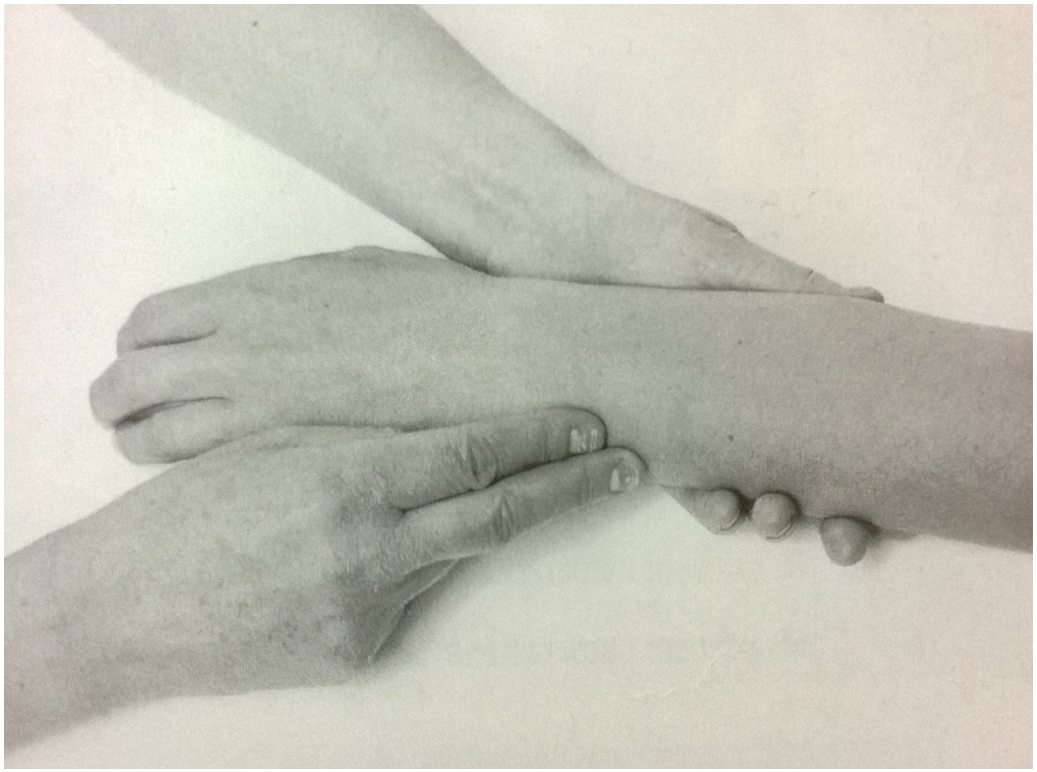


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between pronation and suupination, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm from the palmar side (dont´t touch the main muscle)

Movement: extension and ulnar duction of the wrist (both together) by pushing the hand on the ulnar side of the hand, fingers relaxed

Wrist extension with ulnar duction – grade 1,0

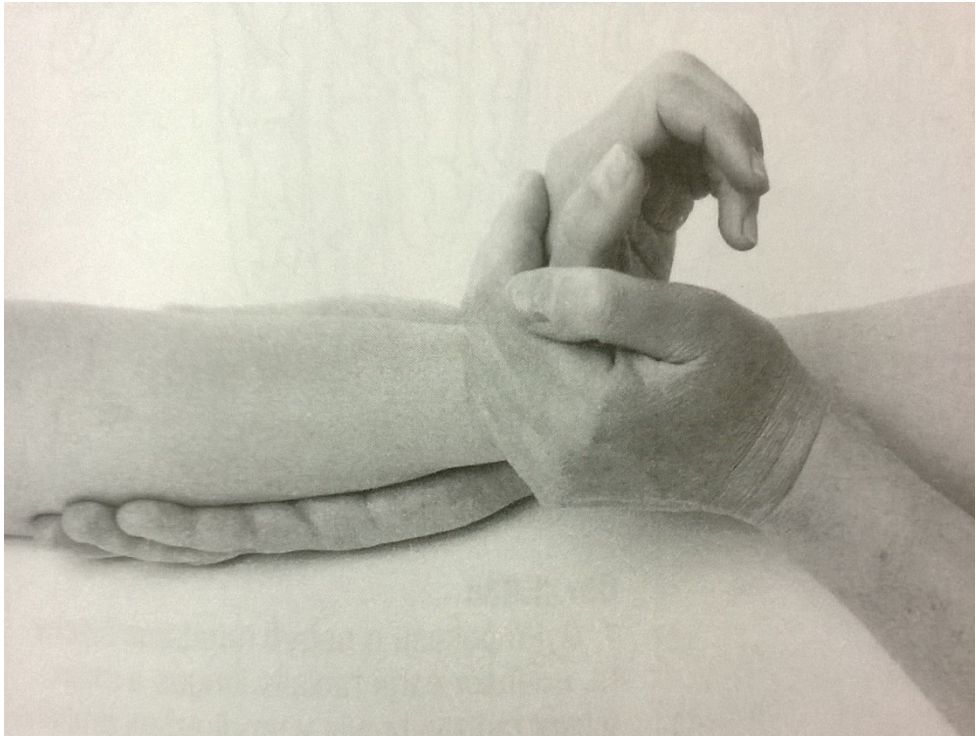


Position: the same as testing before

Fixation: the lower part of the forearm from the palmar side

Attempt to move: during patients attempt of extension and ulnar duction of the wrist PT palpates the trace of contraction of extensor carpi ulnaris (at the back of the hand, at the processus slyloideus ulnae area)

Wrist extension with radial duction – grade 5,4



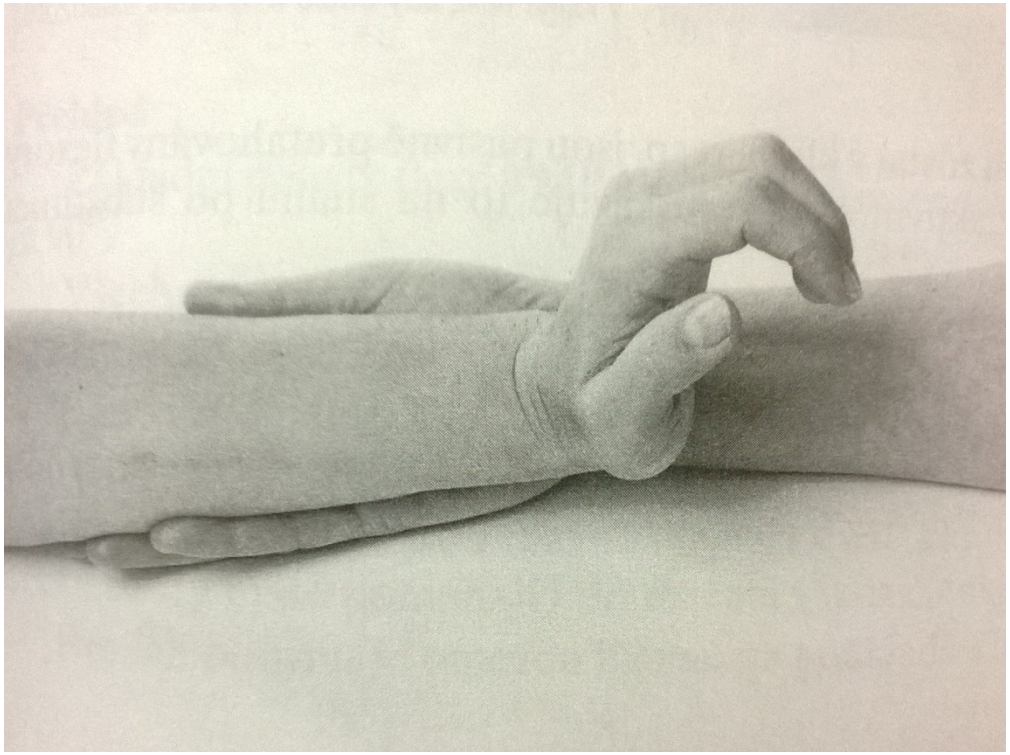
Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm pronated, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm from the palmar side (dont´t touch the main muscle)

Movement: extension and radial duction of the wrist (both together), fingers relaxed

Resistance: PT puts resistance on the back of the hand (II. metatars) against the movement

Wrist extension with radial duction – grade 3

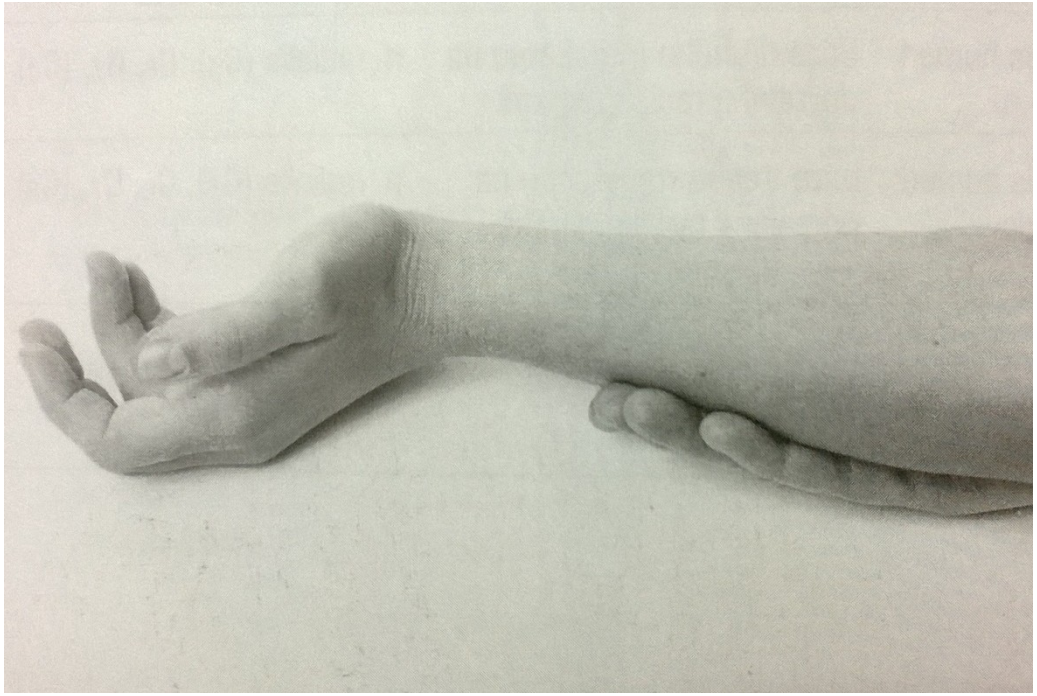


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm pronated, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm from the palmar side (dont´t touch the main muscle)

Movement: extension and radial duction of the wrist (both together), fingers relaxed

Wrist extension with radial duction – grade 2

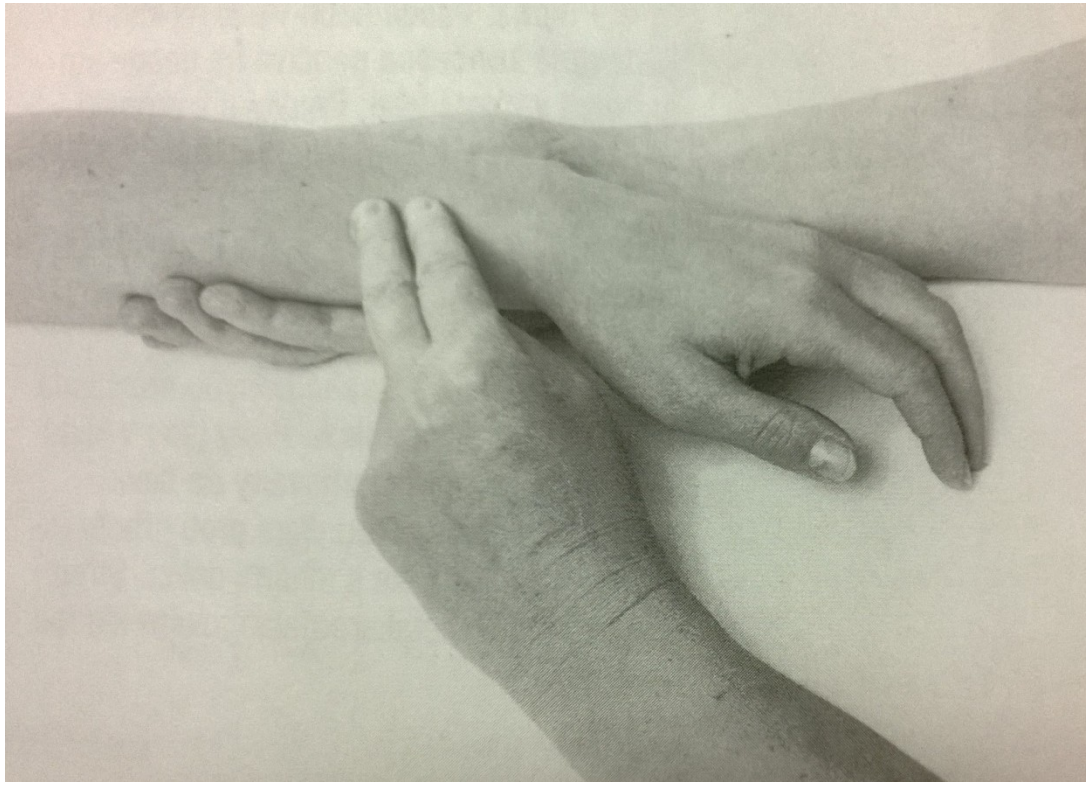


Position: patient sits (or lies supine), tested upper limb on the table – slightly flexed in the elbow, forearm between pronation and supination, wrist in the central position, fingers relaxed

Fixation: fix the lower part of the forearm from the ulnar side

Movement: extension and radial duction of the wrist (both together) by pushing the hand on the ulnar side on the table, fingers relaxed

Wrist extension with radial duction – grade 1, 0



Position: the same as testing before

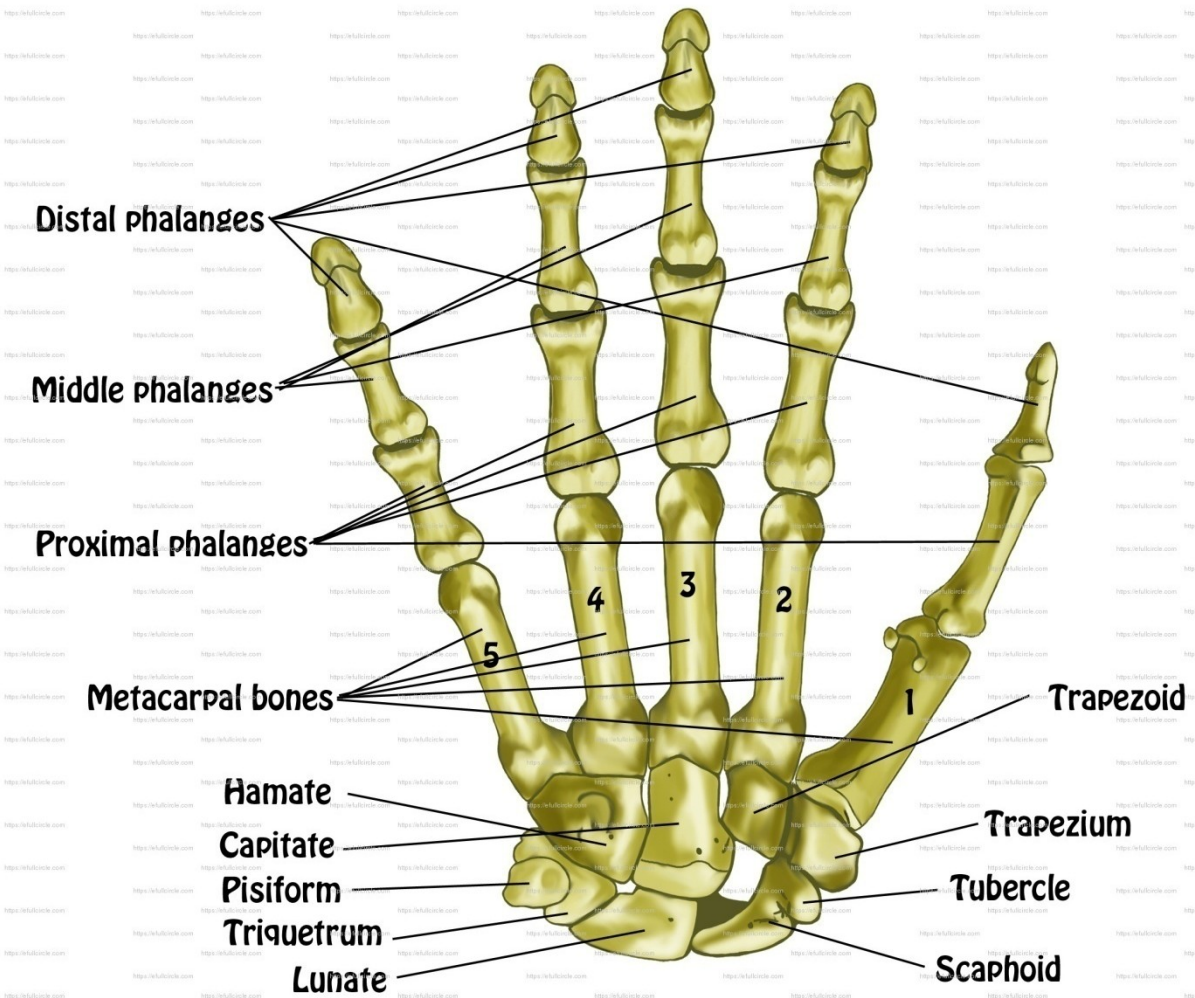
Fixation: the lower part of the forearm from the palmar side

Attempt to move: during patients attempt of extension and radial duction of the wrist (both together) PT palpates the trace of contraction of extensor radialis longus and brevis (radial side of the back of the wrist), fingers relaxed

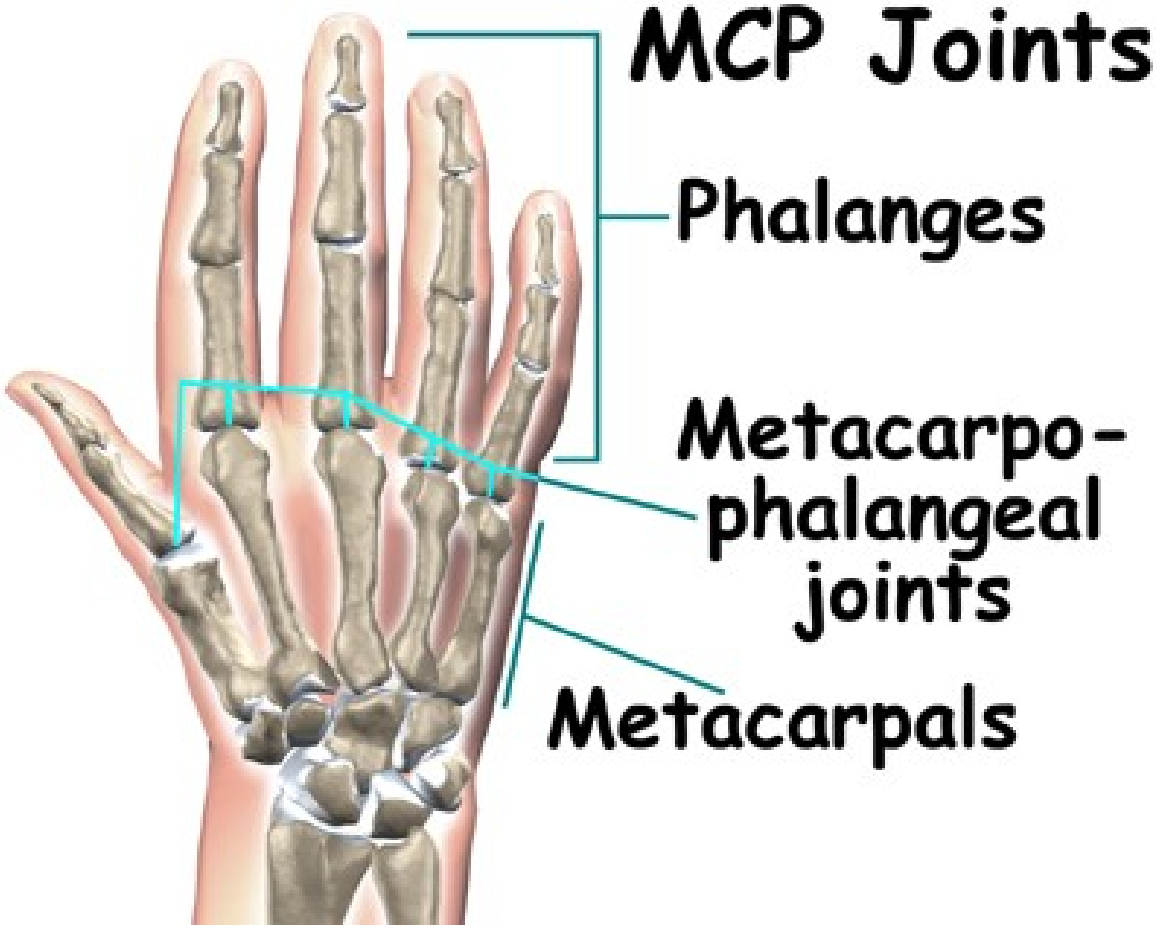
Wrist extension – notes:

