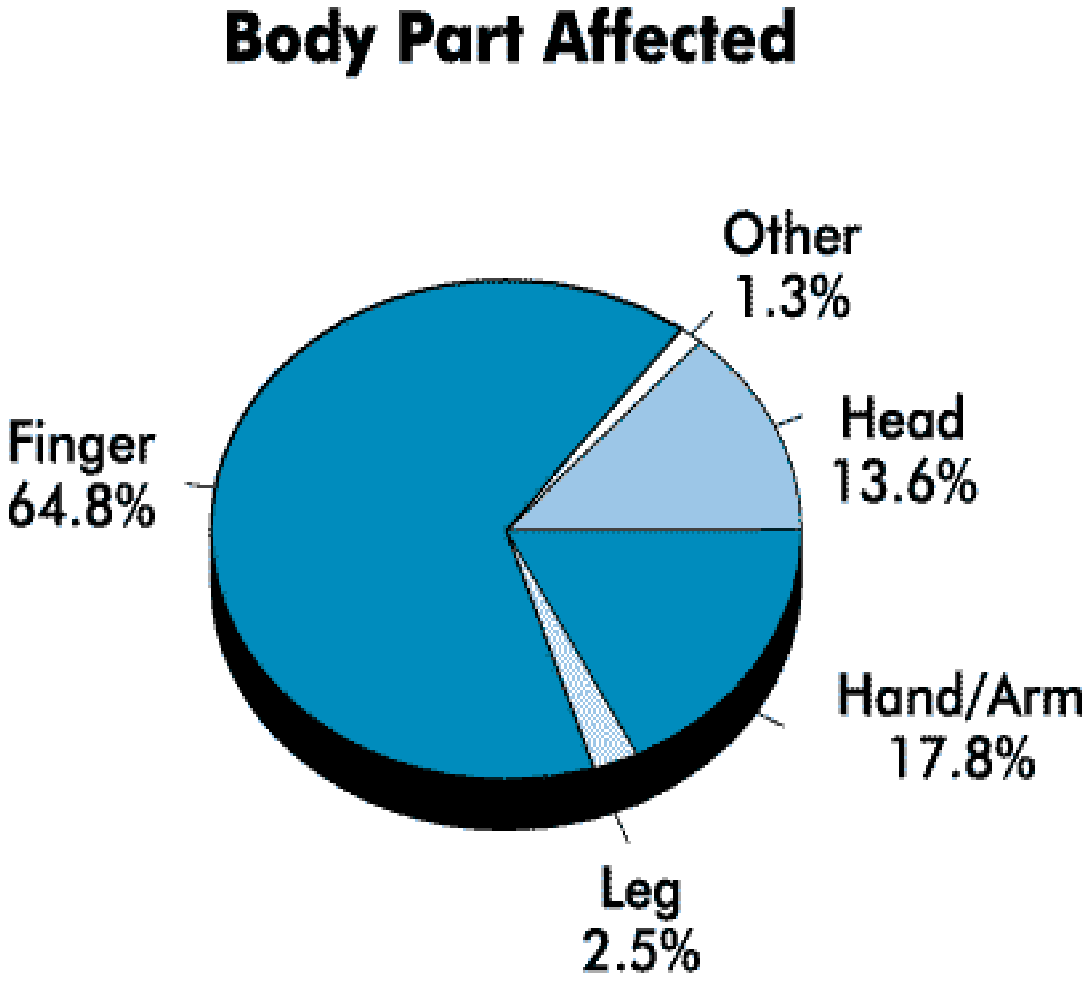
Rehabilitation of Flexor/Extensor Tendon injuries

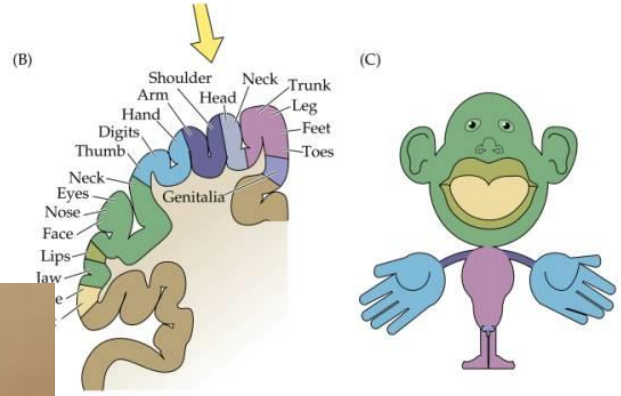
Moslem cheraghifard PhD canditate of occupational therapy