- Elbow should be slightly flexed
- Fingers should be relaxed during the whole tested movement

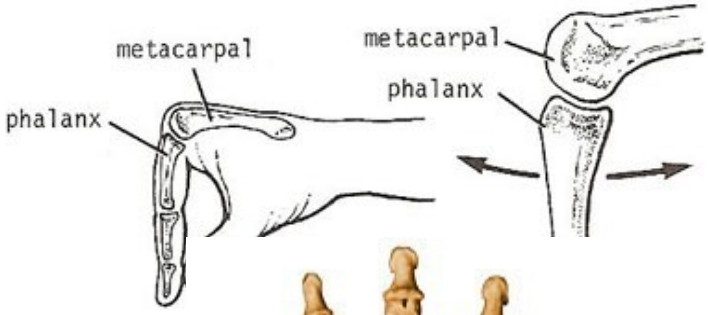
Hand

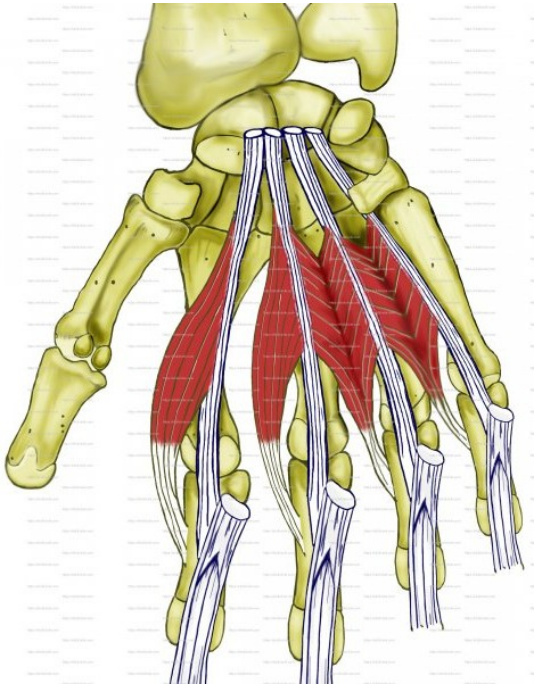

Distal phalanges
Middle phalanges
Proximal phalanges
Metacarpal bones
Hamate
Capitate
Pisiform
Triquetrum
Lunate
Trapezoid
Trapezium
Tubercle
Scaphoid
1
2
3
4
5

Metacarpophalangeal joints of the fingers (MCP)



MCP flexion





Lumbicales

Interosseals palmares

Interosseals dorsales

Interosseus muscles, palmar (1-3)

Origin

- Palmar surfaces of 2nd, 4th and 5th metacarpals (unipennate muscles)

Insertion

- Extensor expansions of digits and bases of proximal phalanges of digits 2, 4 and 5

Action

- Adduct digits toward axial line and assist lumbricals in flexing MCP joints and extending interphalangeal joints

Innervation

- Deep branch of ulnar nerve (C8 and T1) (C8, T1)

Interosseus muscles, dorsal (1-4)

Origin

- Adjacent sides of two metacarpals (bipennate muscles)

Insertion

- Extensor expansions and bases of proximal phalanges of digits 2 – 4

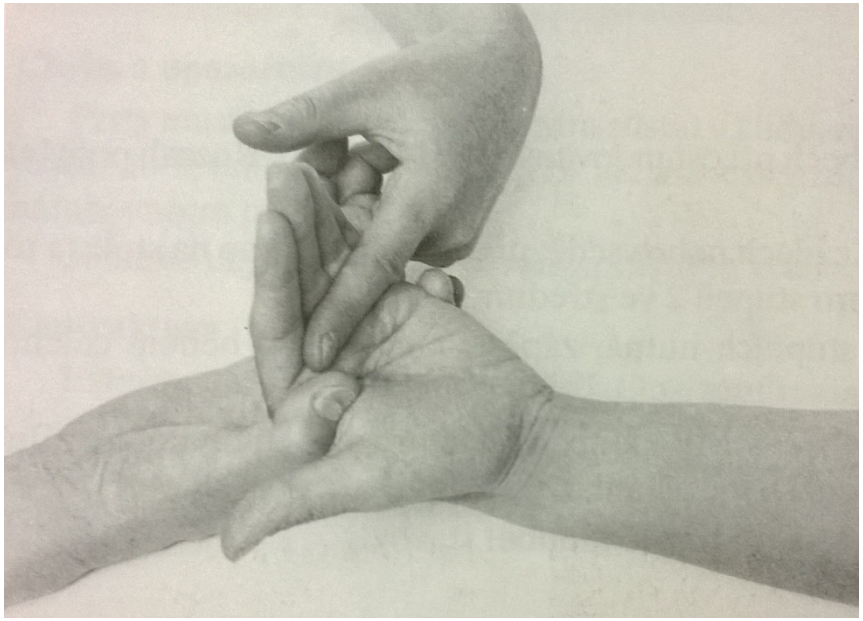
Action

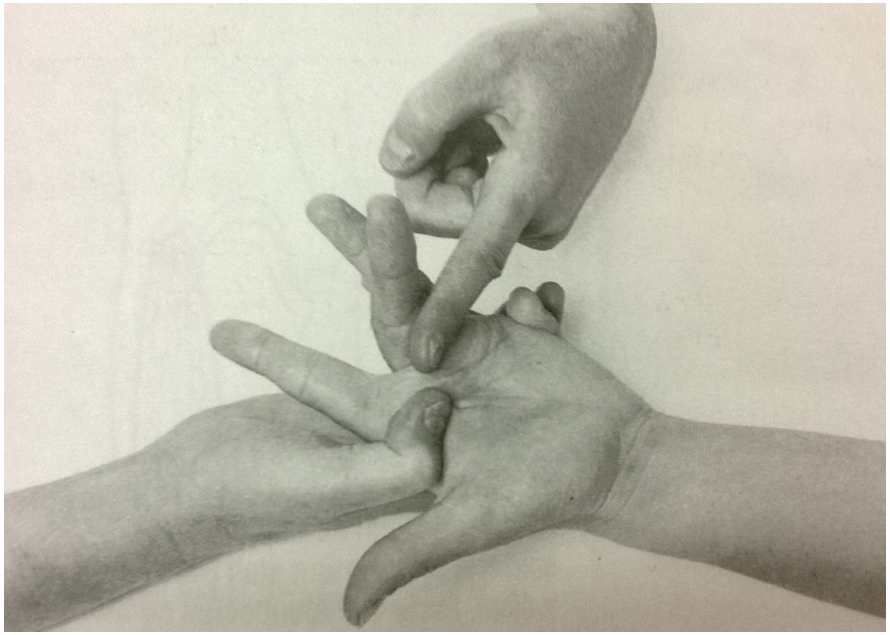
- Abduct digits from axial line and act with lumbricals to flex MCP joints and extend interphalangeal joints

Innervation

- Deep branch of ulnar nerve (C8 and T1) (C8, T1)

MCP flexion – grade 5,4





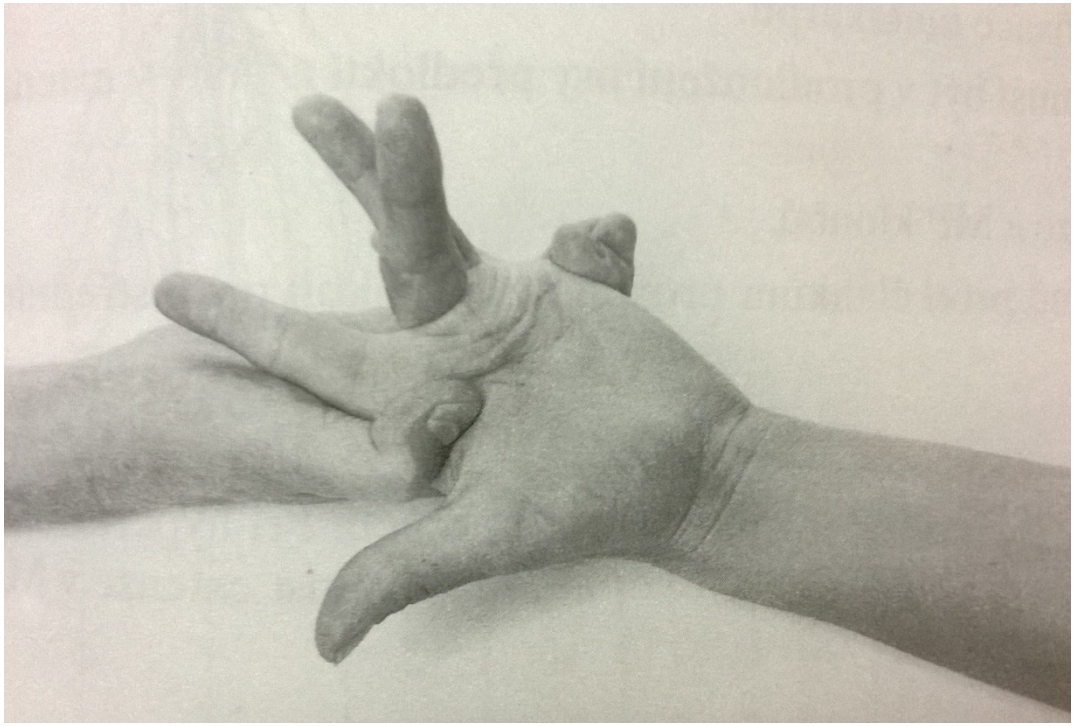
Position: patient sits (or lies supine), elbow slightly flexed, forearm lying supine on the table, fingers extended

Fixation: the head of metacarps

Movement: MCP flexion (except of the thumb) – all fingers together (a.), or one by one (b.), IP joints extended

Resistance: PT puts resistance on the volar side of proximal phalangs

MCP flexion – grade 3

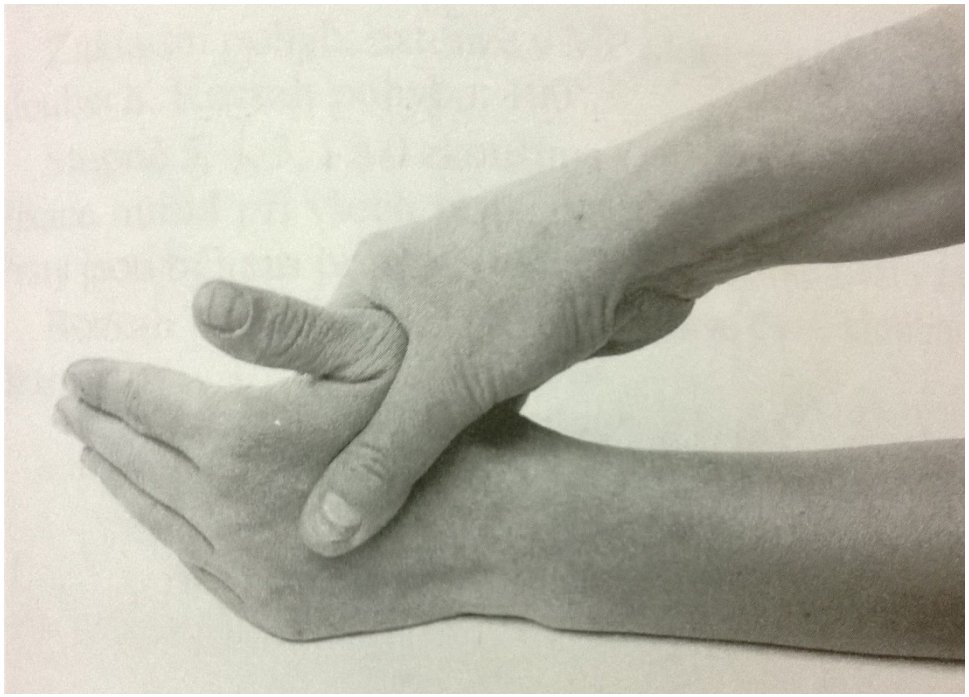


Position: patient sits (or lies supine), elbow slightly flexed, forearm lying supine on the table, fingers extended

Fixation: the head of metacarps

Movement: MCP flexion (except of the thumb) – all fingers together, or one by one, IP joints extended

MCP flexion – grade 2

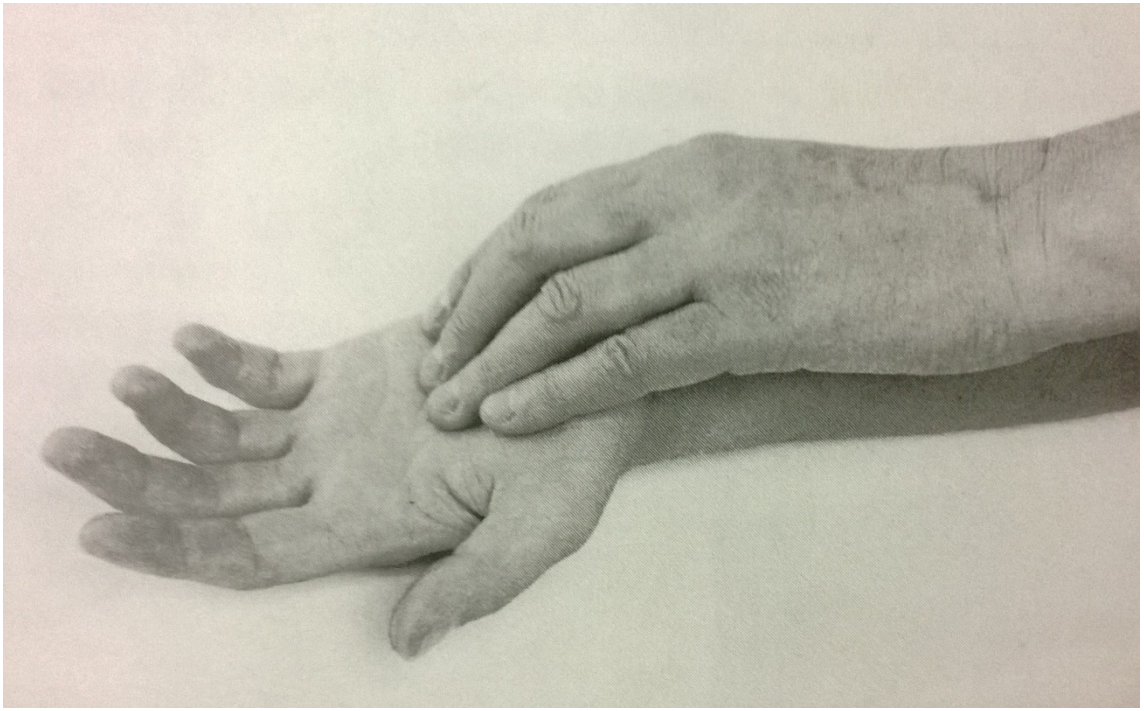


Position: patient sits (or lies supine), forearm lying on the table between pronation and supination, fingers extended

Fixation: the head of metacarps

Movement: MCP flexion (except of the thumb) – all fingers together, IP joints extended

MCP flexion – grade 1,0



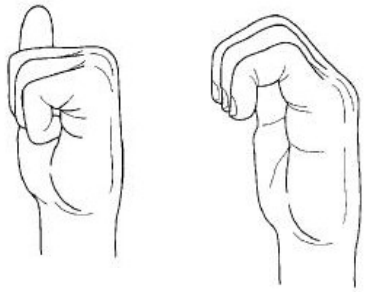
Position: patient sits (or lies supine), elbow slightly flexed, forearm lying supine on the table, fingers relaxed

Attempt to move: PT palpates the trace of contraction of lumbricales during patients´ attempt to flex the MCP joints (in the palm)

MCP flexion – notes:

- Don´t forget to fix the metacarps
- The wrist should stay in central position, fingers should stay extended during testing
- Put resistance against proximal phalanges

MCP extension



Extensor digitorum

Extensor indicis

Extensor digiti minimi

Extensor digitorum

Origin

- Lateral epicondyle of humerus

Insertion

- Extensor expansions of medial four digits

Action

- Extends medial four digits at metacarpophalangeal joints
- Extends hand at wrist joint

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

Extensor indicis

Origin

- Posterior surface of ulna and interosseous membrane

Insertion

- Extensor expansion of 2nd digit

Action

- Extends 2nd digit and helps to extend hand

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

Extensor digiti minimi

Origin

- Lateral epicondyle of humerus

Insertion

- Extensor expansion of 5th digit

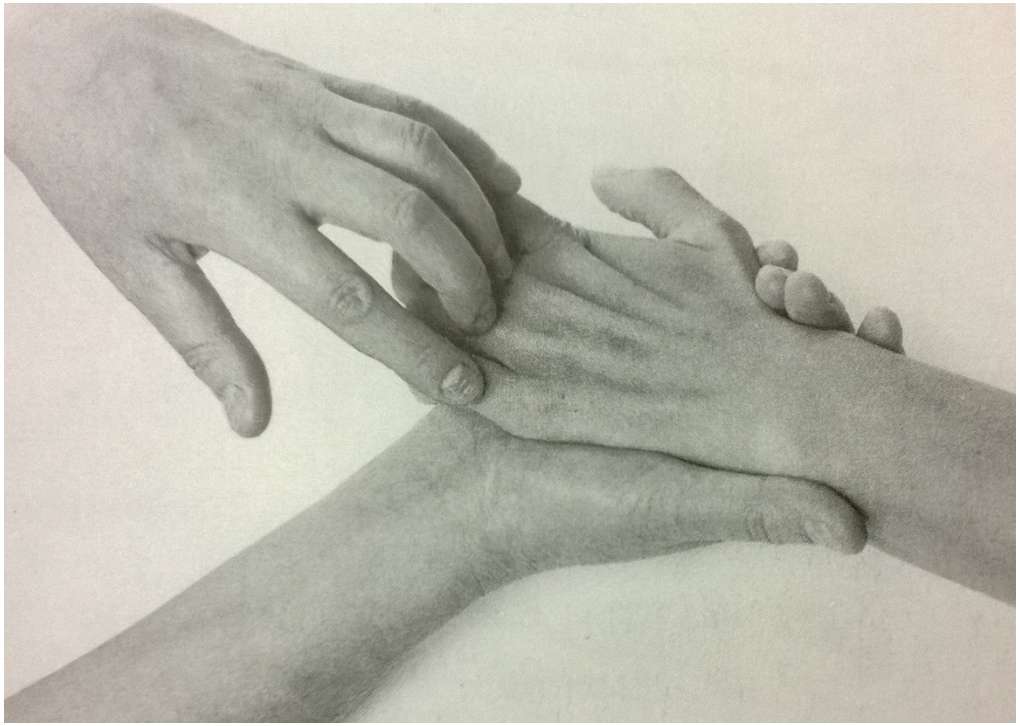
Action

- Extends 5th digit at metacarpophalangeal and interphalangeal joints

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

MCP extension – grade 5,4



Position: patient sits or lies supine, elbow slightly flexed, forearm lying prone on the table, wrist in central position, IP joints slightly flexed, MP joints flexed

Fixation: wrist and metacarps from the palmar side

Movement: MCP extension in full range of motion

Resistance: PT puts resistance on the proximal phalangs (II.-V.) against the movement

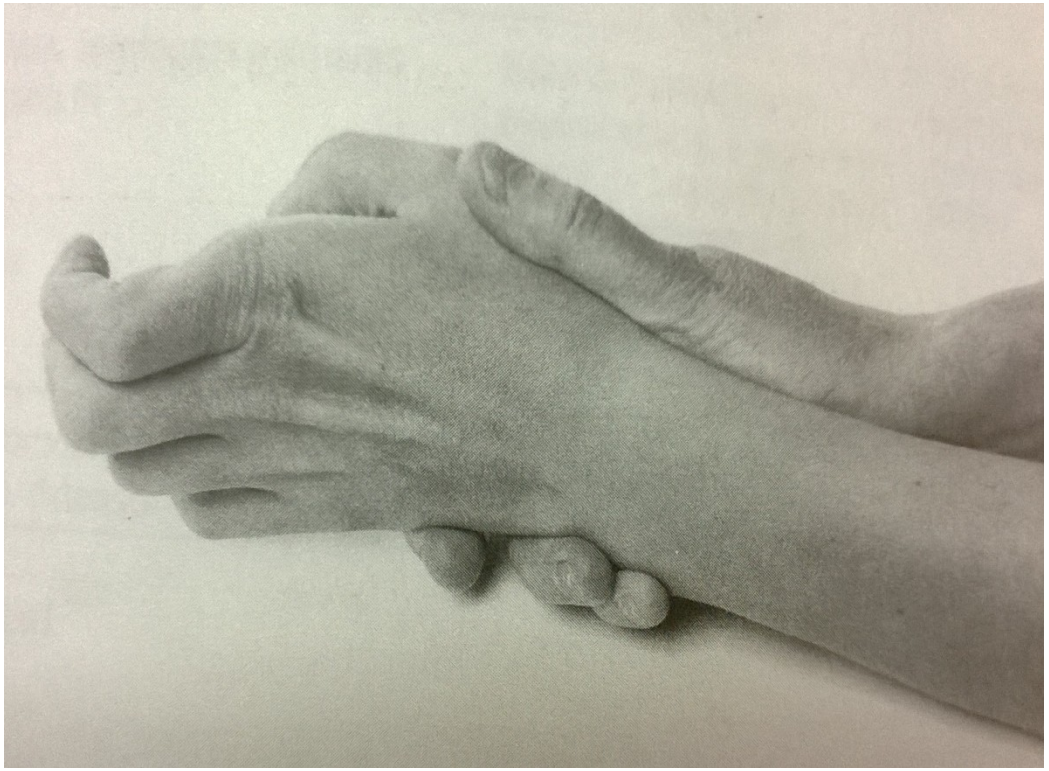
MCP extension – grade 3

Position: patient sits or lies supine, elbow slightly flexed, forearm lying prone on the table, wrist in central position, IP joints slightly flexed, MP joints flexed

Fixation: wrist and metacarps from the palmar side

Movement: MCP extension in full range of motion

MCP extension – grade 2

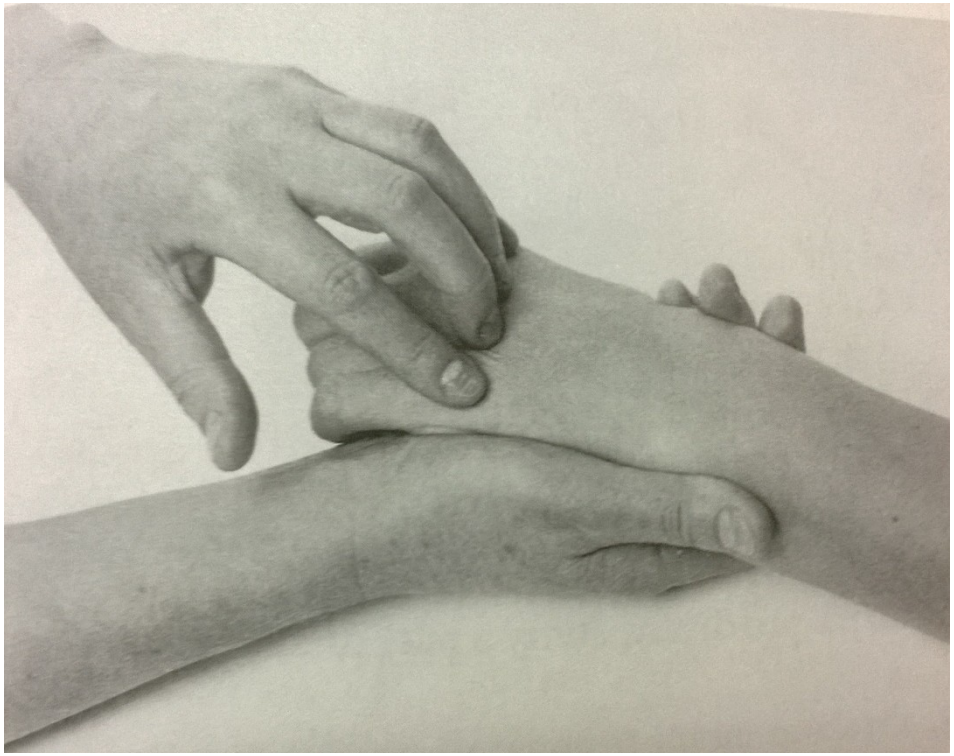


Position: patient sits or lies supine, elbow slightly flexed, forearm lying on the ulnar side on the table, wrist in central position, IP joints slightly flexed, MP joints flexed

Fixation: wrist and metacarps from the palmar side

Movement: MCP extension in full range of motion

MCP extension – grade 1,0



Position: patient sits or lies supine, elbow slightly flexed, forearm lying prone on the table, wrist in central position, IP joints slightly flexed, MP joints flexed

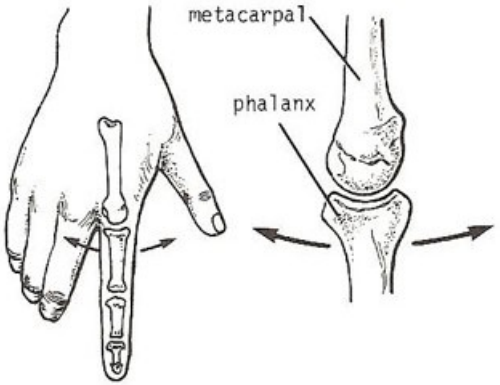
Fixation: wrist and metacarps from the palmar side

Attempt to move: PT palpates a trace of contraction during patients´ attempt of MCP extension (on the back of the hand over the metacarps)

MCP extension – notes:

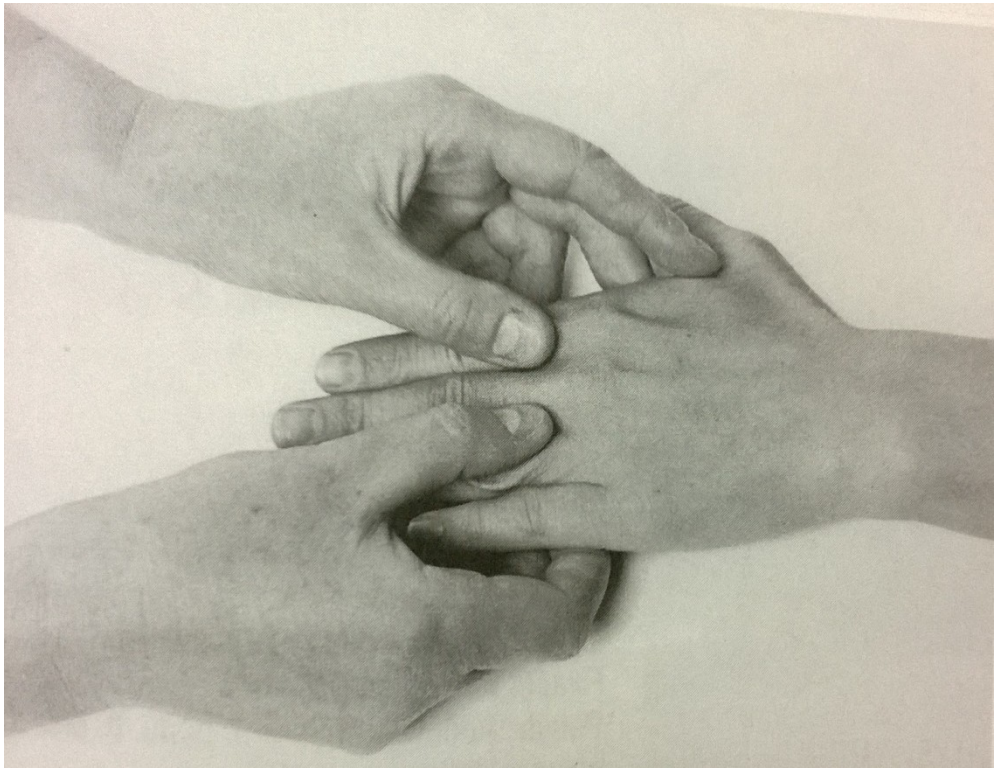
- Don´t interchange extension of MCP and IP joints
- Fix the hand (wrist) firmly
- Fingers has to be relaxed during testing

MCP adduction



Interosseals palmares

MCP adduction – grade 5,4



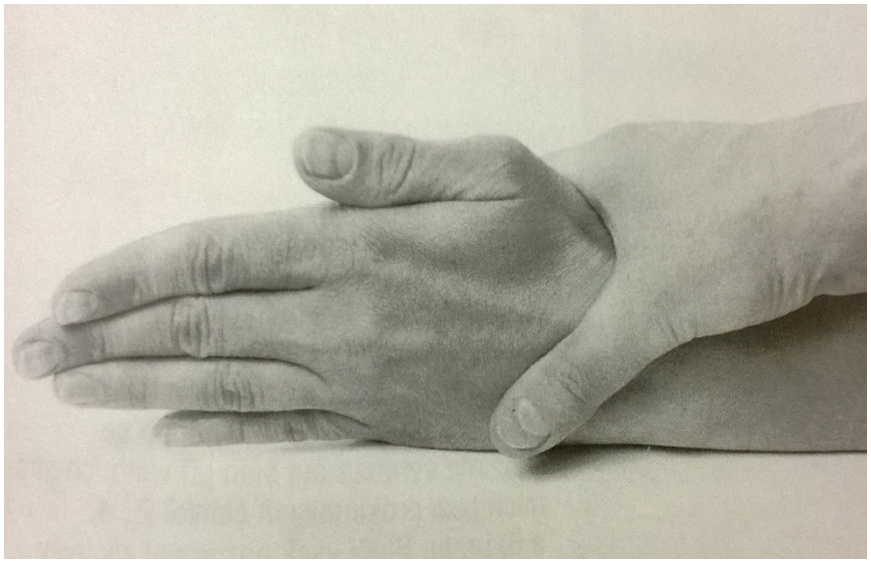
Position: patient sits or lies supine, forearm lying supine on the table, fingers supported in abduction

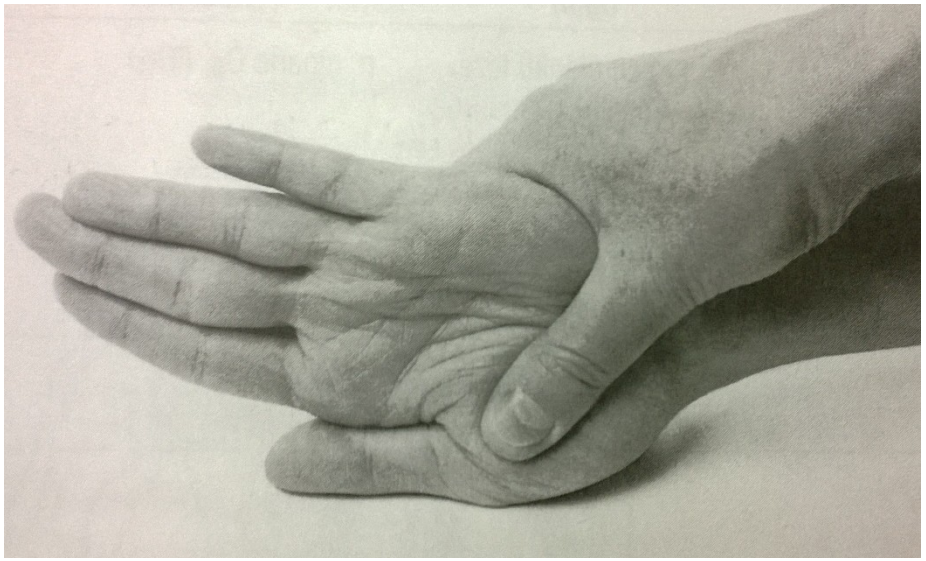
Fixation: support fingers and put resistance (at the same time)

Movement: from maximal abduction do an adduction of II., IV., V. finger

Resistance: PT put resistance against MCP adduction on the proximal IP joints

MCP adduction – grade 3





Position: patient sits or lies supine, forearm lying:

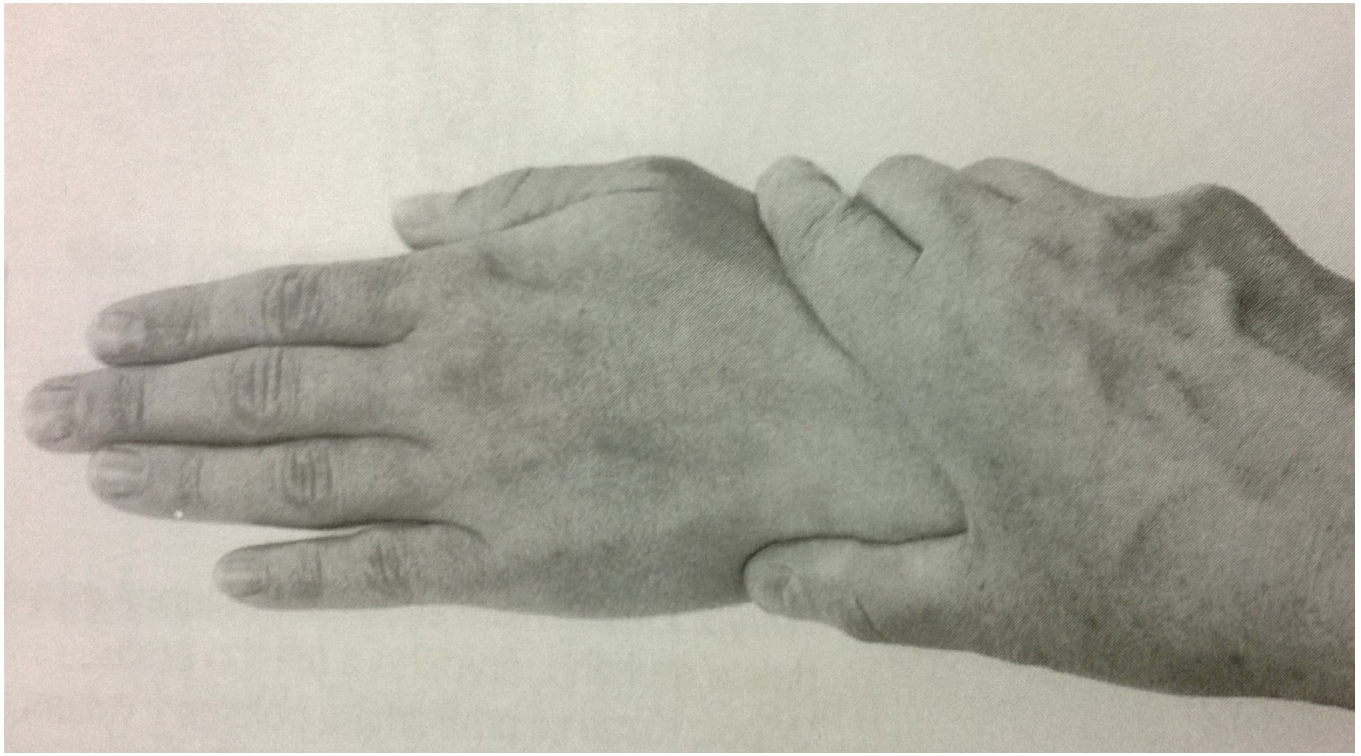
a. ulnar side on the table (for testing IV., V. finger)

b. b. radial side on the table (for testing II. finger)

Fixation: wrist

Movement: from maximal abduction do an adduction of II., IV., V. finger (acording the position)

MCP adduction – grade 2

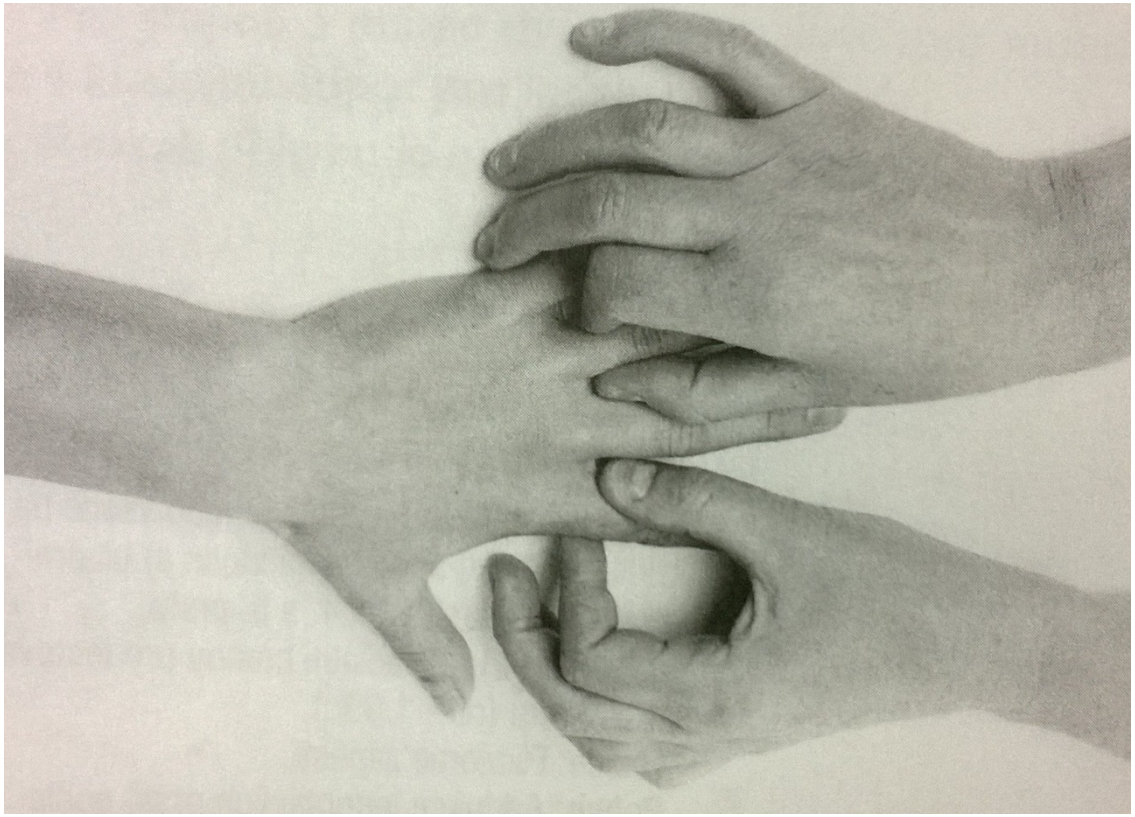


Position: patient sits or lies supine, forearm lying prone on the table, fingers abducted

Fixation: wrist (not necessary)

Movement: from maximal abduction do an adduction of II., IV., V. finger

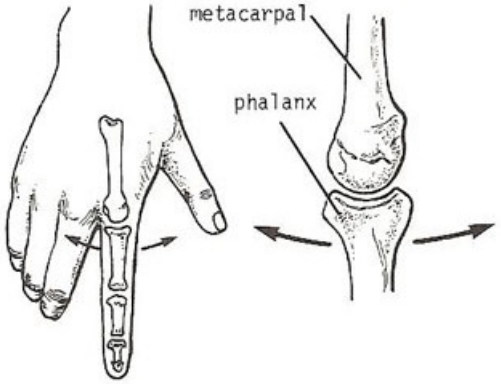
MCP adduction – grade 1,0



Position: patient sits or lies supine, forearm lying prone on the table, fingers abducted

Attempt to move: PT palpates the trace of contraction of interosseal palmares during patients attempt to do an adduction of II., IV., V. finger (at the area of basis of proximal phalangs)

MCP abduction



Interosseals dorsales

Abductor digiti minimi

Abductor digiti minimi

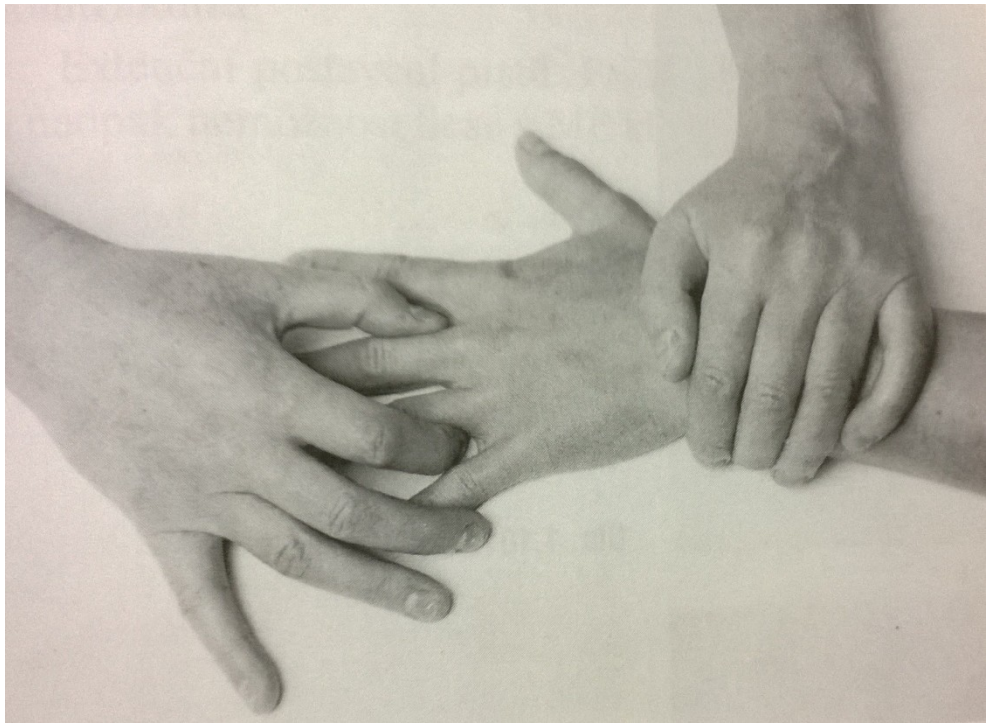
Origin
- Pisiform

Insertion
- Medial side of base of proximal phalanx of little finger

Action
- Abducts little (5th) finger

Innervation
- Deep branch of ulnar nerve (C8 and T1) (C8, T1)