Work related injuries



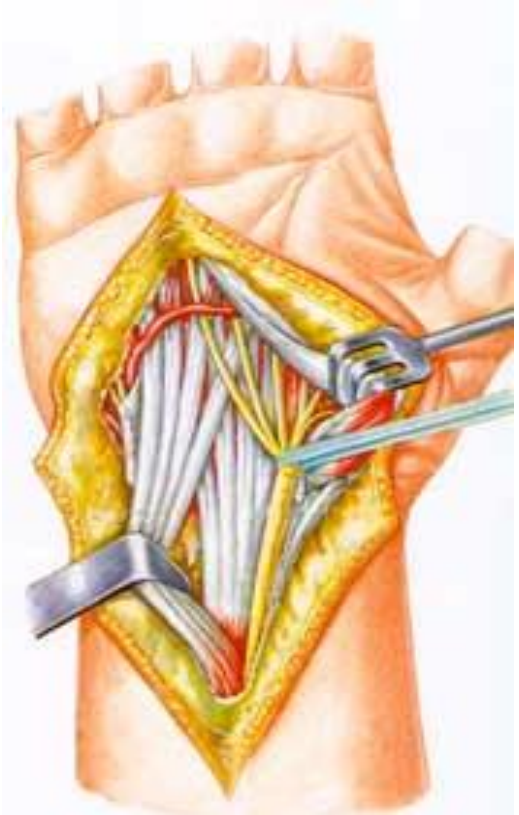
The Importance of the Hand

- Sensation
- Communication
- Employment
- Independent Living

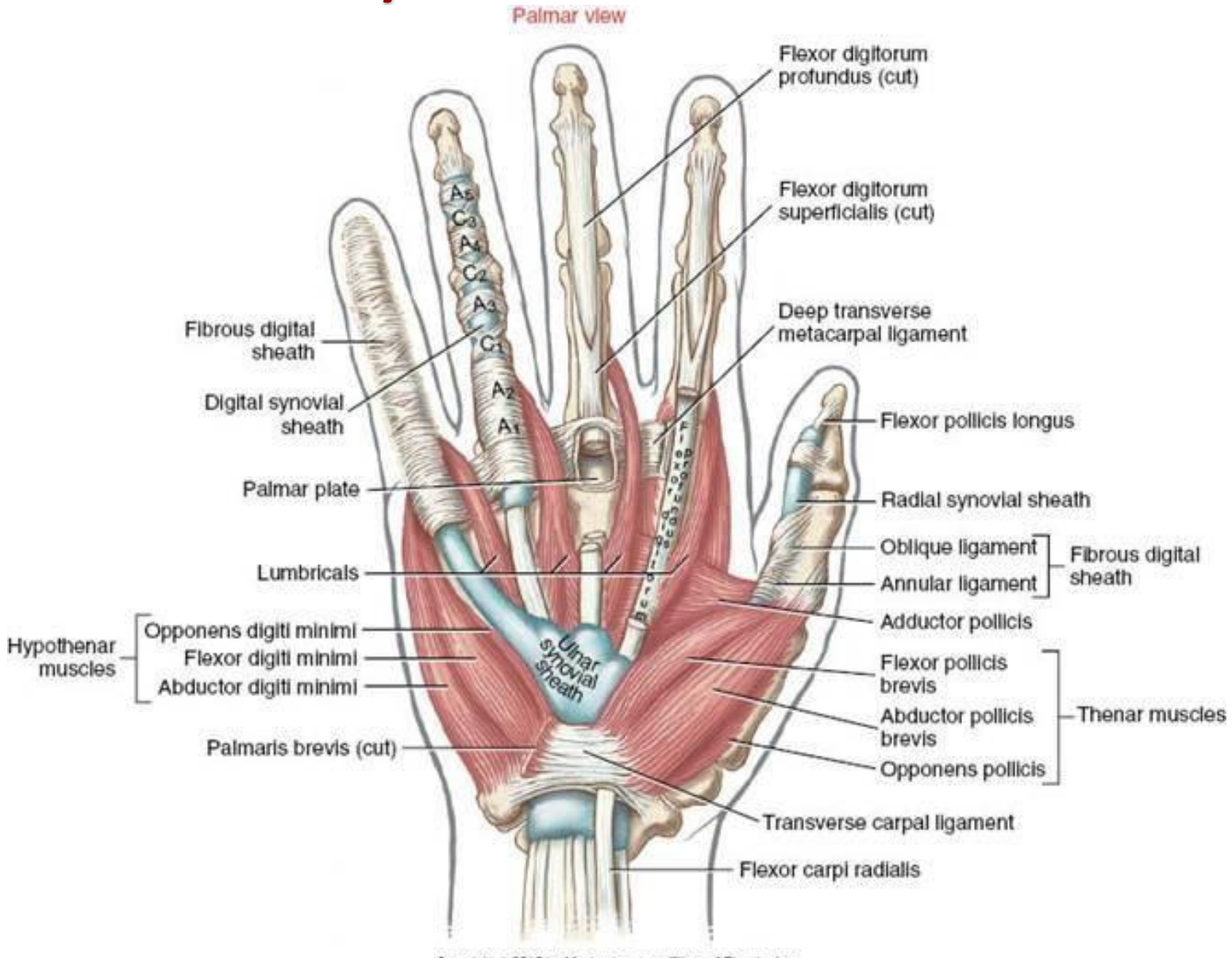


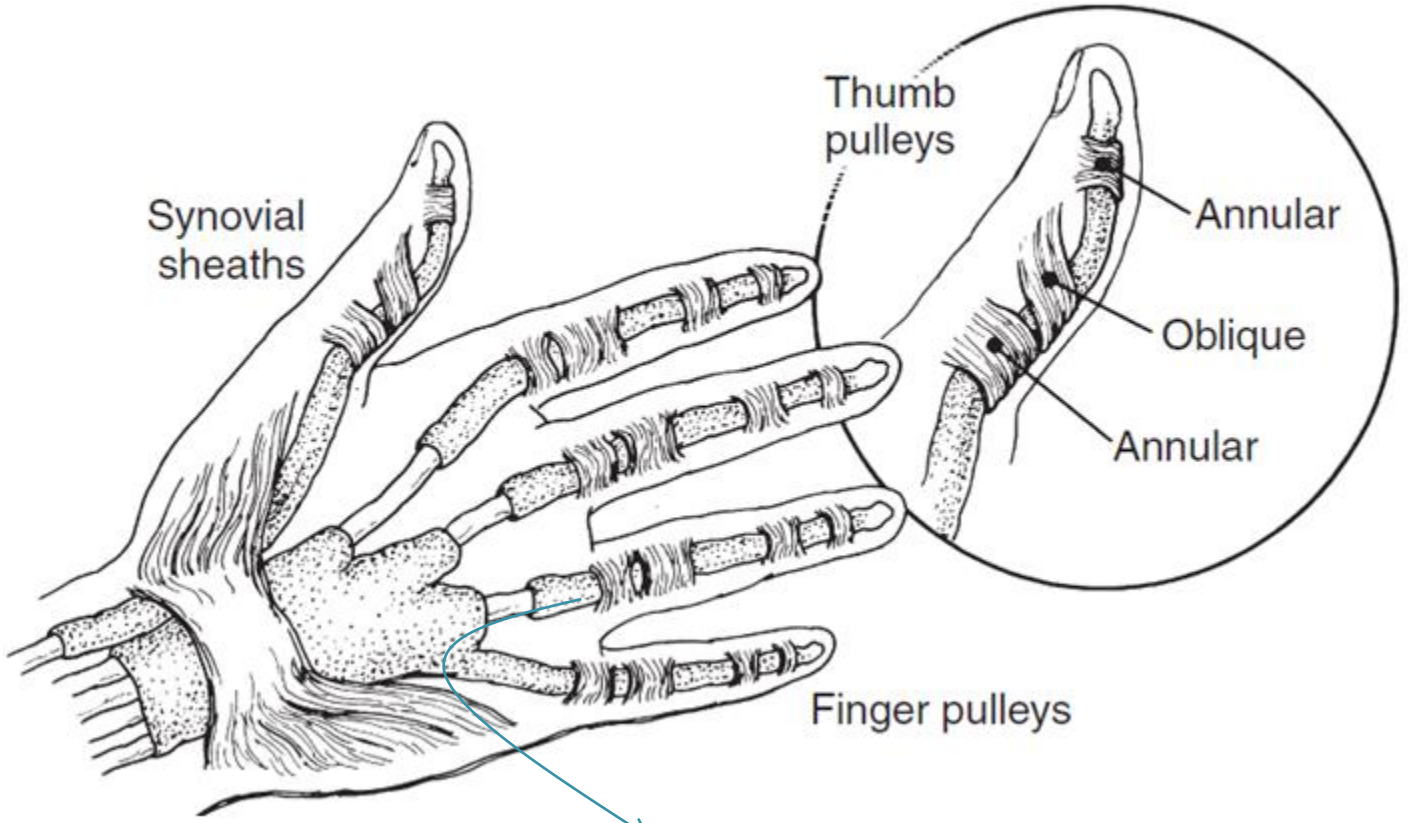
Tendons

- White fibrous connective tissue cords which connect muscles to bones.
- Tendon continuity is necessary for transmission of force from muscle bellies to hand.
- Disruption of a tendon causes loss of motion of the digit, diminished grip or pinch.