MCP abduction – grade 5,4



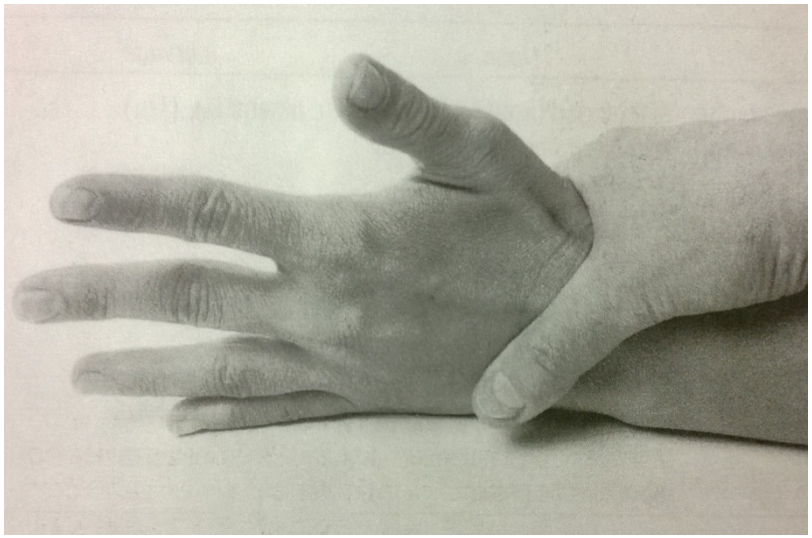
Position: patient sits or lies supine, the forearm prone, fingers adducted

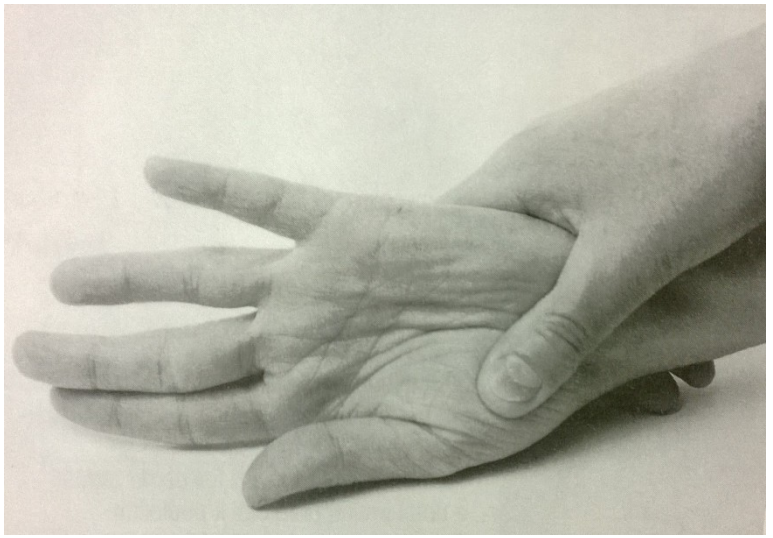
Fixation: wrist and lower part of the forearm

Movement: MCP abduction in full range of motion

Resistance: PT puts resistance on the basis of first phalanges of fingers (one by one) against the MCP abduction

MCP abduction – grade 3





Position: patient sits or lies supine, the forearm on the table:

a. Ulnar side

b. Radial side

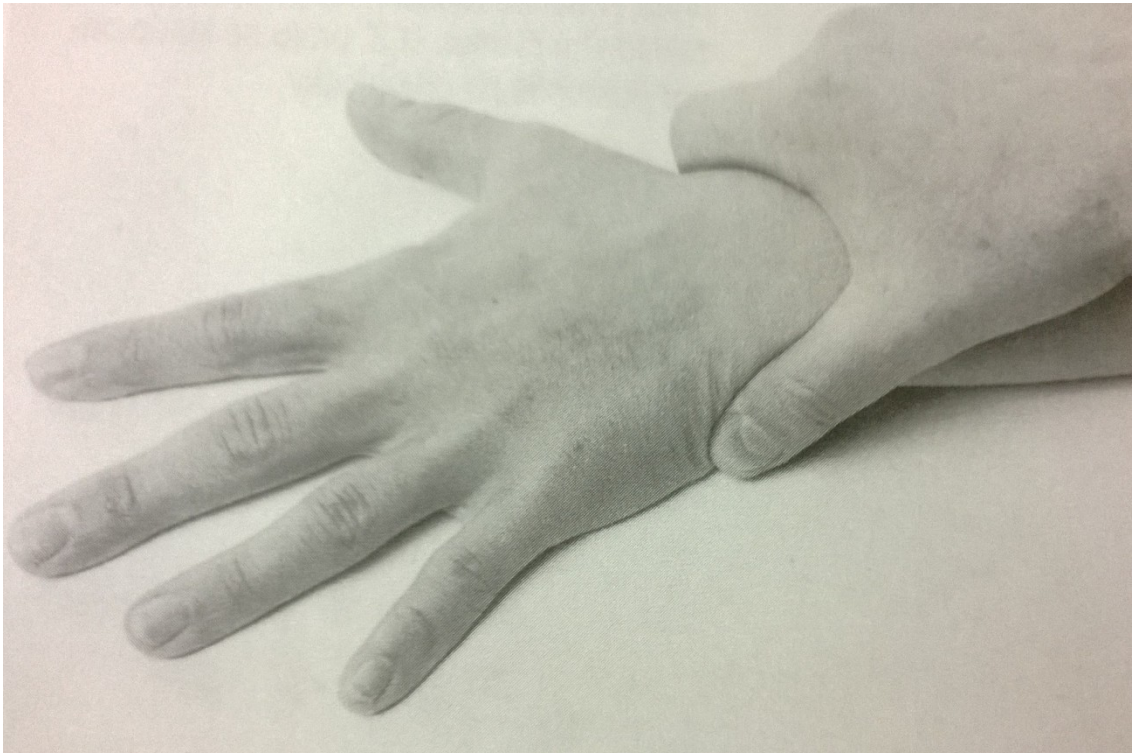
Fixation: wrist and lower part of the forearm

Movement: MCP abduction in full range of motion

a. Ulnar side – for II., III. finger

b. Radial side – for III., IV., V. finger

MCP abduction – grade 2

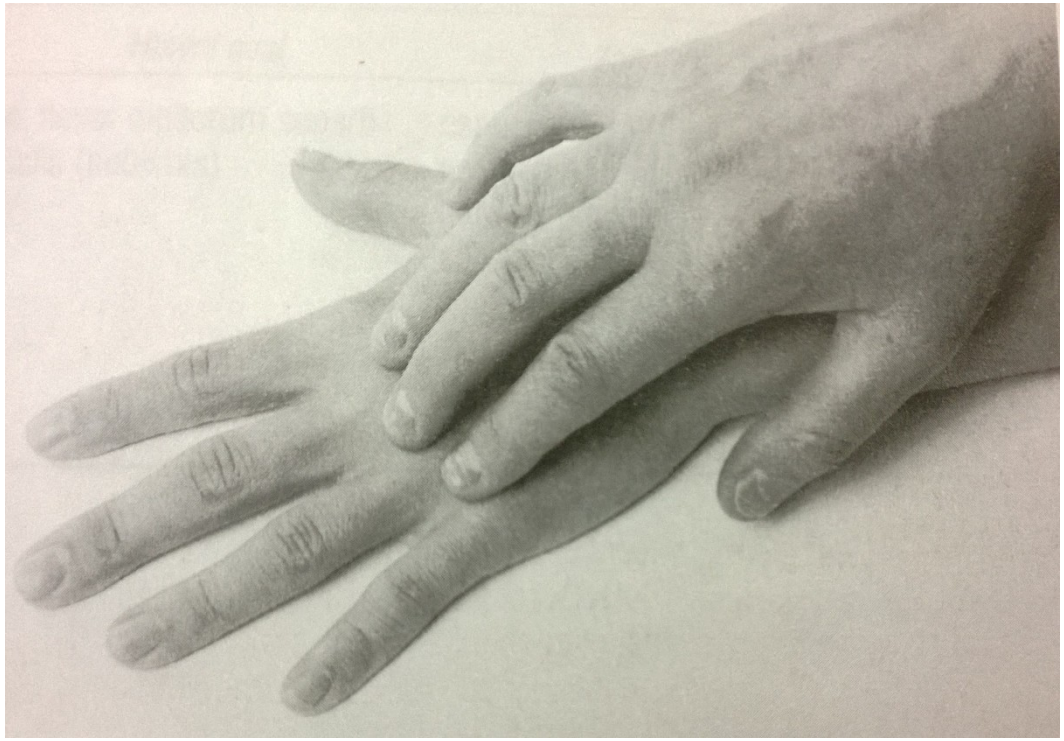


Position: patient sits or lies supine, the forearm prone, fingers adducted

Fixation: wrist and lower part of the forearm

Movement: MCP abduction in full range of motion

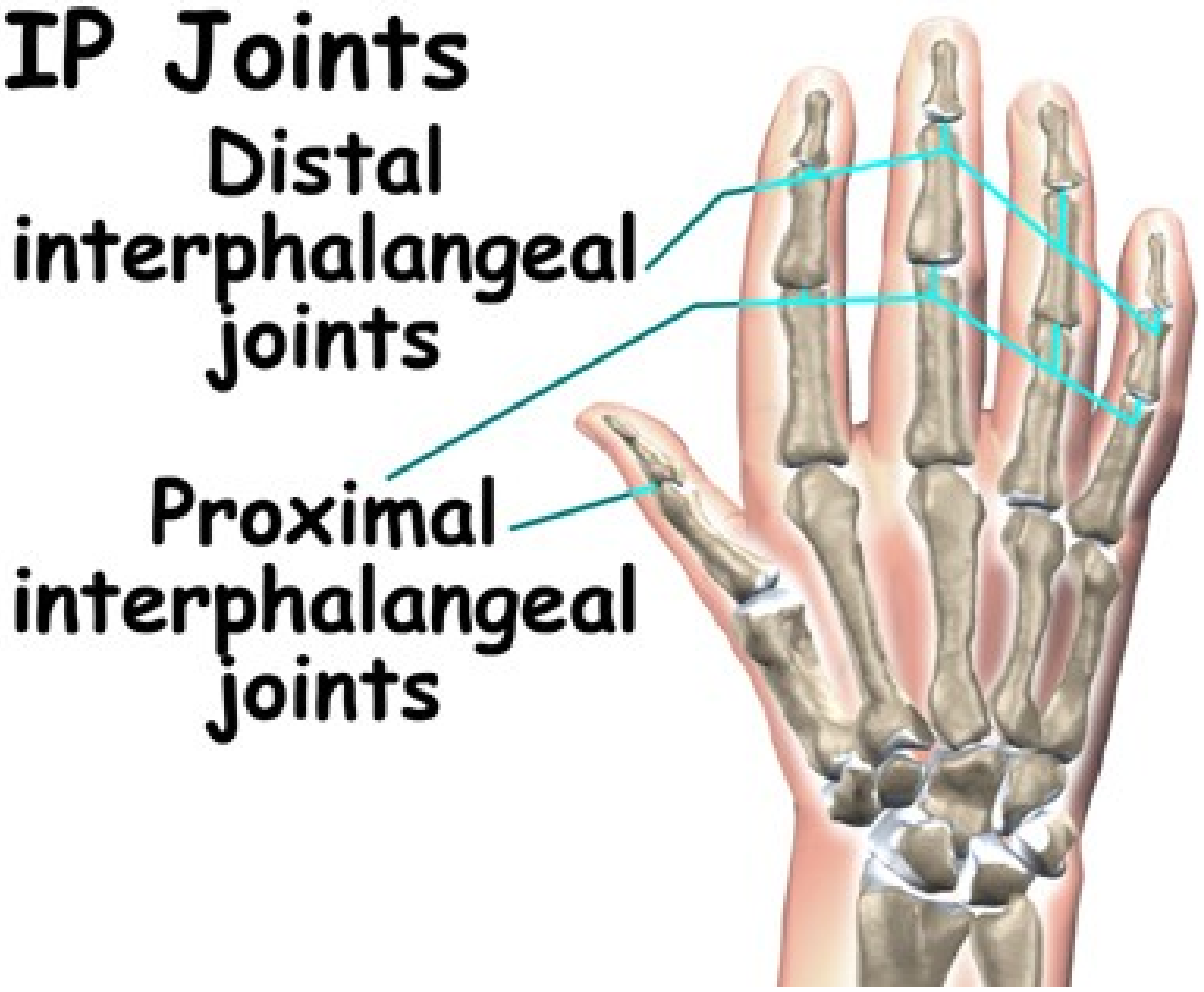
MCP abduction – grade 1,0



Position: patient sits or lies supine, the forearm prone, fingers adducted

Attempt to move: PT palpates the trace of contraction of interosseals dorsales at intermetacarpal area (or see the vibration of fingers)

Interphalangeal joints of fingers (IP)



Proximal IP flexion

Flexor digitorum superficialis

Flexor digitorum superficialis

Origin

- Humeroulnar head: medial epicondyle of humerus, ulnar collateral ligament, and coronoid process of ulna;
- Radial head: superior half of anterior border of radius

Insertion

- Bodies of middle phalanges of digits 2 – 5

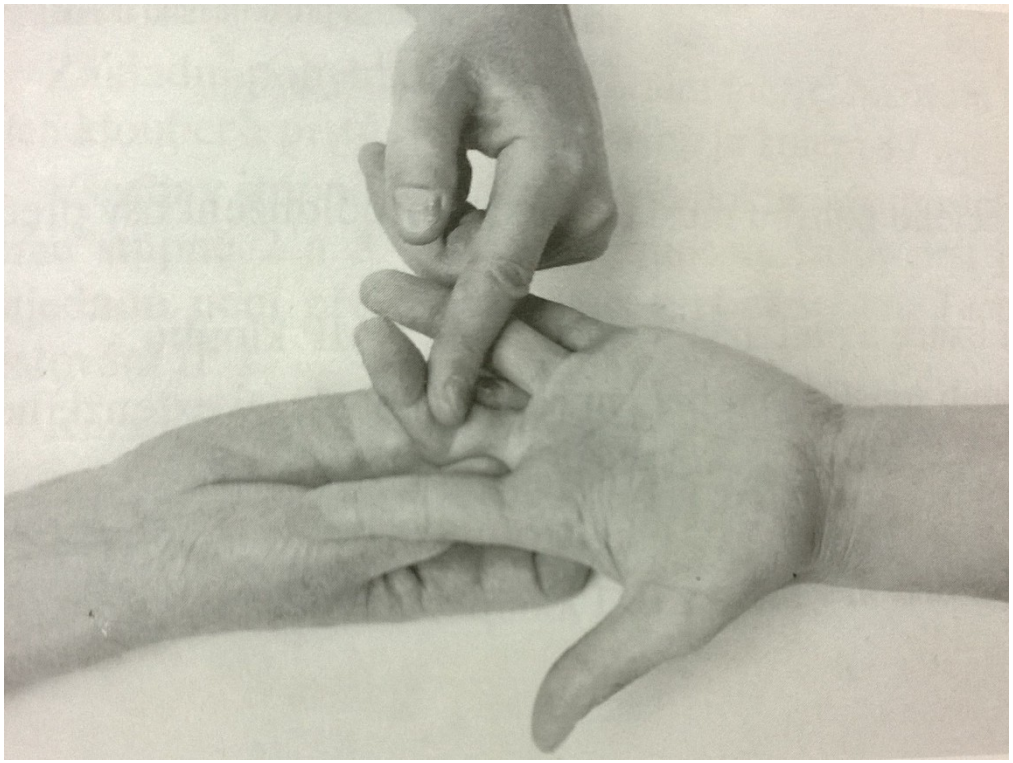
Action

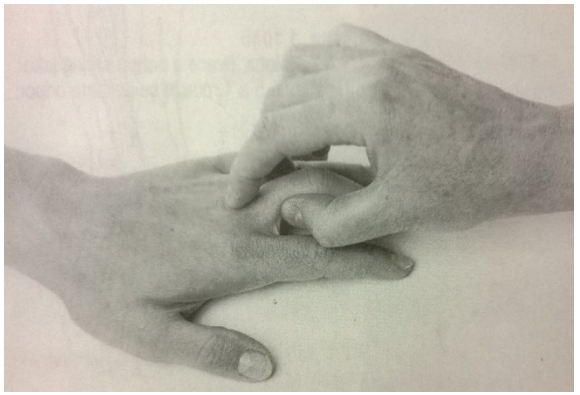
- Flexes middle phalanges at proximal IP joints of medial four digits
- acting more strongly, it also flexes proximal phalanges at MCP joints and hand

Innervation

- Median nerve (C7, C8 and T1) (C7, C8, T1)

Proximal IP flexion – grade 5,4





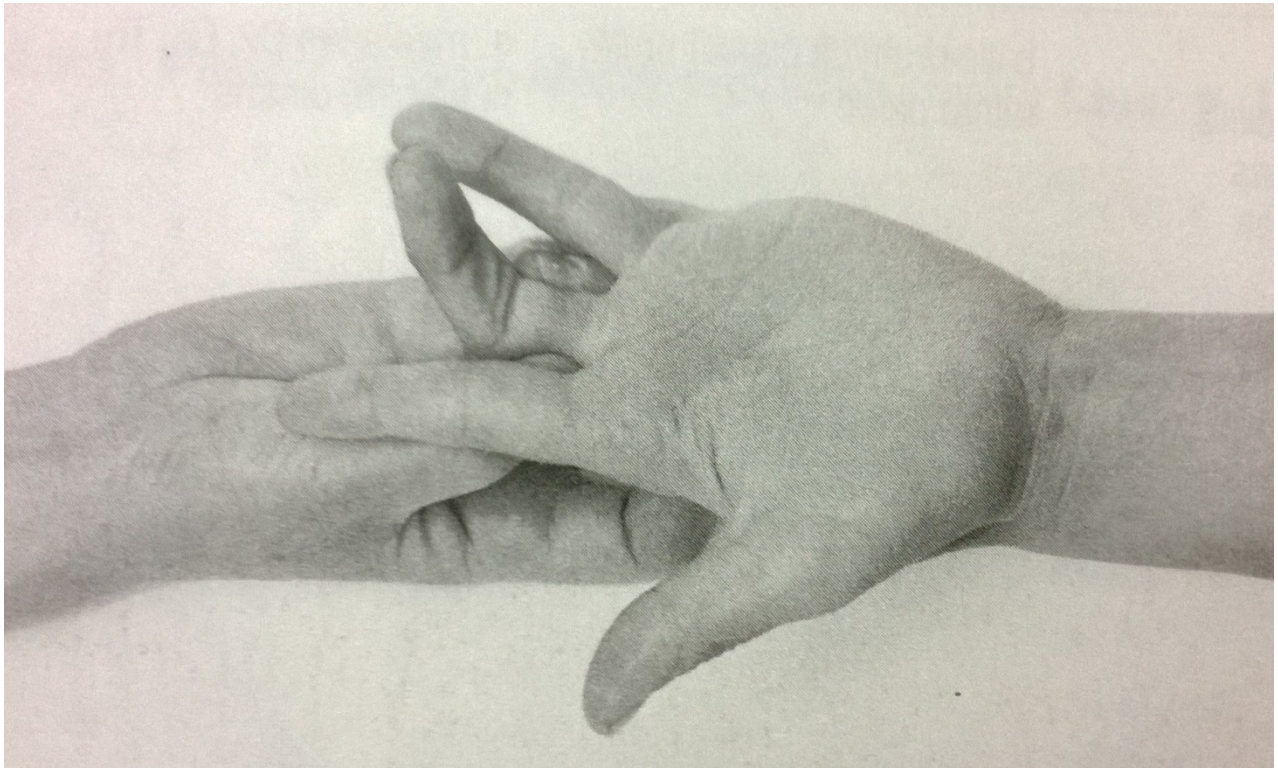
Position: patient sits or lies supine, elbow slightly flexed, forearm supine, wrist in central position, fingers extended

Fixation: fix proximal phalang to ensure MP joint hyperextension

Movement: proximal IP flexion in full range of motion

Resistance: PT put resistance on the volar side of middle phalang

Proximal IP flexion – grade 3,2

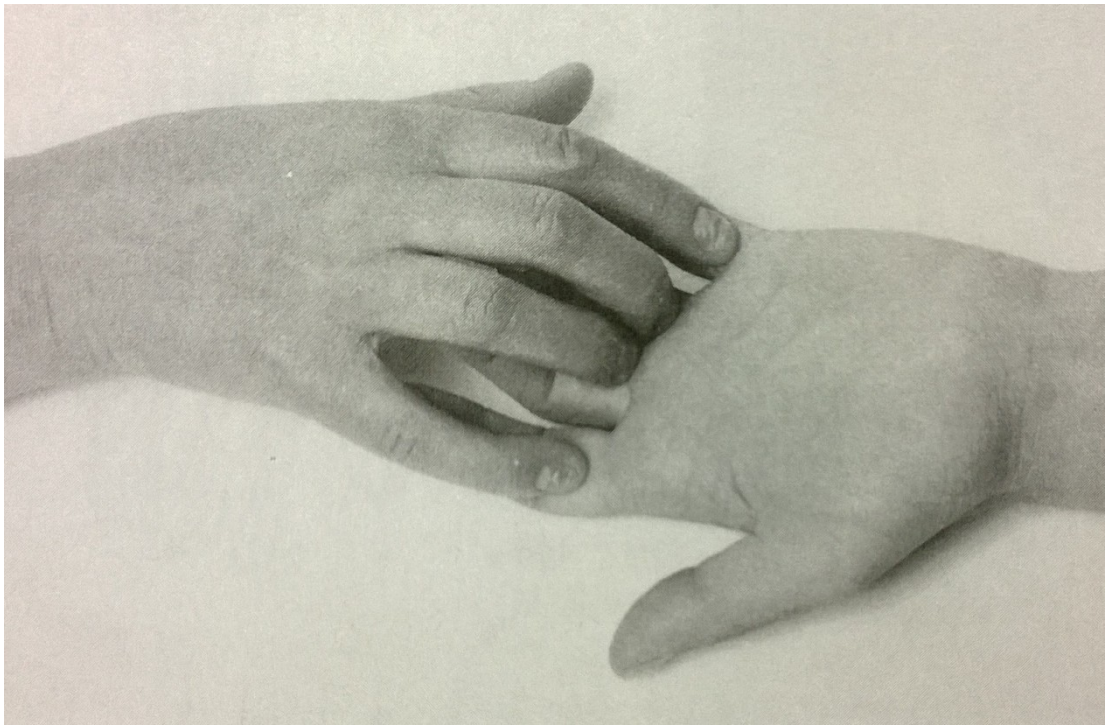


Position: patient sits or lies supine, elbow slightly flexed, forearm supine, wrist in central position, fingers extended

Fixation: fix proximal phalang to ensure MP joint hyperextension

Movement: proximal IP flexion in full range of motion

Proximal IP flexion – grade 1,0



Position: patient sits or lies supine, elbow slightly flexed, forearm supine, wrist in central position, fingers extended

Attempt to move: PT palpates a trace of contraction during patients´ attempt of proximal IP flexion (the tendon on volar side of proximal phalang)

Proximal IP flexion – notes:

- Wrist has to be in central position during whole test
- Fixation of MCP joints is necessary: it has to be slightly hyperextended
- Distal IP joint has to be extended, no flexion during testing
- We don´t differentiate grade 3 and 2
- Test each finger individually

Distal IP flexion

Flexor digitorum profundus

Flexor digitorum profundus

Origin

- Proximal 3/4 of medial and anterior surfaces of ulna and interosseous membrane

Insertion

- Base of the distal phalanx of digits 2 – 5

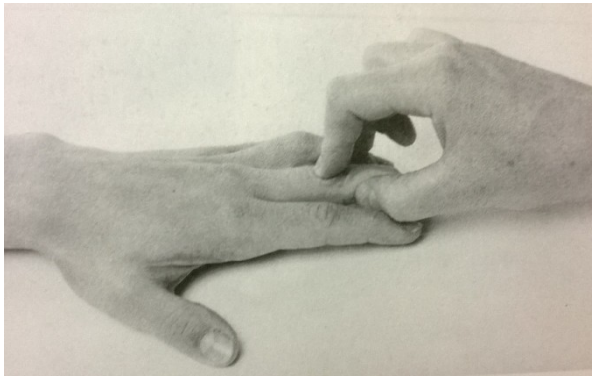
Action

- Flexes distal phalanges at distal interphalangeal joints of medial four digits
- assists with flexion of hand

Innervation

- Medial part: ulnar nerve (C8 and T1)
- Lateral part: anterior interosseous branch of median nerve (C8 and T1) (C8, T1)

Distal IP flexion – grade 5,4



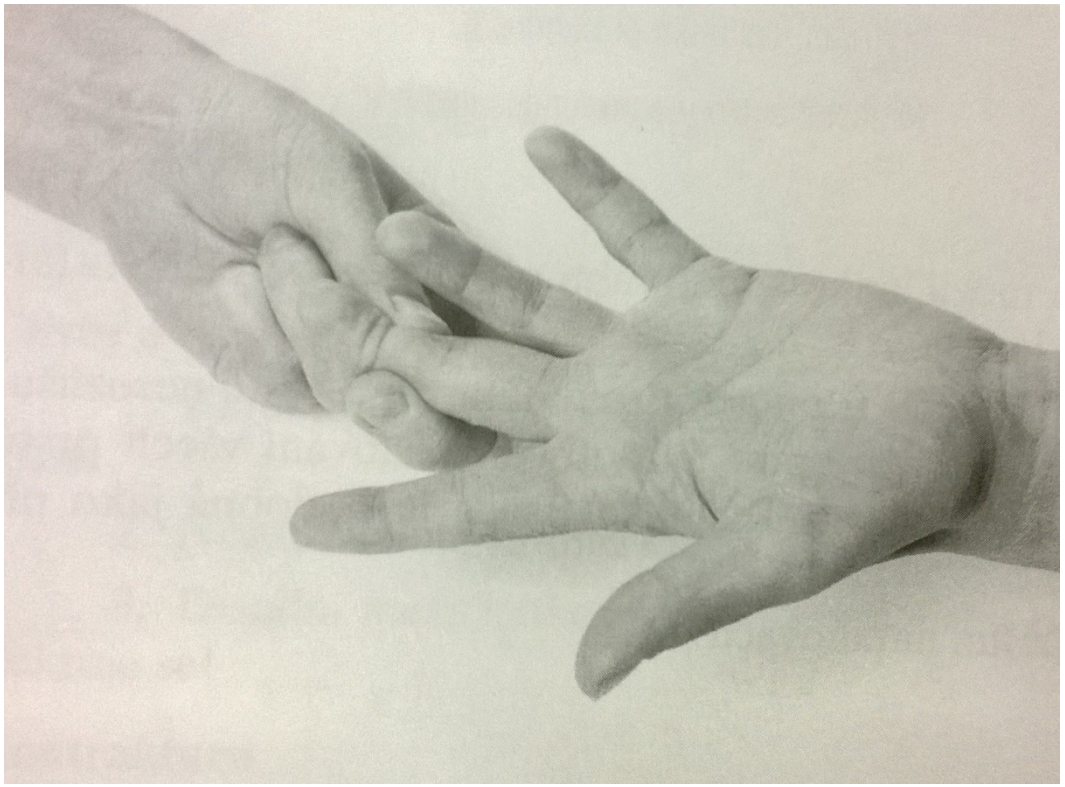
Position: patient sits or lies supine, elbow slightly flexed, forearm supine, wrist in central position, fingers extended

Fixation: the middle phalang (from the side)

Movement: distal IP flexion in full range of motion

Resistance: PT puts resistance on the volar side of distal phalang against the movement

Distal IP flexion – grade 3,2

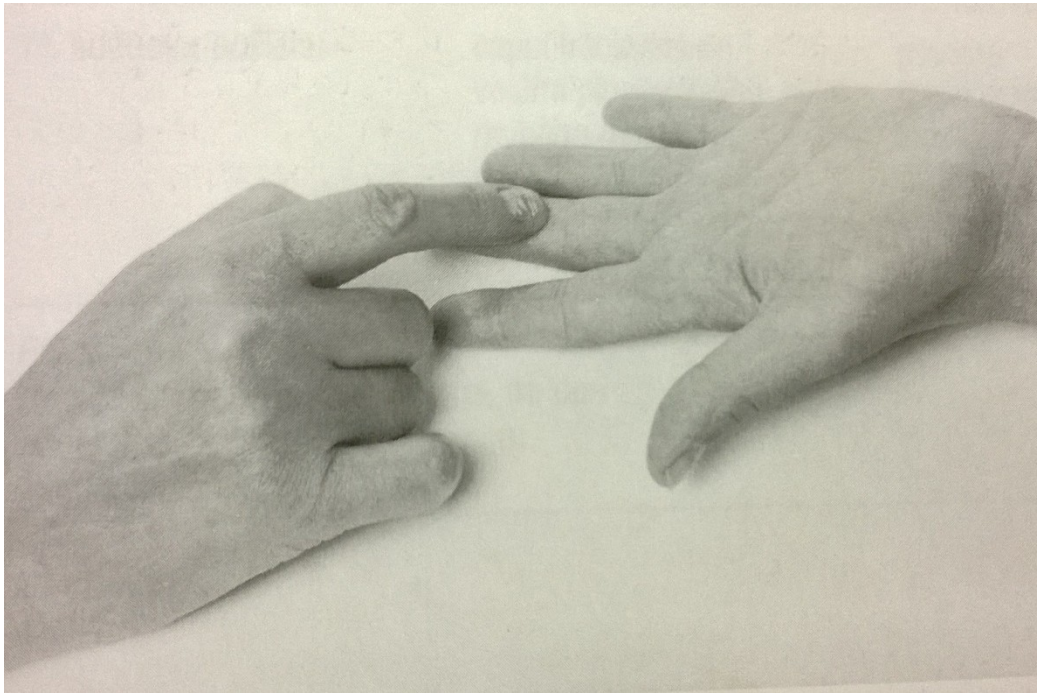


Position: patient sits or lies supine, elbow slightly flexed, forearm supine, wrist in central position, fingers extended

Fixation: the middle phalang (from the side)

Movement: distal IP flexion in full range of motion

Distal IP flexion – grade 1,0



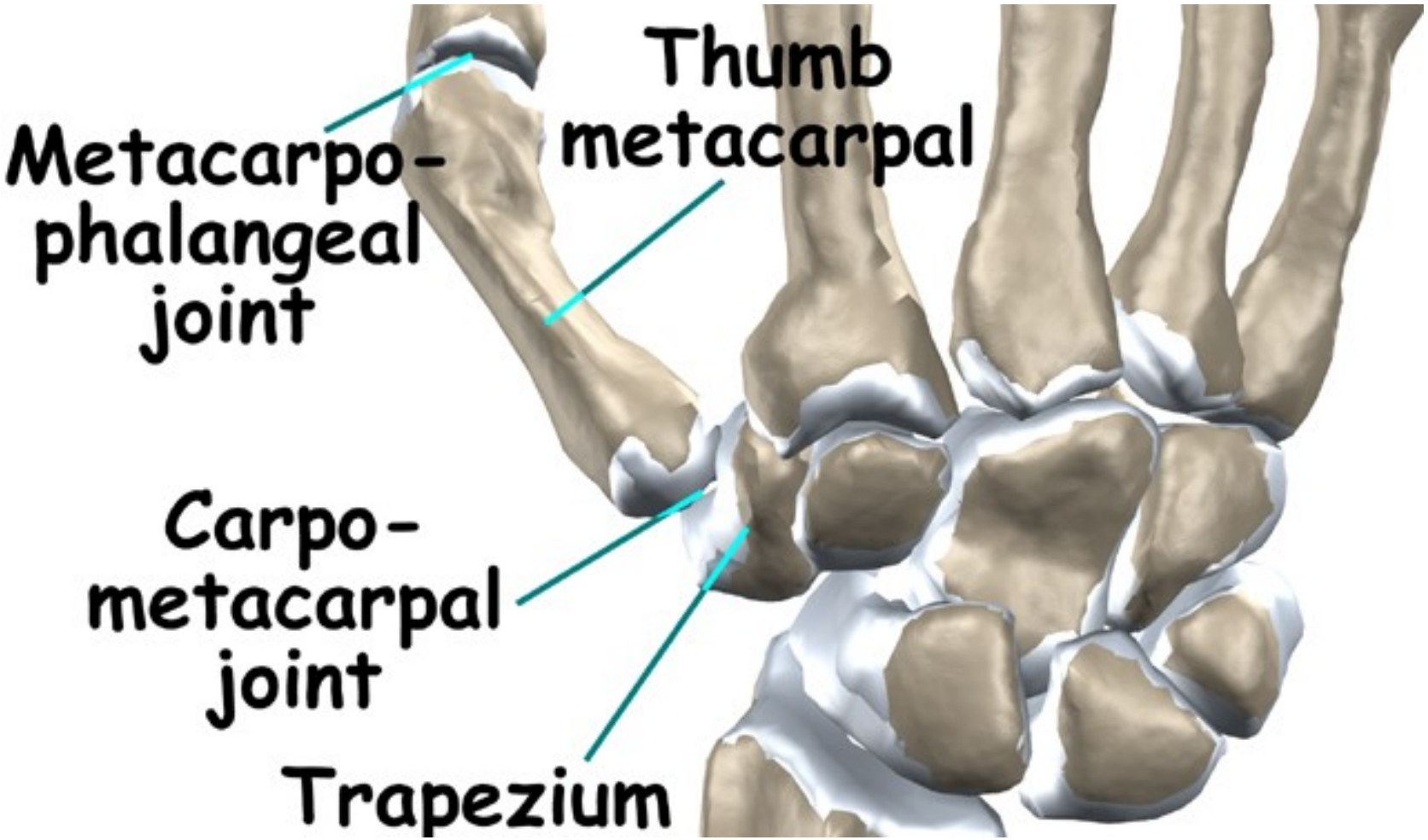
Position: patient sits or lies supine, elbow slightly flexed, forearm supine, wrist in central position, fingers extended

Attempt to move: PT palpates a trace of contraction during patients attempt of distal IP flexion (on the volar side of the middle phalang)

Distal IP flexion – notes:

- Wrist should be in central position during whole testing
- Fix the middle phalang from the side (no compression of the tendon)
- Proximal IP joint and MCP joint should be extended

CMC joint of thumb



CMC thumb joint adduction

Adductor pollicis

Adductor pollicis

Origin

- Oblique head: bases of 2nd and 3rd metacarpals, capitate, and adjacent carpals
- Transverse head: anterior surface of body of 3rd metacarpal

Insertion

- Medial side of base of proximal phalanx of thumb

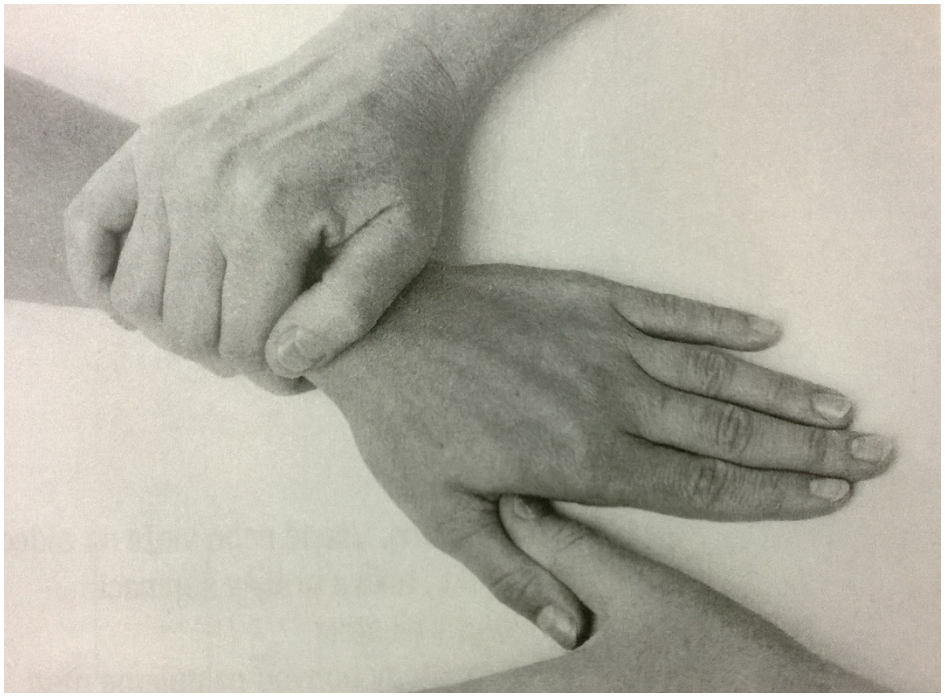
Action

- Draws 1st metacarpal laterally to oppose thumb toward center of palm and rotates it medially

Innervation

- Deep branch of ulnar nerve (C8 and T1) (C8, T1)

CMC thumb joint adduction – grade 5,4



Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb abducted

Fixation: wrist

Movement: CMC thumb joint adduction (in palm plane) in full range of motion

Resistance: PT puts resistance on the ulnar side of thumb against movement

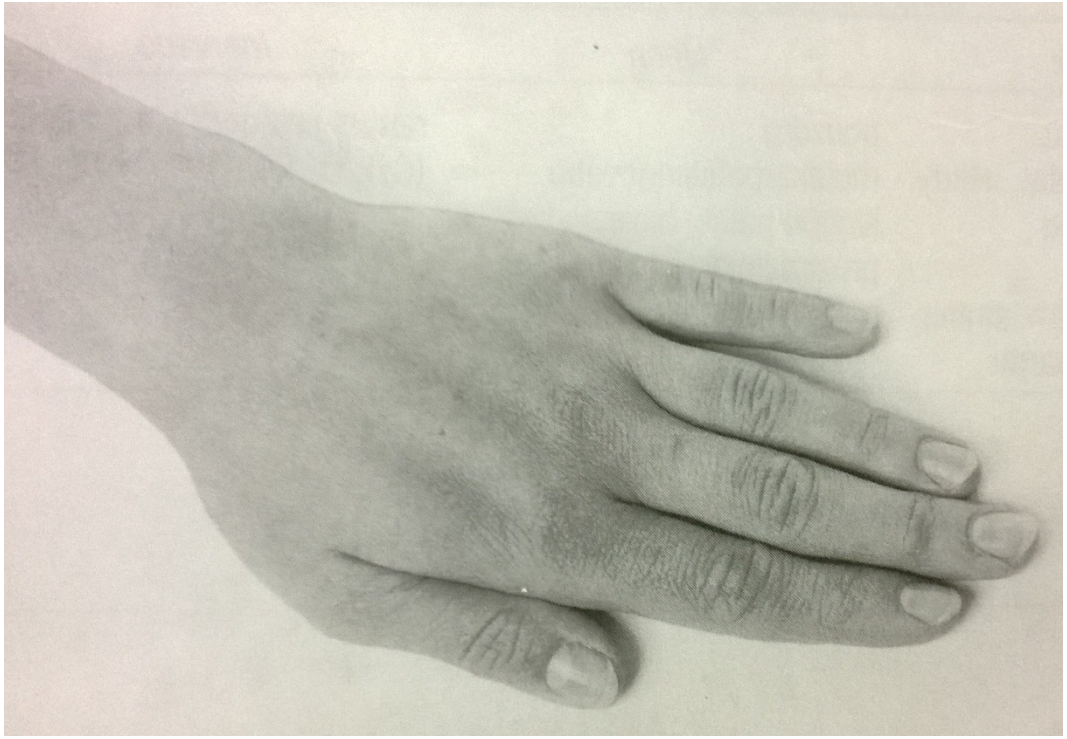
CMC thumb joint adduction – grade 3

Position: patient sits or lies supine, forearm on the radial side on the table, wrist in central position, thumb abducted