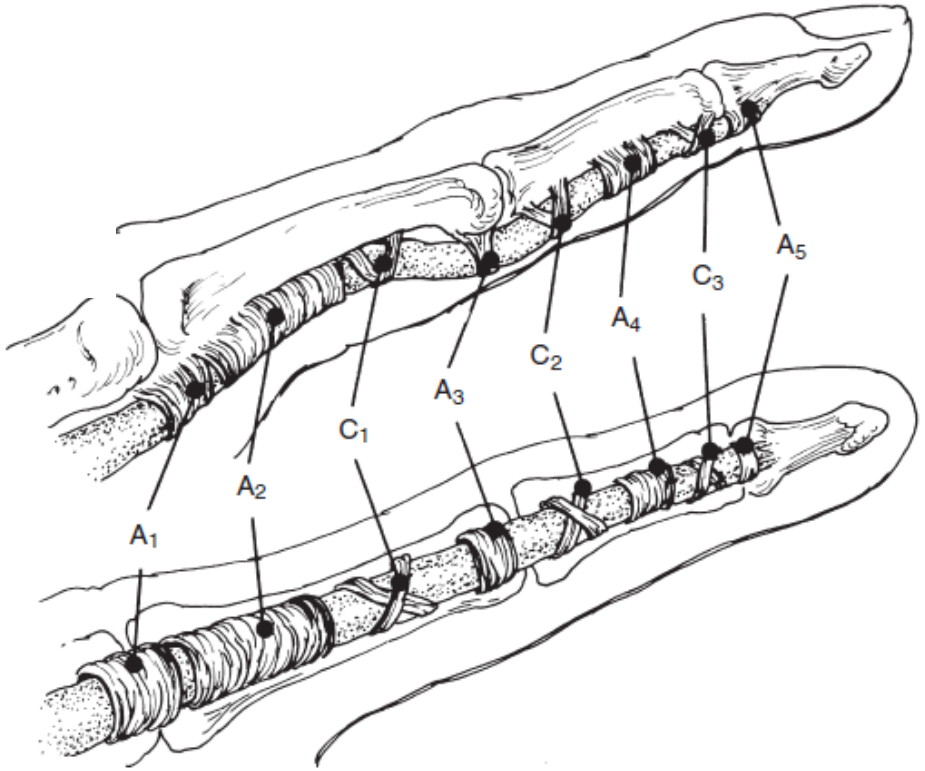


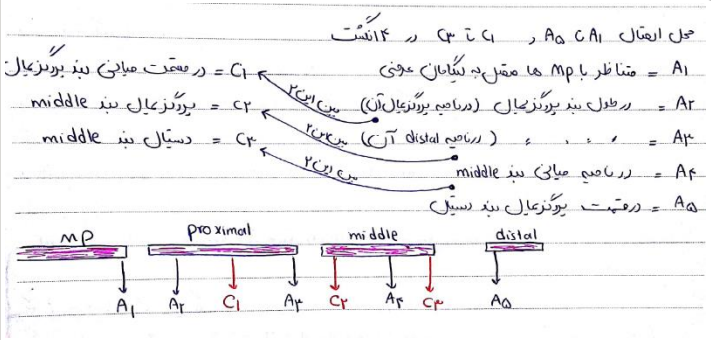
Basic Anatomy of the Hand - Tendons



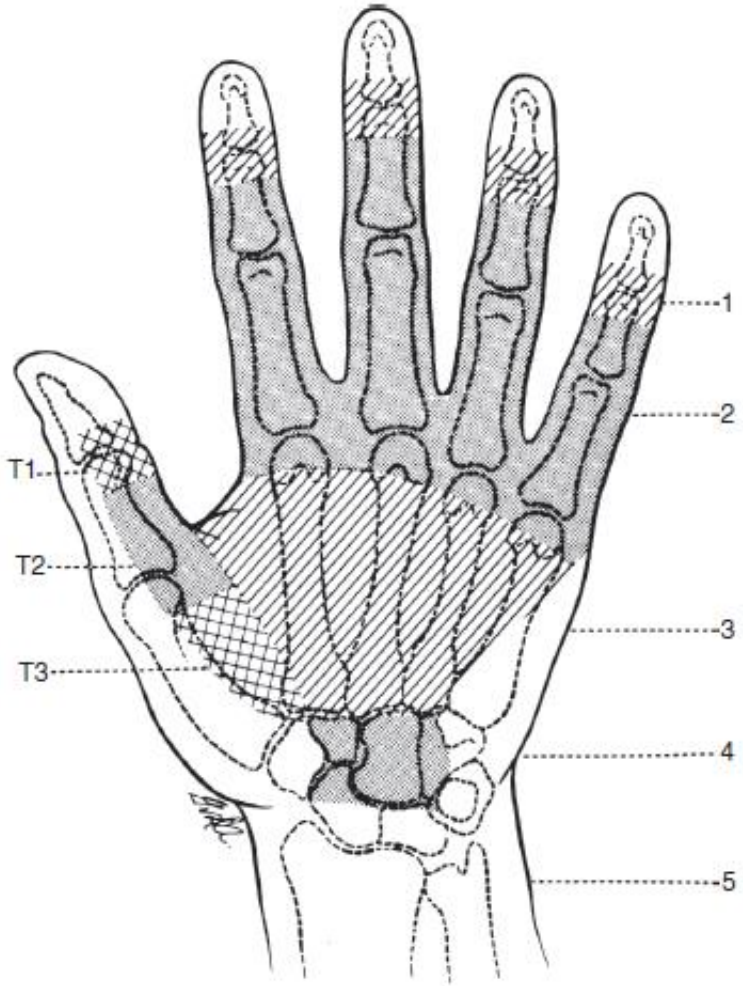


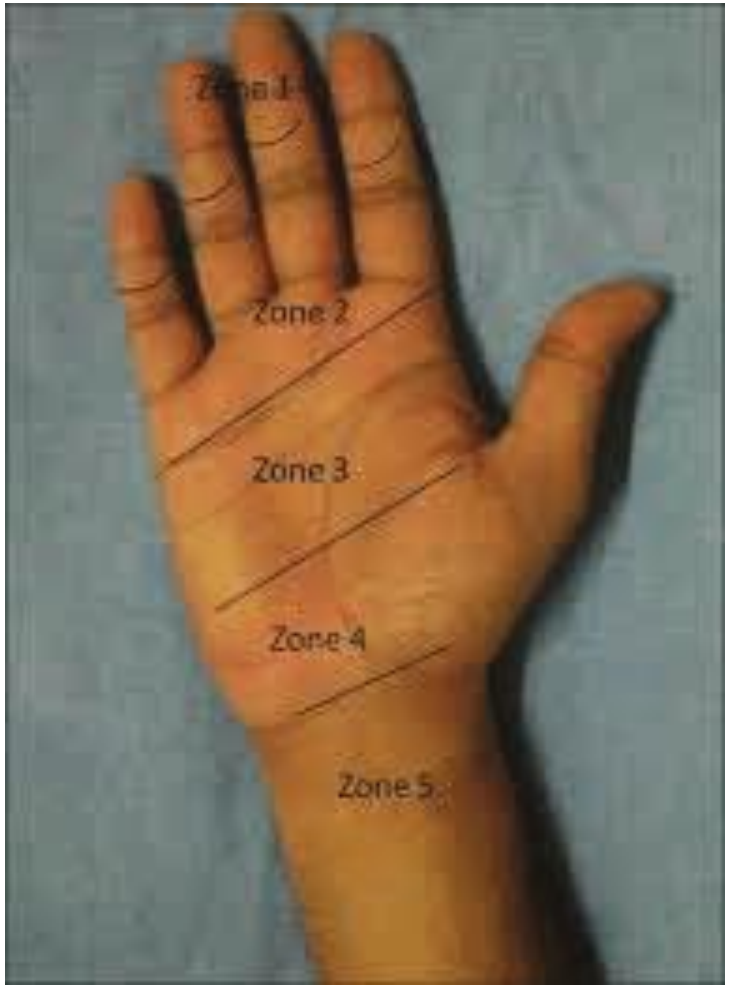
Flexor tendon sheaths



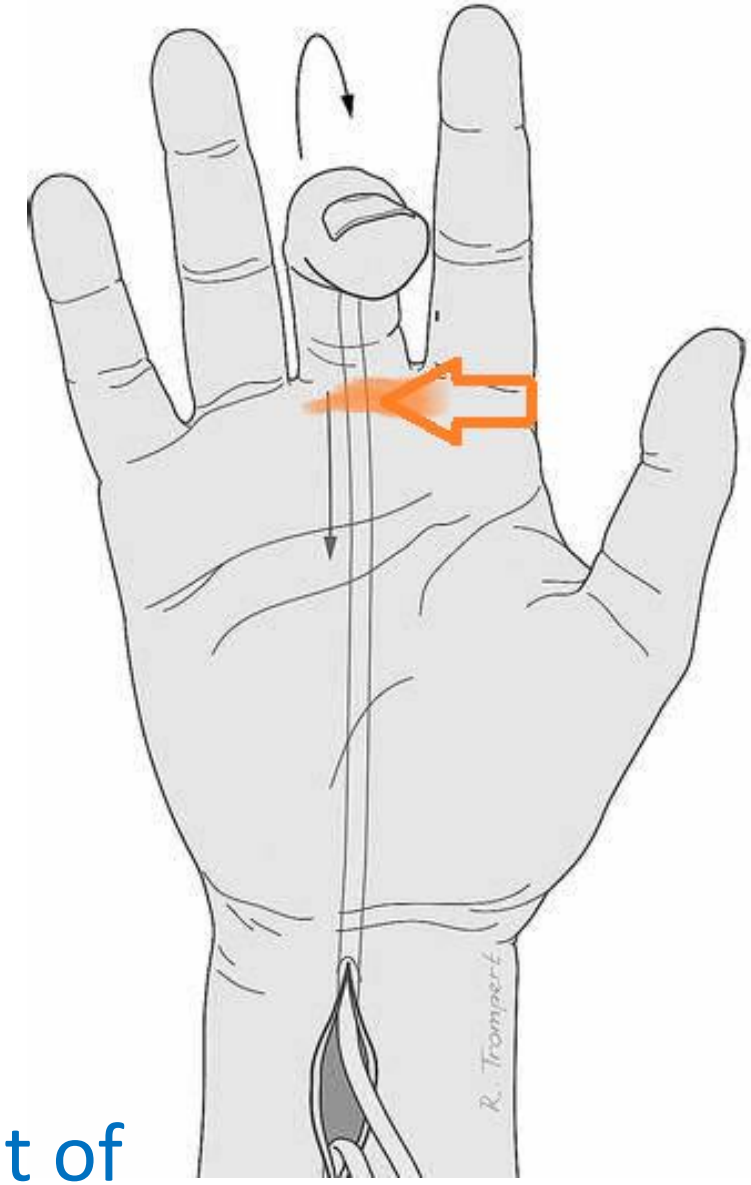