Fixation: support forearm and wrist, fingers

Movement: CMC thumb joint adduction (in palm plane) in full range of motion

CMC thumb joint adduction – grade 2

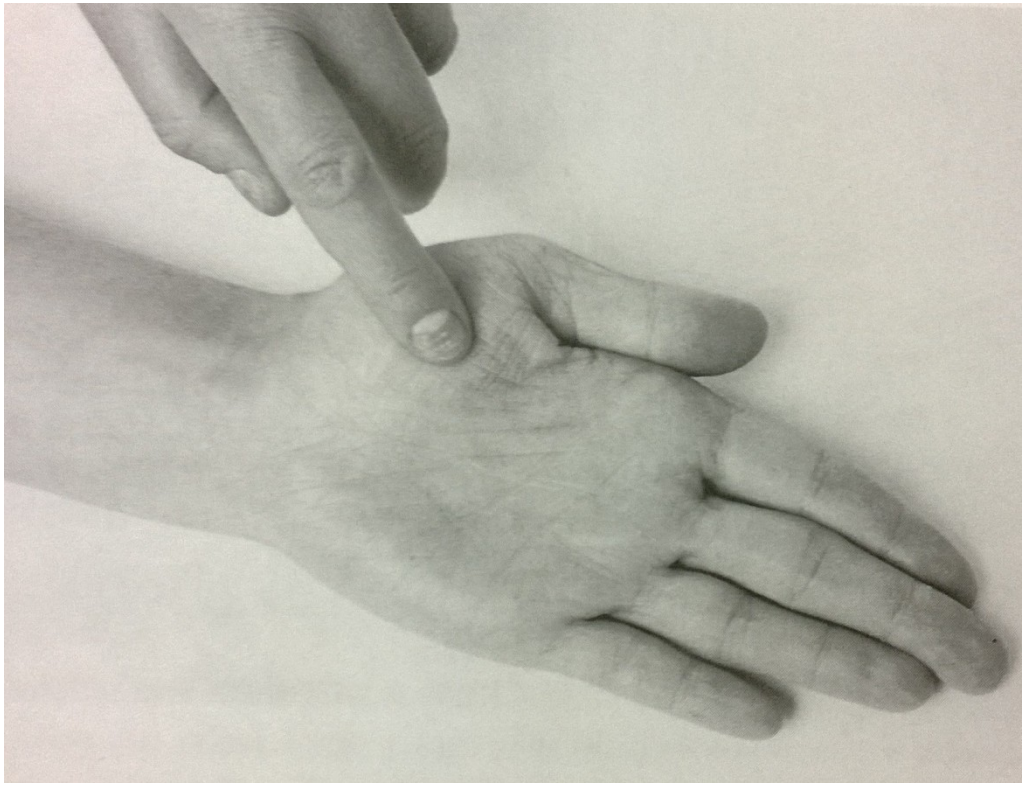


Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb abducted

Fixation: not necessary

Movement: CMC thumb joint adduction (in palm plane) in full range of motion

CMC thumb joint adduction – grade 1,0



Position: patient sits or lies supine, forearm lying supine on the table, wrist in central position

Attempt to move: PT palpates a trace of contraction during patients´ attempt of CMC thumb joint adduction (in palm plane) – on the volar side between I. and II. metacarp

CMC thumb joint adduction – notes:

- The movement of the joint should be in the plane of the palm
- MCP and IP joint should be extended

CMC thumb joint abduction

Abductor pollicis longus

Abductor pollicis brevis

Abductor pollicis longus

Origin

- Posterior surfaces of ulna, radius and interosseous membrane

Insertion

- Base of 1st metacarpal

Action

- Abducts thumb and extends it at carpometacarpal joint

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

Abductor pollicis brevis

Origin

- Flexor retinaculum and tubercles of scaphoid and trapezium

Insertion

- Lateral side of base of proximal phalanx of thumb

Action

- Abducts thumb and helps oppose it

Innervation

- Recurrent branch of median nerve (C8 and T1) (C8, T1)

CMC thumb joint abduction – grade 5,4

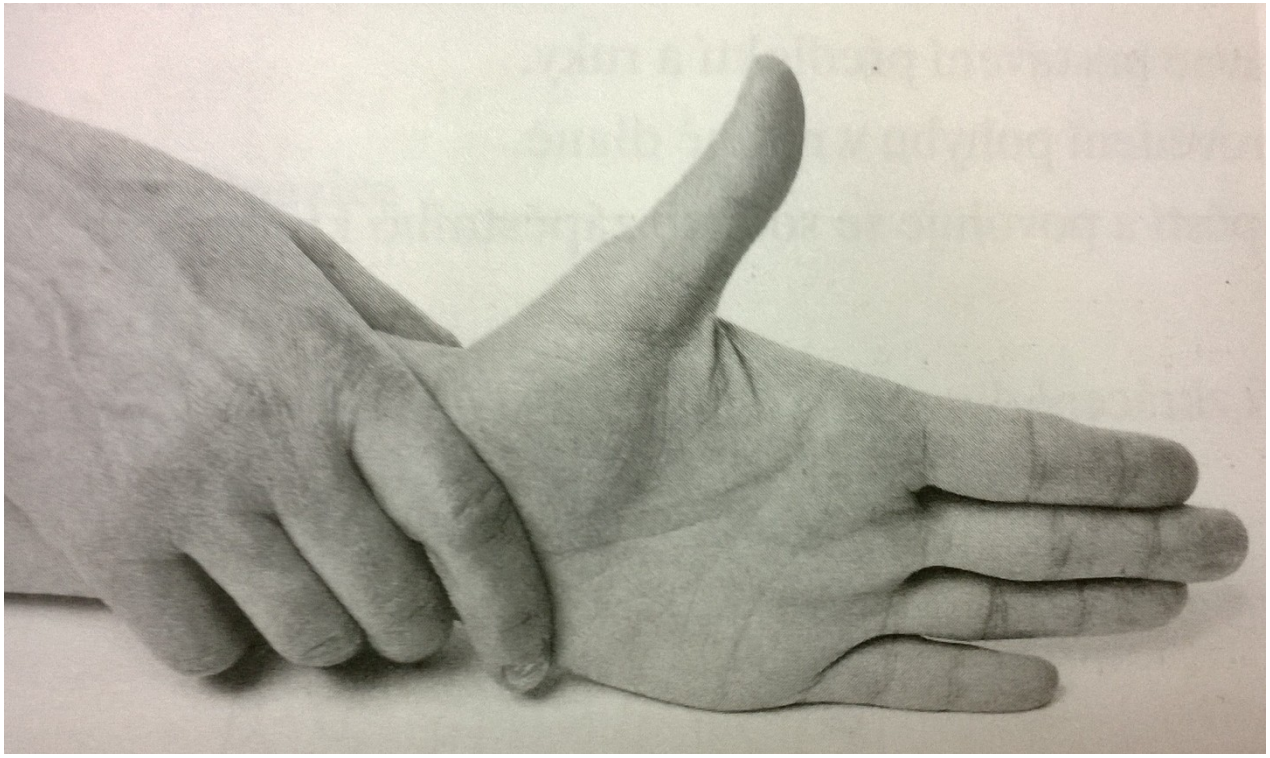
Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb adducted, fingers extended

Fixation: wrist

Movement: CMC thumb joint abduction in full range of motion

Resistance: PT puts resistance on the radial side of thumb against the movement

CMC thumb joint abduction – grade 3

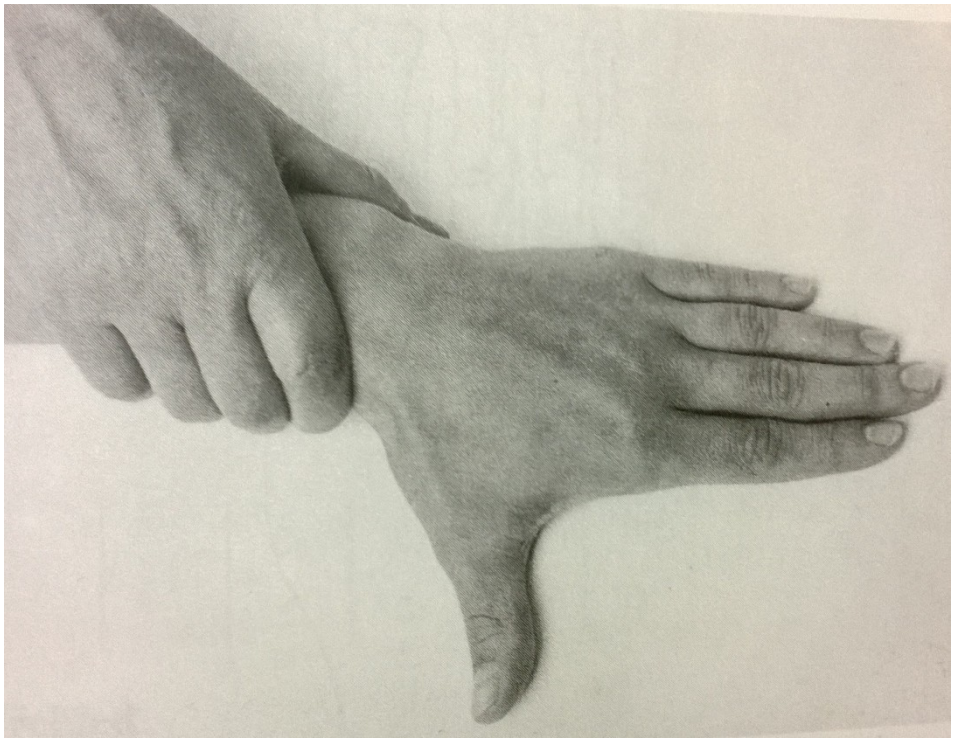


Position: patient sits or lies supine, forearm lying on the ulnar side on the table, wrist in central position, thumb adducted, fingers extended

Fixation: wrist

Movement: CMC thumb joint abduction in full range of motion

CMC thumb joint abduction – grade 2

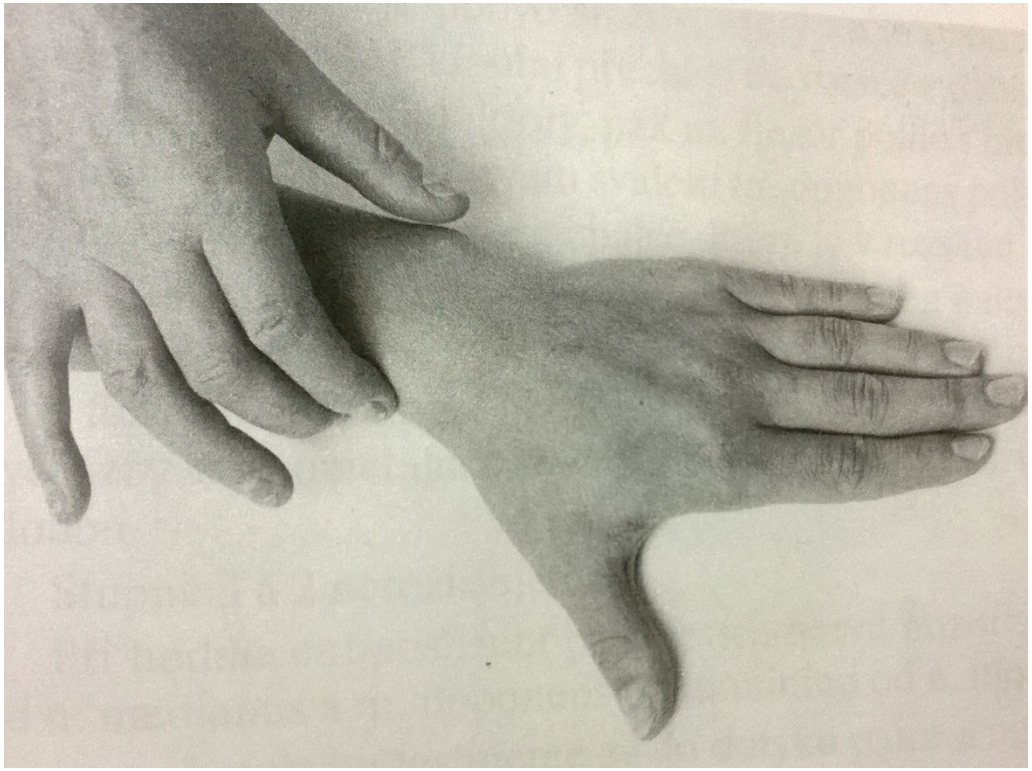


Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb adducted, fingers extended

Fixation: wrist

Movement: CMC thumb joint abduction in full range of motion

CMC thumb joint abduction – grade 1,0



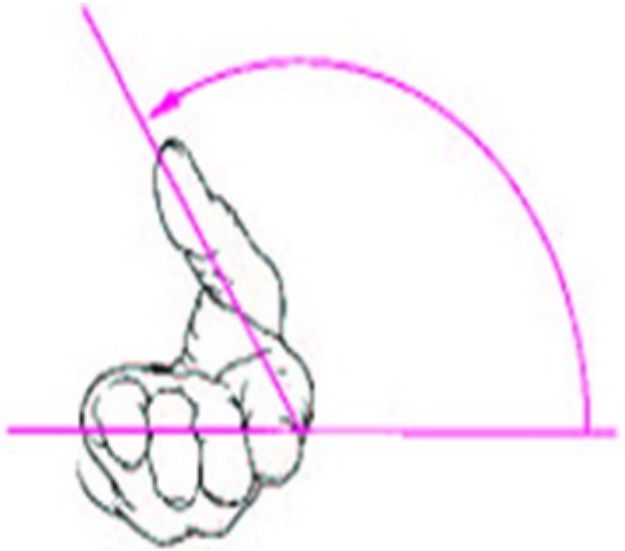
Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb extended, relaxed, fingers extended

Attempt to move: PT palpates a trace of contraction during patients attempt of CMC thumb joint abduction (in the processus styloideus radii area)

CMC thumb joint abduction – notes:

- Wrist and the hand should be fixed, in central position
- The movement should be done in the plane of the palm

Thumb and little finger opposition



Opponnens pollicis

Opponnens digiti minimi

Opponnens pollicis

Origin

- Flexor retinaculum and tubercles of scaphoid and trapezium

Insertion

- Lateral side of 1st metacarpal

Action

- Draws 1st metacarpal laterally to oppose thumb toward center of palm and rotates it medially

Innervation

- Recurrent branch of median nerve (C8 and T1) (C8, T1)

Opponnens digiti minimi

Origin

- Hook of hamate and flexor retinaculum

Insertion

- Medial border of 5th metacarpal

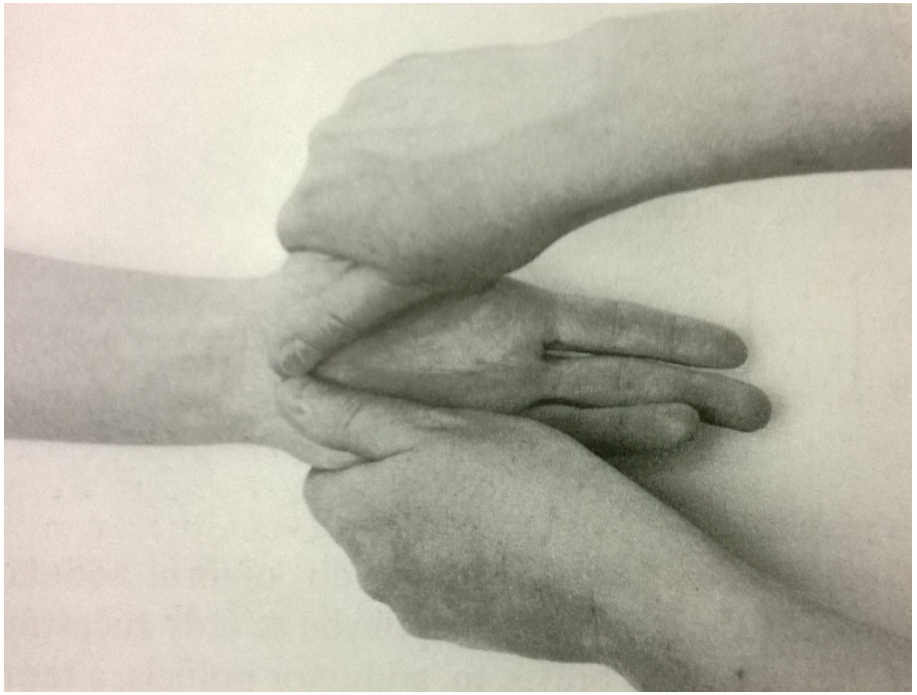
Action

- Draws 5th metacarpal anteriorly and rotates it, bringing little finger (5th digit) into opposition with thumb

Innervation

- Deep branch of ulnar nerve (C8 and T1) (C8, T1)

Thumb and little finger opposition – grade 5,4



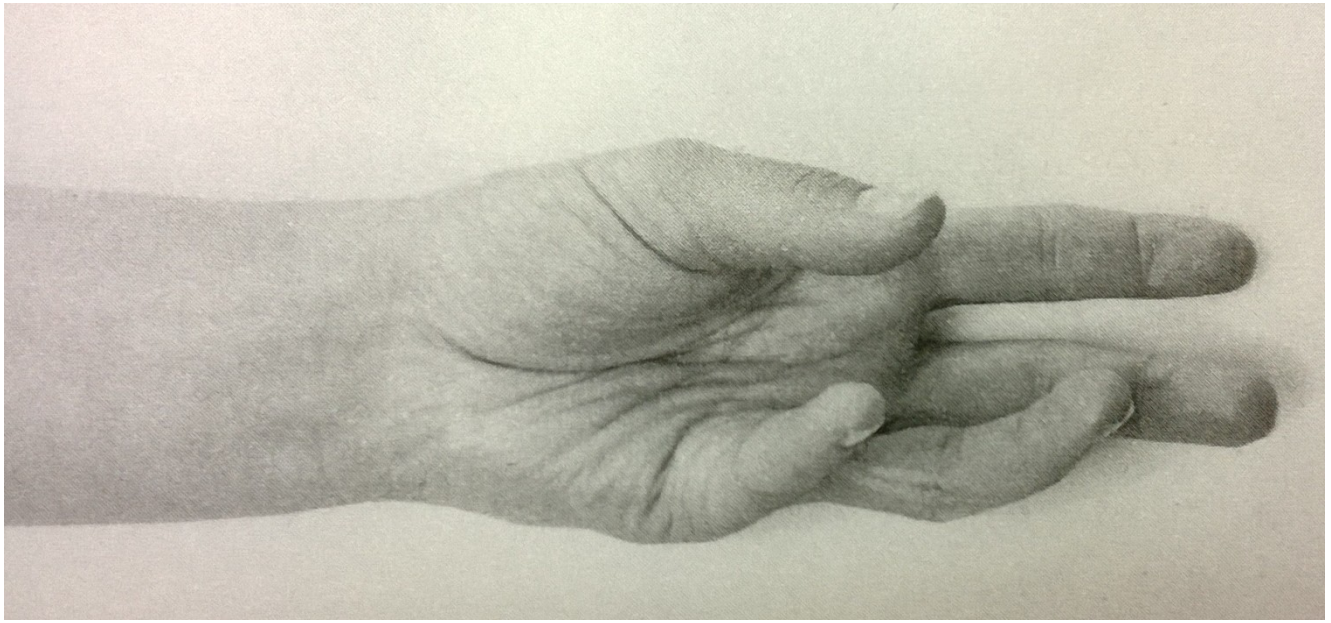
Position: patient sits or lies supine, forearm lying supine on the table, wrist in central position, fingers extended

Fixation: not necessary

Movement: thumb and little finger opposition

Resistance: PT puts resistance on volar side of I. and V. metatars

Thumb and little finger opposition – grade 3,2

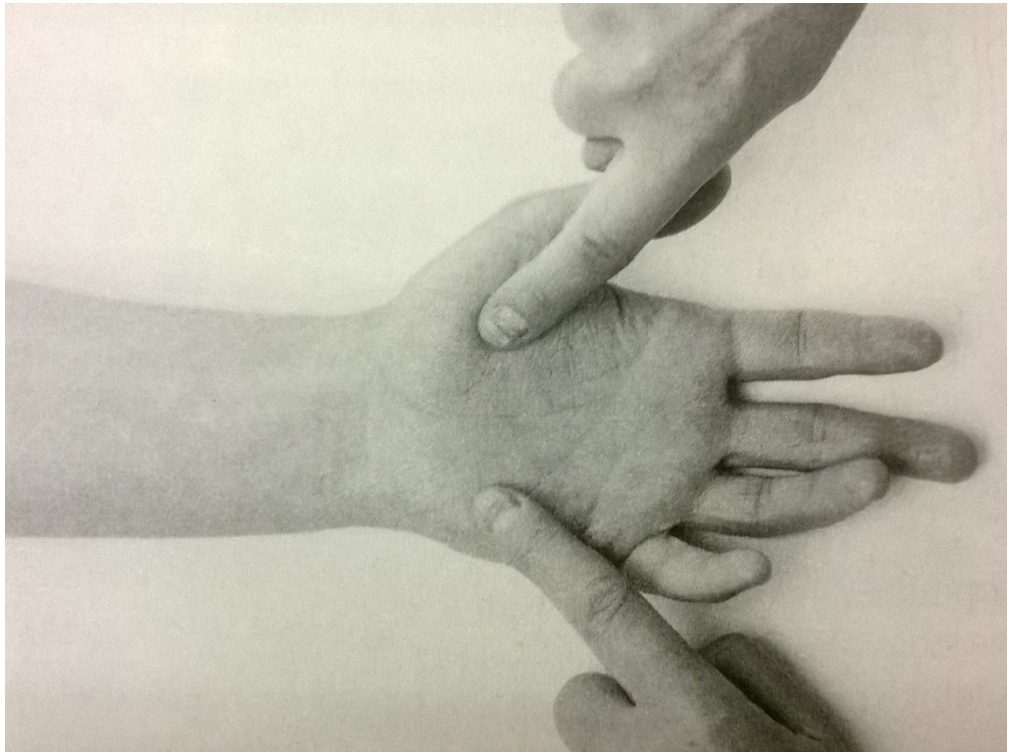


Position: patient sits or lies supine, forearm lying supine on the table, wrist in central position, fingers extended

Fixation: not necessary

Movement: thumb and little finger opposition

Thumb and little finger opposition – grade 1,0



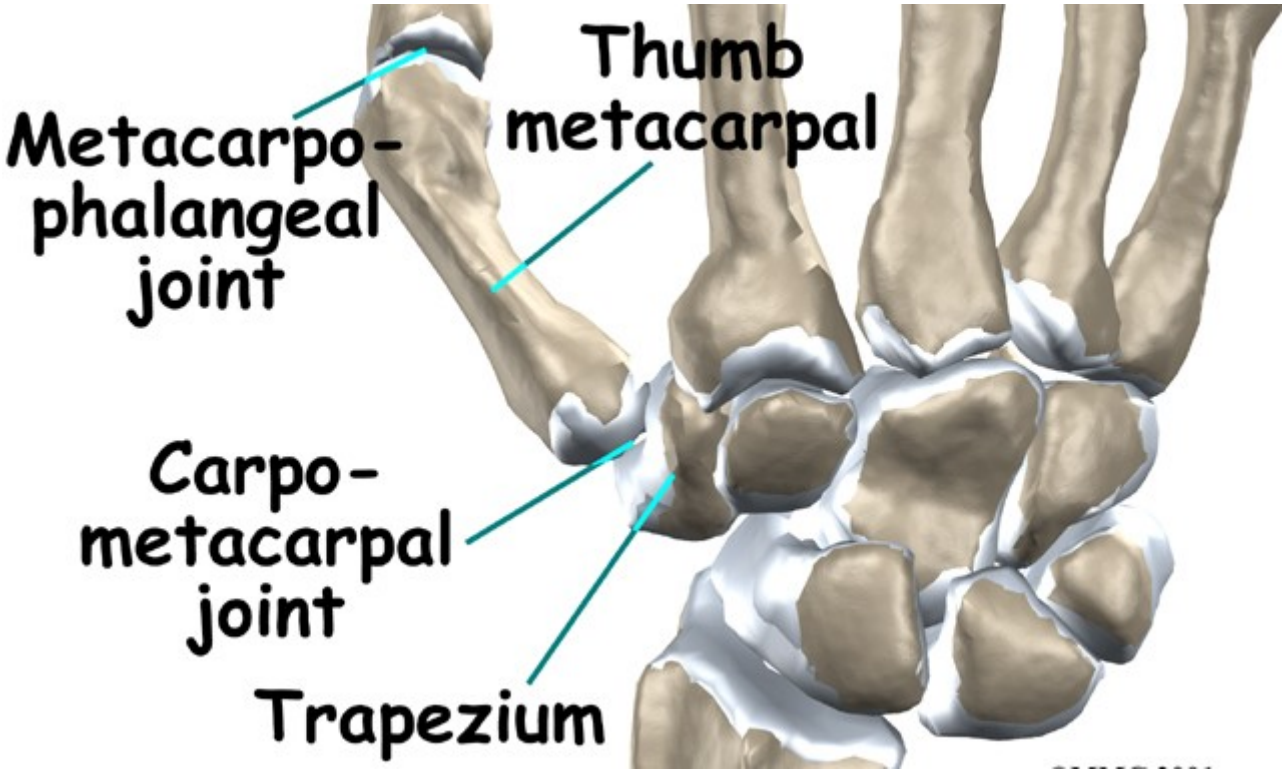
Position: patient sits or lies supine, forearm lying supine on the table, wrist in central position, fingers extended

Attempt to move: PT palpates a trace of contraction during patients´ attempt of thumb and little finger opposition – on the volar and radial side of I. metacarp, and in the area of hypothenar

Thumb and little finger opposition – notes:

- The movement should be done properly – it is not enought to do an adduction an flexion of the thumb
- Put the resistance in good way – against opposition

Metacarpophalangeal joint of the thumb (MCP)



Thumb MCP flexion

Flexor pollicis brevis

Flexor pollicis brevis

Origin
- Flexor retinaculum and tubercles of scaphoid and trapezium

Insertion
- Lateral side of base of proximal phalanx of thumb

Action
- Flexes thumb

Innervation
- Recurrent branch of median nerve (C8 and T1) (C8, T1)

Thumb MCP flexion – grade 5,4

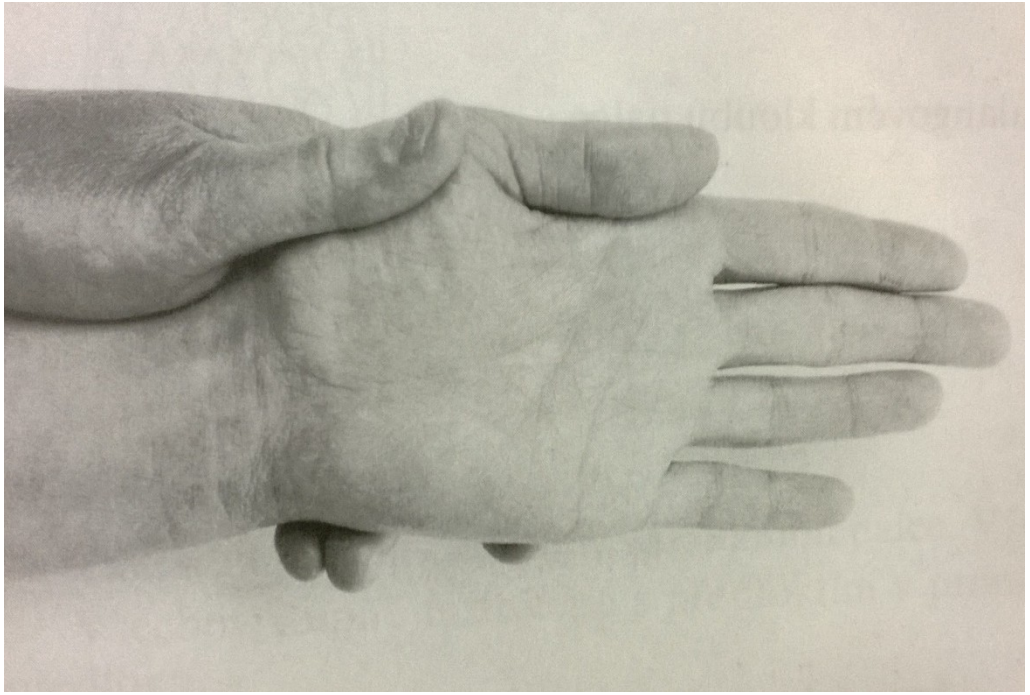
Position: patient sits or lies supine, forearm lying supine on the table, thumb extended and abducted, fingers relaxed

Fixation: fix first metacarp in starting position (don´t press the thenar)

Movement: thumb MCP flexion in full range of motion

Resistance: PT puts resistance against thumb MCP flexion on volar side of proximal phalang of the thumb

Thumb MCP flexion – grade 3,2

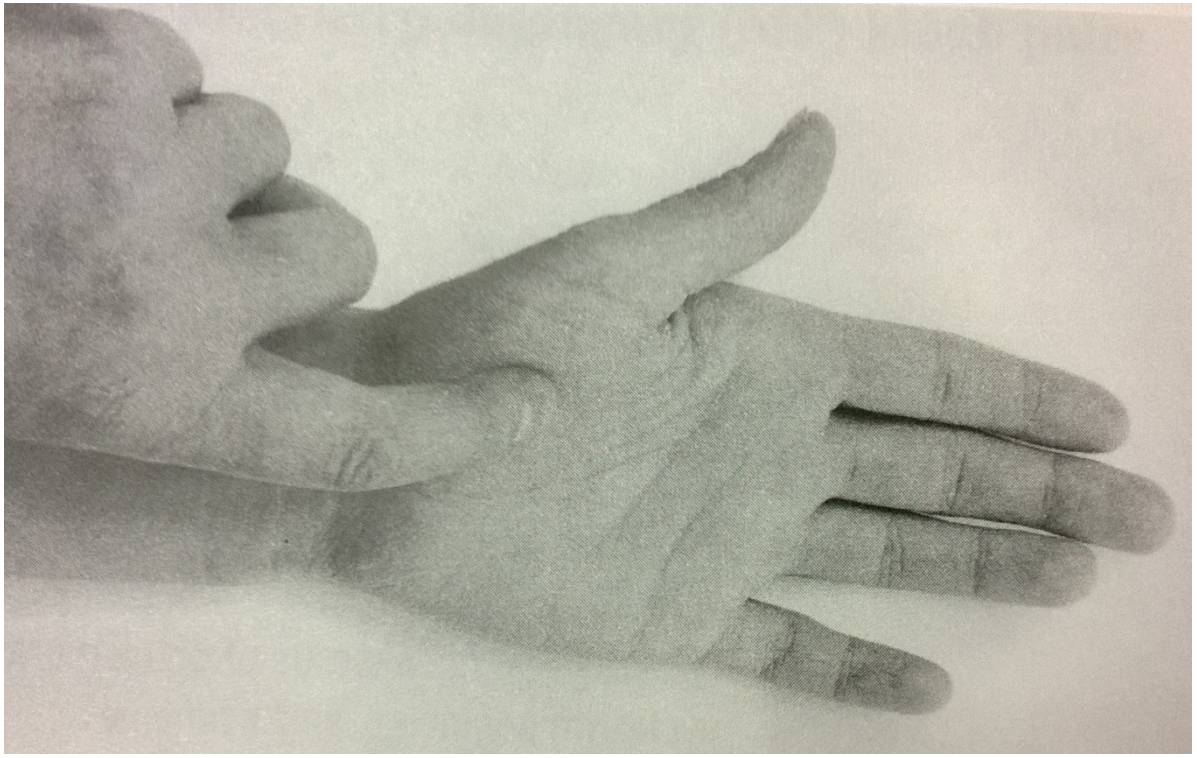


Position: patient sits or lies supine, forearm lying supine on the table, thumb extended and abducted, fingers relaxed

Fixation: fix first metacarp in starting position (don´t press the thenar)

Movement: thumb MCP flexion in full range of motion

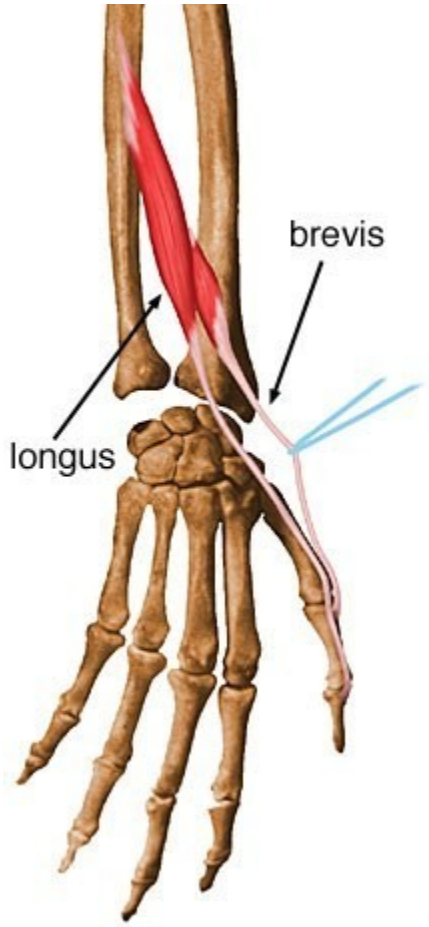
Thumb MCP flexion – grade 1,0



Position: patient sits or lies supine, forearm lying supine on the table, thumb extended and abducted, fingers relaxed

Attempt to move: PT palpates a trace of patients´ attempt of thumb MCP flexion on the palmar side of I. metacarp

Thumb MCP extension



Extensor pollicis brevis

Extensor pollicis brevis

Origin

- Posterior surfaces of radius and interosseous membrane

Insertion

- Base of proximal phalanx of thumb

Action

- Extends proximal phalanx of thumb at carpometacarpal joint

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

Thumb MCP extension – grade 5,4

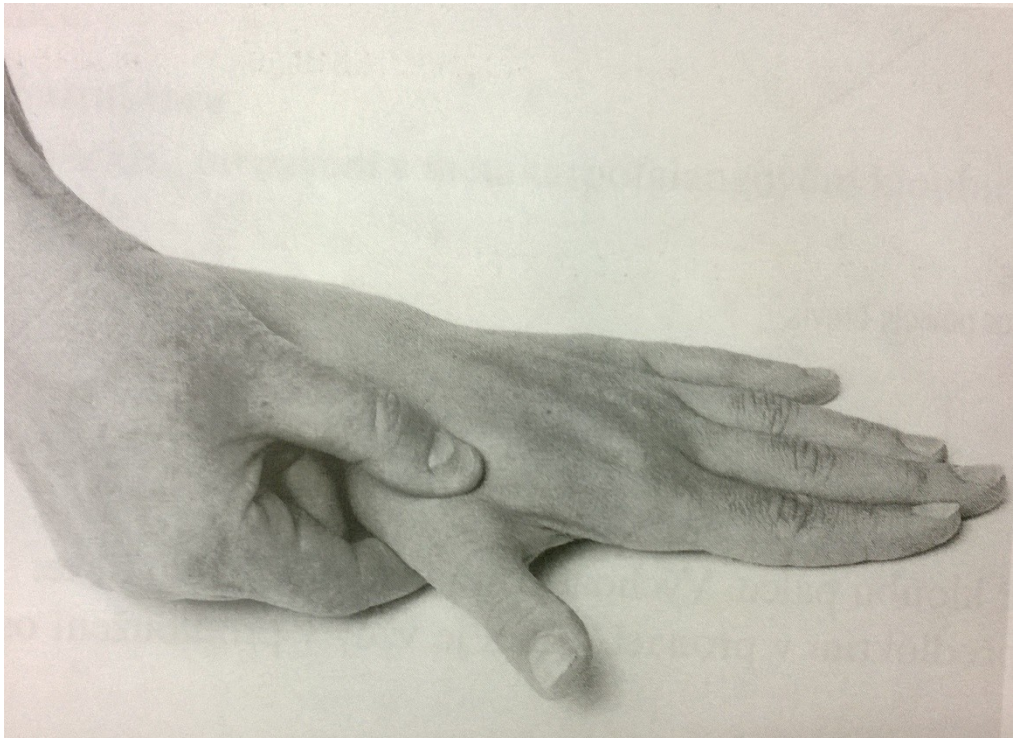
Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb between adduction and abduction, MP joint flexed, fingers relaxed

Fixation: fix slightly the I. metacarp

Movement: thumb MCP extension

Resistance: PT puts resistance against thumb MCP extension on dorsal side of prosimal thumb phalang

Thumb MCP extension – grade 3,2

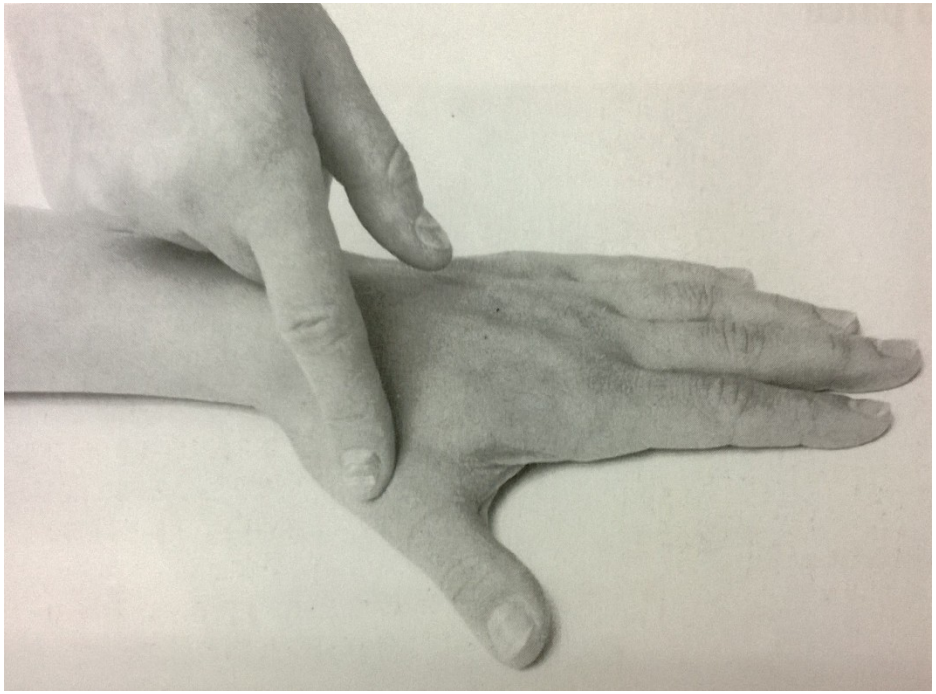


Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb between adduction and abduction, MP joint flexed, fingers relaxed

Fixation: fix slightly the I. metacarp

Movement: thumb MCP extension

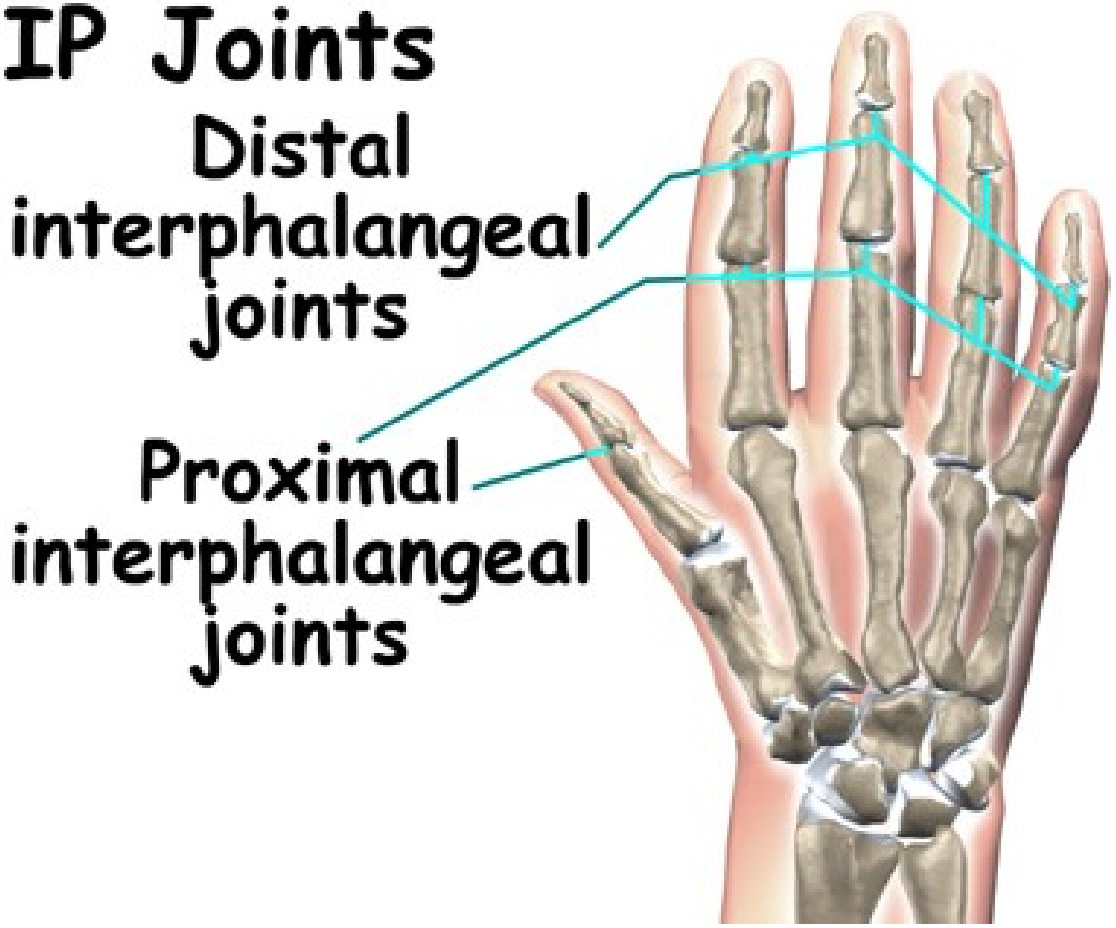
Thumb MCP extension – grade 1,0



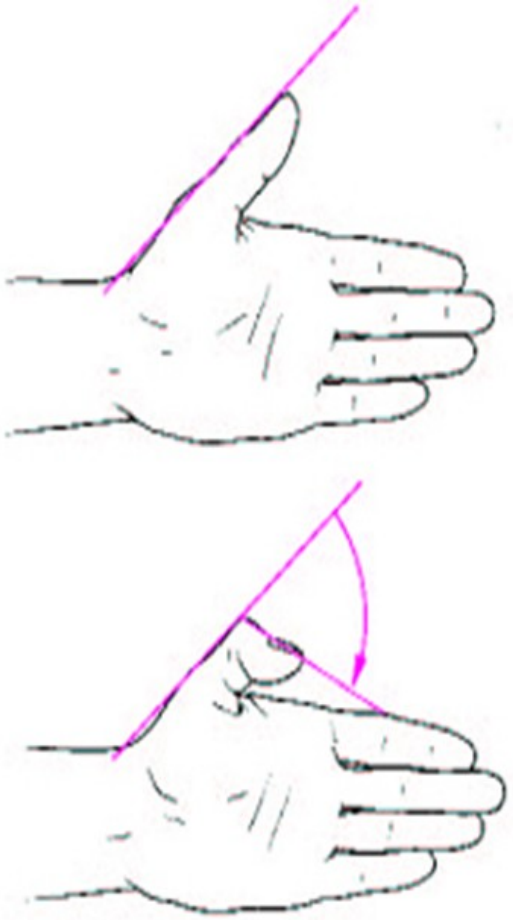
Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb between adduction and abduction, MP joint flexed, fingers relaxed