FLEXOR ZONE SYSTEM





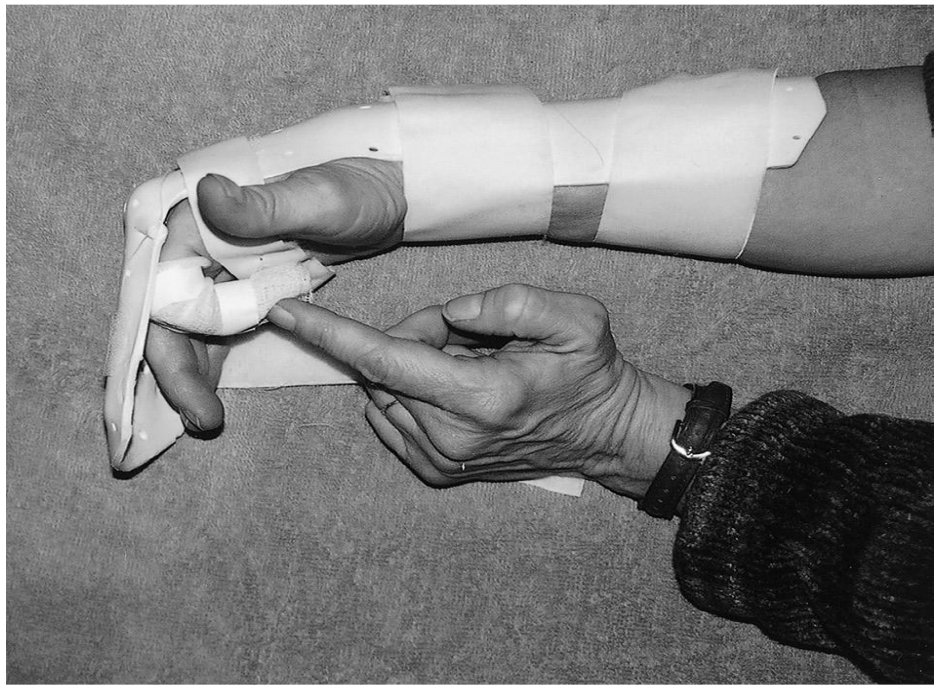
Following repair, flexor tendon adhesions develop quickly, because the tendon becomes adherent to surrounding tissue due to scar formation, especially when repaired within the pulley system.

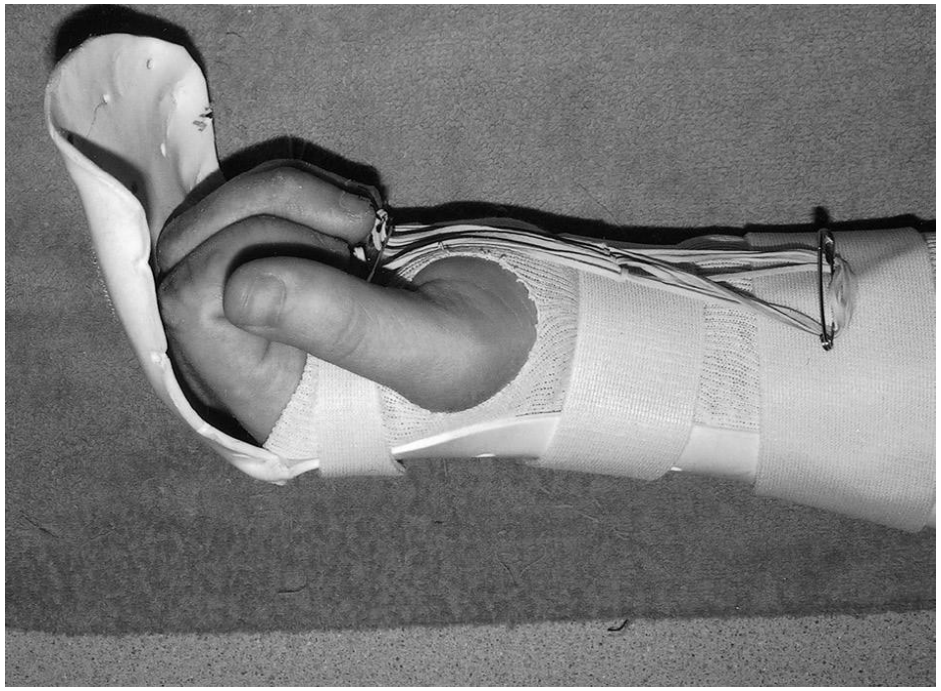


Tensile strength describes the amount of force the tendon will tolerate before rupture.