Attempt to move: PT palpates a trace of contraction during patients´ attempt of thumb MCP extension in the area of I. metacarp

Interphalangeal joint of the thumb (IP)



Thumb IP flexion



Flexor pollicis longus

Flexor pollicis longus

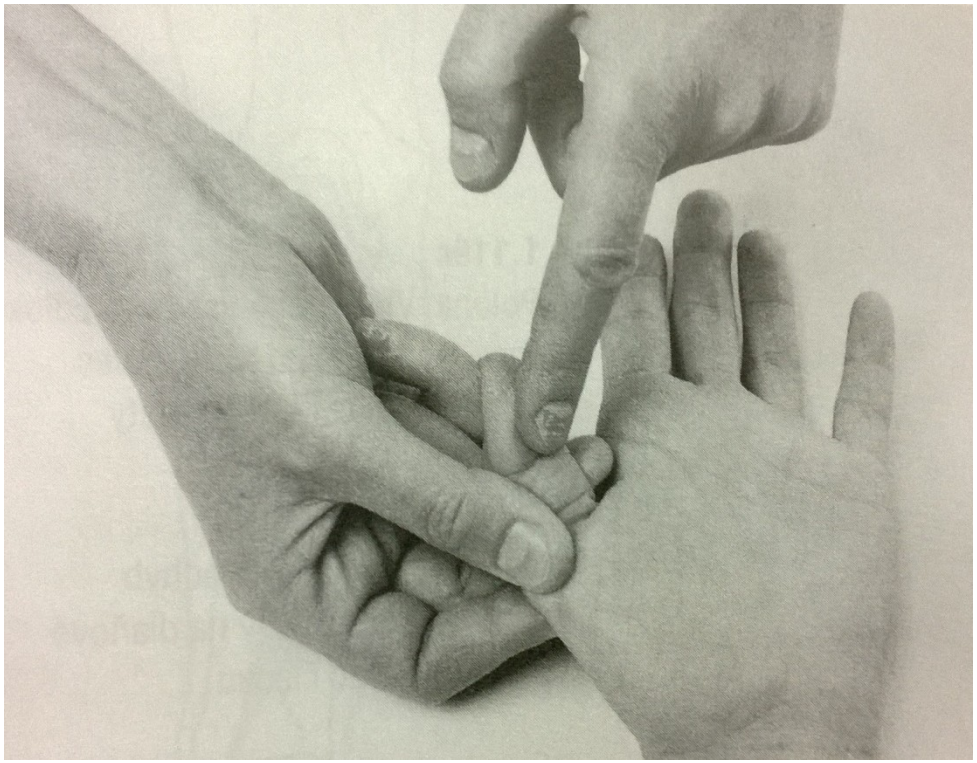
Origin
- Anterior surface of radius and adjacent interosseous membrane

Insertion
- Base of distal phalanx of thumb

Action
- Flexes phalanges of 1st digit (thumb)

Innervation
- Anterior interosseous nerve from median nerve (C8 and T1) (C8, T1)

Thumb IP flexion – grade 5,4



Position: patient sits or lies supine, forearm lying supine on the table, thumb extended and abducted, fingers relaxed

Fixation: proximal phalang of the thumb (from the side)

Movement: thumb IP flexion in full range of motion

Resistance: PT puts resistance against palmar side of distal phalang of the thumb

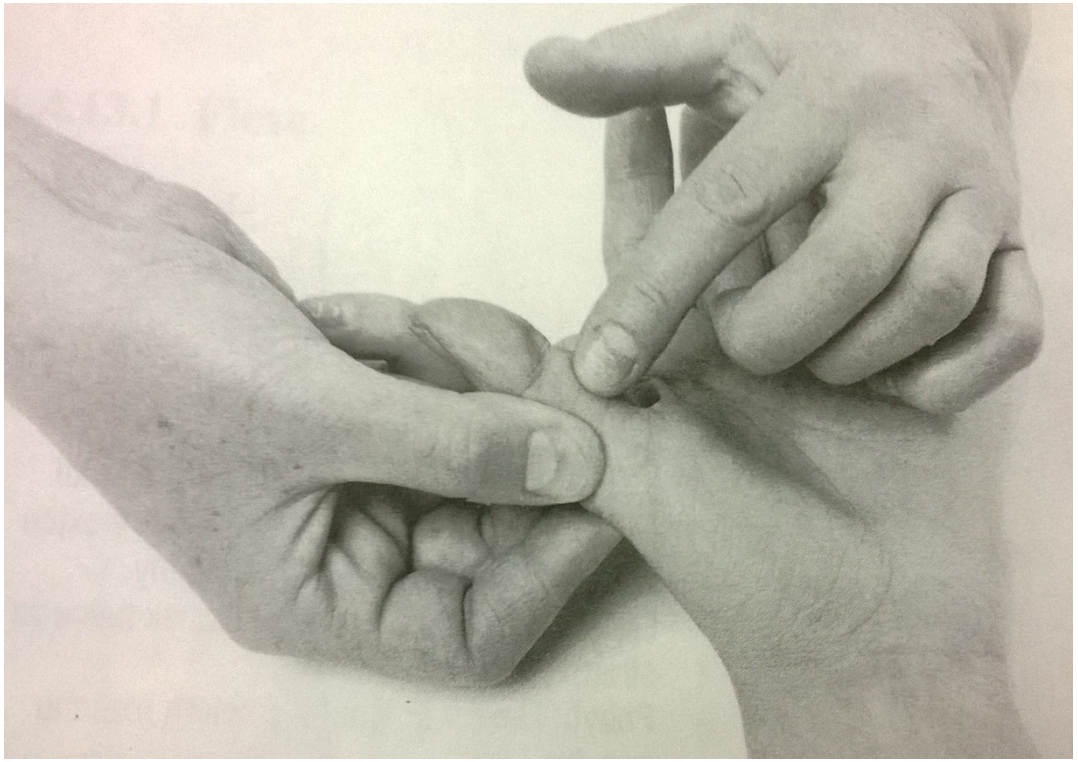
Thumb IP flexion – grade 3,2

Position: patient sits or lies supine, forearm lying supine on the table, thumb extended and abducted, fingers relaxed

Fixation: proximal phalang of the thumb (from the side)

Movement: thumb IP flexion in full range of motion

Thumb IP flexion – grade 1,0

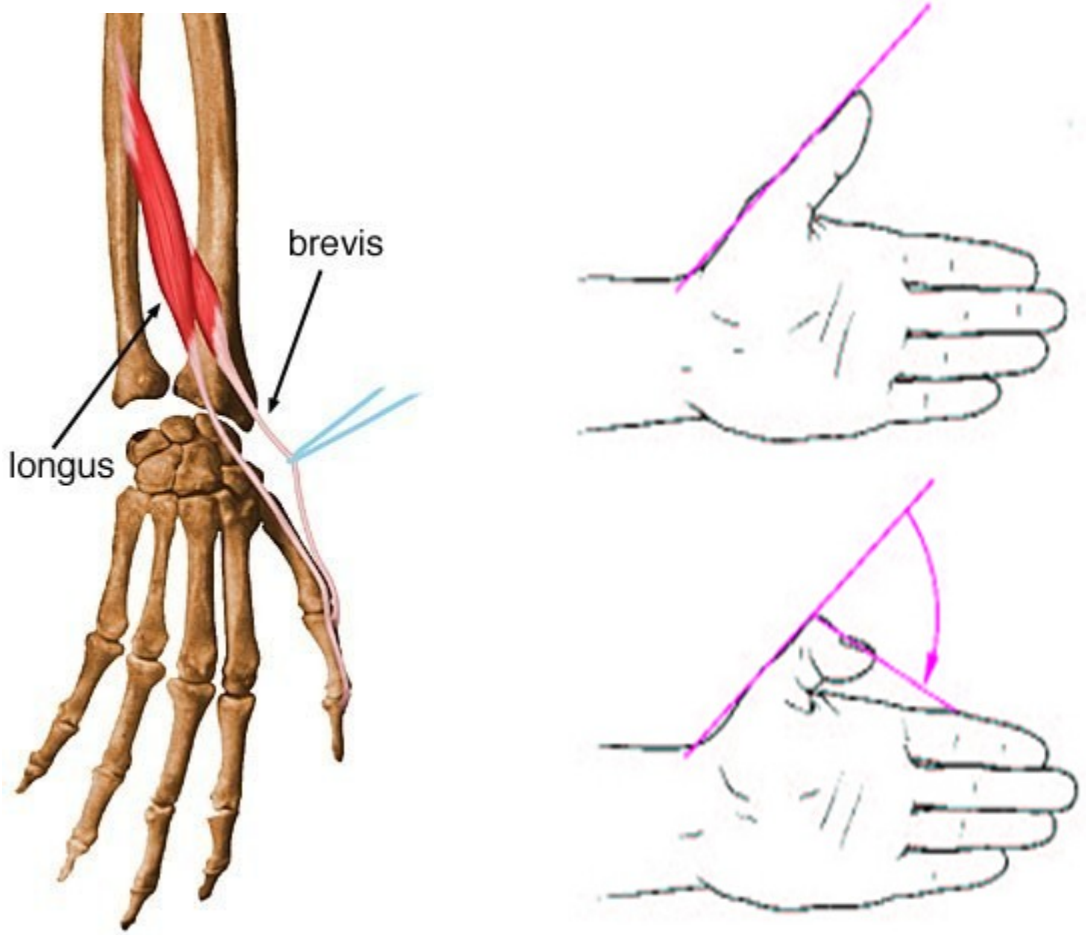


Position: patient sits or lies supine, forearm lying supine on the table, thumb extended and abducted, fingers relaxed

Fixation: proximal phalang of the thumb (from the side)

Attempt to move: PT palpates a trace of contraction during patients´ attempt of thumb IP flexion on the palmar side of proximal phalang of the thumb

Thumb IP extension



Extensor pollicis longus

Extensor pollicis longus

Origin

- Posterior surface of middle 1/3 of ulna and interosseous membrane

Insertion

- Base of distal phalanx of thumb

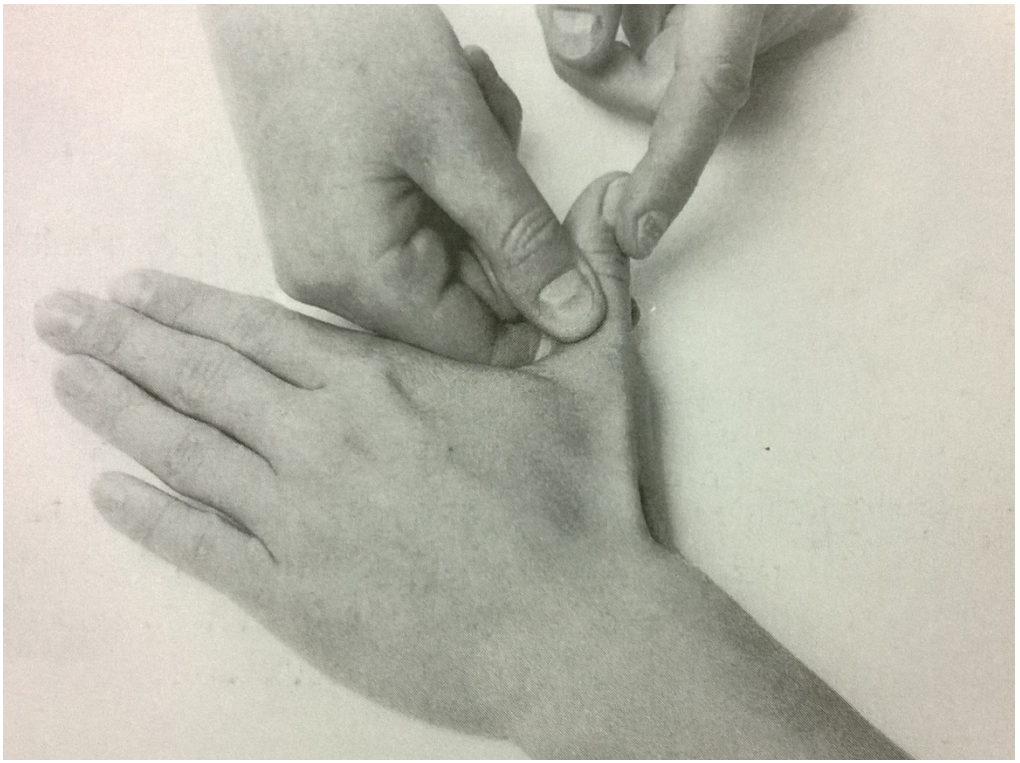
Action

- Extends distal phalanx of thumb at carpometacarpal and interphalangeal joints

Innervation

- Posterior interosseous nerve (C7 and C8), the continuation of the deep branch of the radial nerve (C7, C8)

Thumb IP extension – grade 5,4



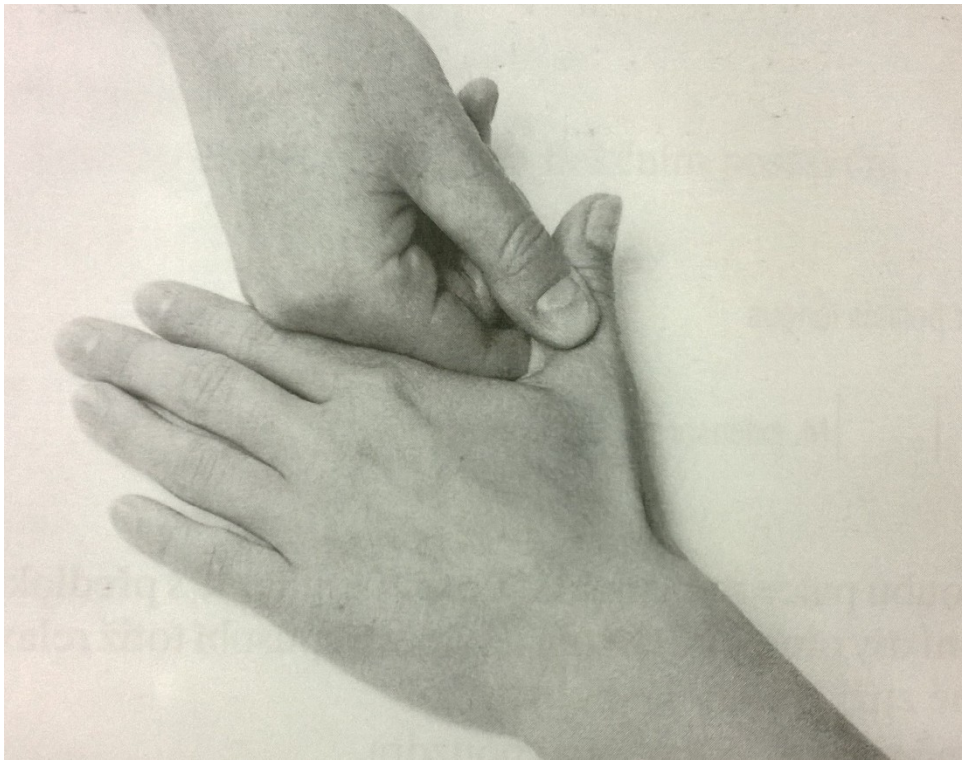
Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb IP flexion, MP extension, fingers relaxed

Fixation: fix first phalang of the thumb from the side

Movement: thumb IP extension

Resistance: against the distal phalang of the thumb (on the nail)

Thumb IP extension – grade 3,2

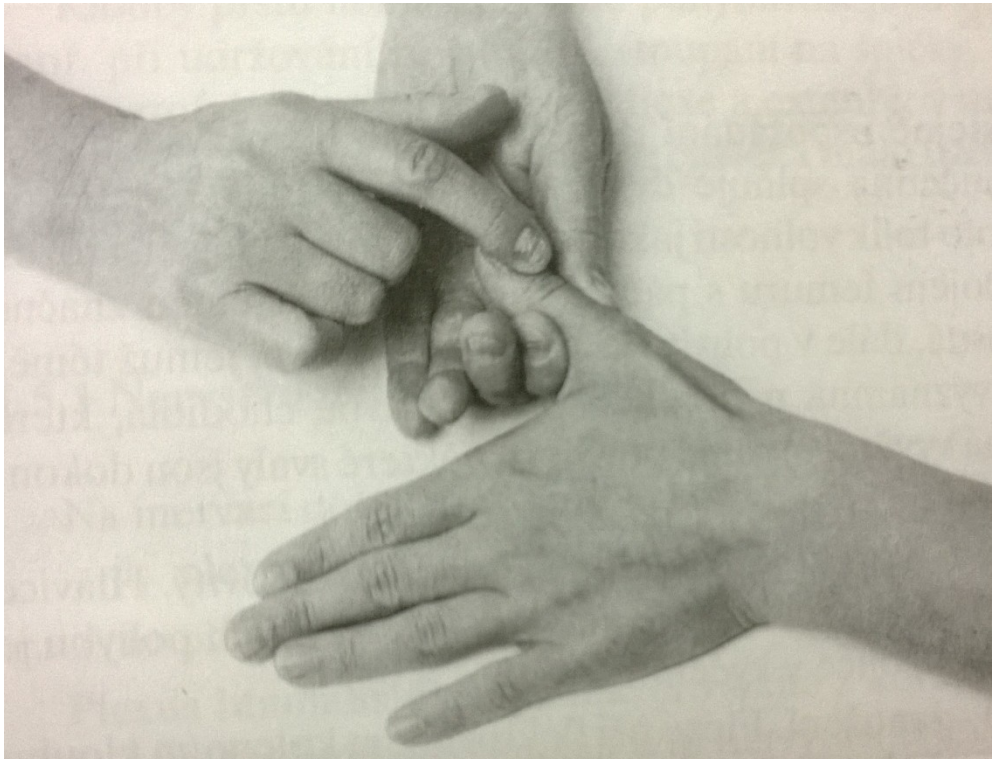


Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb IP flexion, MP extension, fingers relaxed

Fixation: fix first phalang of the thumb from the side

Movement: thumb IP extension

Thumb IP extension – grade 1,0



Position: patient sits or lies supine, forearm lying prone on the table, wrist in central position, thumb IP flexion, MP extension, fingers relaxed

Fixation: fix first phalang of the thumb from the side

Attempt to move: PT palpates a trace of contraction during patients´ attempt of thumb IP extension on dorsal side of first phalang

Literature, e-sources

- http://www.medicinenet.com/elbow_pain/article.htm
- http://www.houstonmethodist.org/orthopedics/where-does-it-hurt/hand
- http://criticalcaremcqs.com/tag/aipgmee-mcqs/page/15/
- https://nervesurgery.wustl.edu/ev/upperextremity

Thank you for your attention ☺