Operative Treatment

- Immobilization
- Immediate Passive Flexion
- Immediate Active Flexion

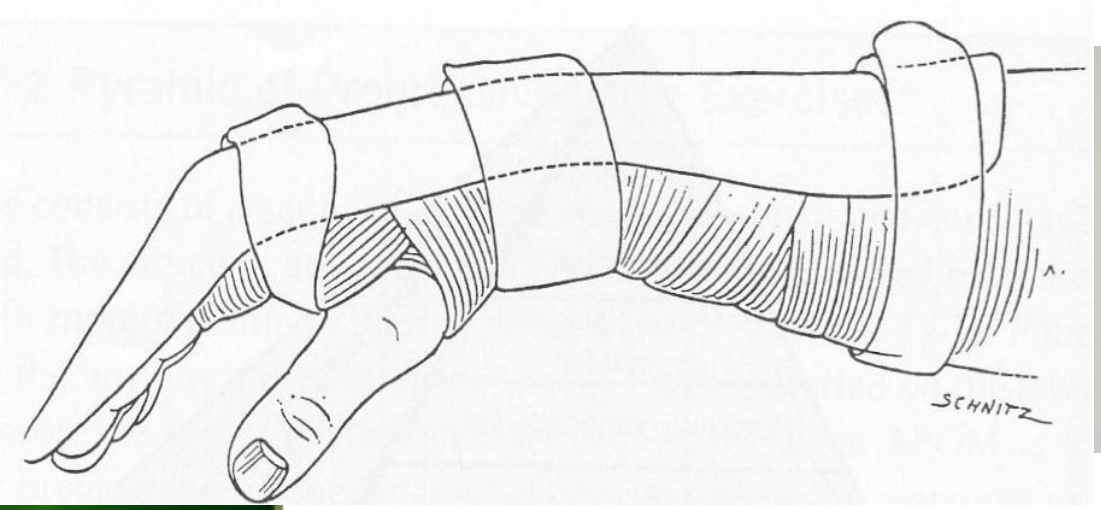


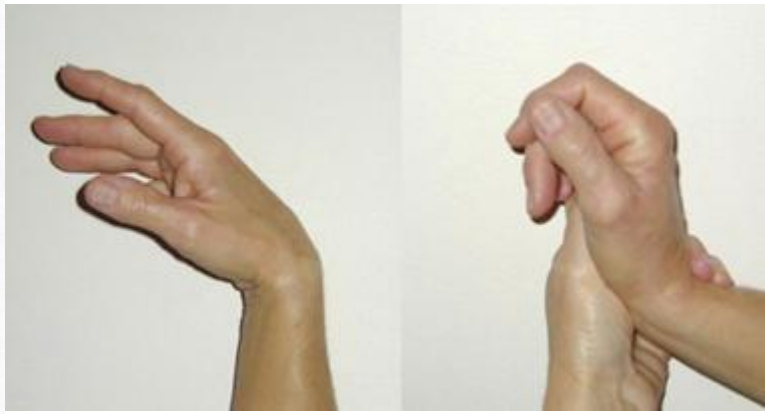


Immobilization Protocol Following Flexor Tendon Repair

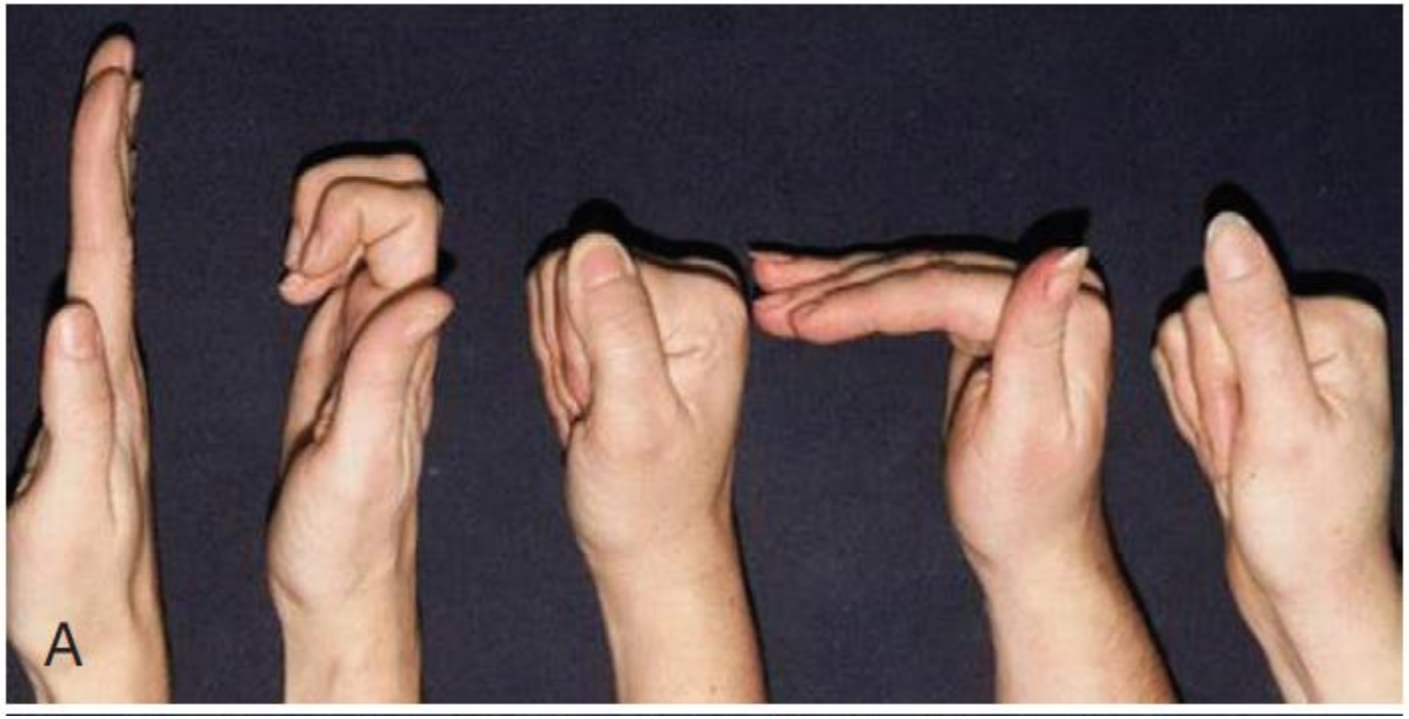
	Early Phase	Intermediate Phase	Late Phase
Orthosis	Dorsal blocking cast or orthosis • Wrist 20° to 30° flexion • MP joints 50° to 60° flexion with IP joints straight	• Adjust dorsal blocking orthosis to wrist neutral • Remove for exercises	• No protective orthosis • Orthosis for extension at night, if needed

Exercises	• Immobilized
	• Passive flexion by therapist if referred early
		• Passive flexion
		• Active digital extension with wrist flexed
		• Wrist tenodesis exercise
		• Gentle active digital flexion
		• Assess tendon gliding at 3 weeks; if adherent, add:
		  • Tendon gliding with straight and hook fist
		  • Blocking exercises
			Add the following:
			• Full active flexion and extension
			• Blocking
			• Light resistance

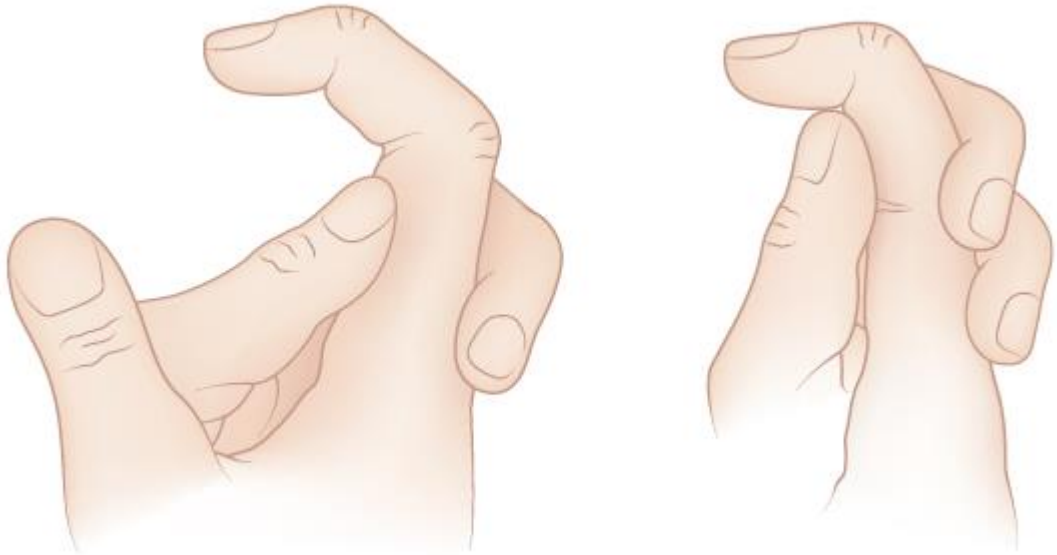




Tendon gliding



Blocking exercise

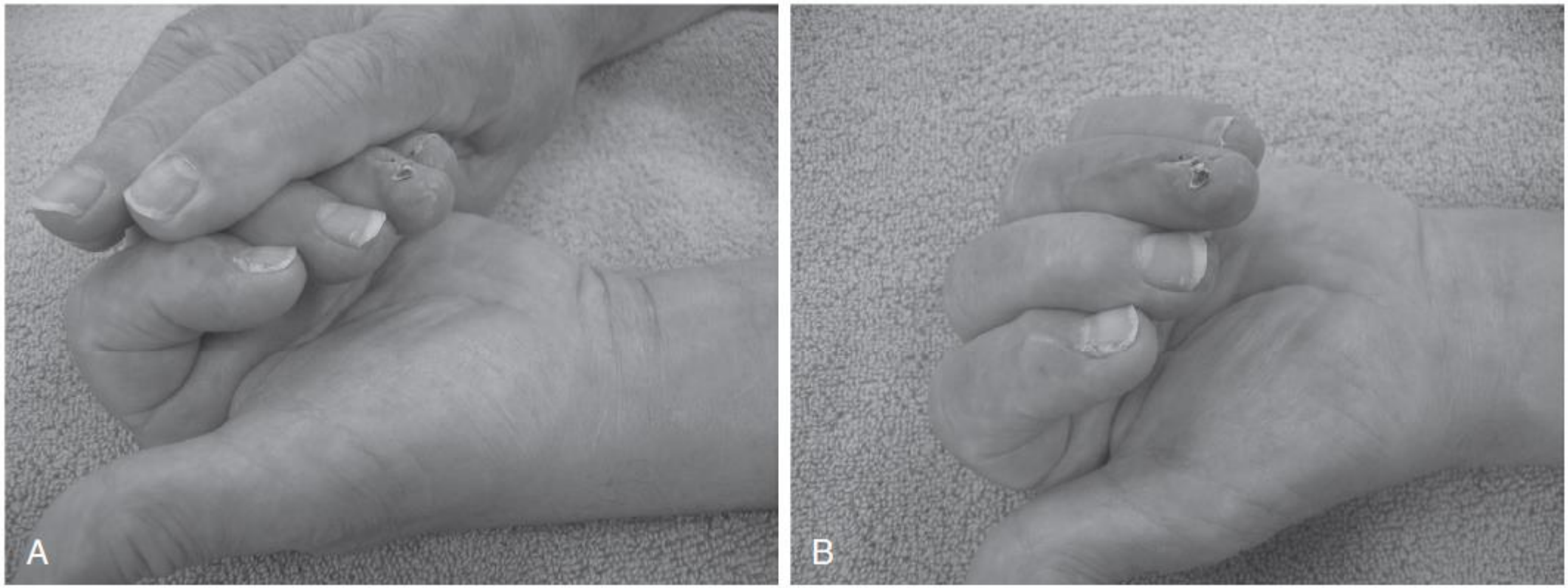


Isolate FDS and FDP movement.

Immediate Passive Flexion Protocols Following Flexor Tendon Repair

	Early Phase	Intermediate Phase	Late Phase
Static positioning orthosis	Dorsal blocking orthosis • Wrist 20° to 30° flexion • MP joints 50° to 60° flexion • IP joints straight	• Remove orthosis for bathing and exercises	• No protective orthosis • Add night extension orthotic if loss of extension
Elastic traction orthosis	• Same as static positioning orthosis, but add the following: • Elastic traction to fingertips during day	• Remove elastic traction from fingertips • Remove orthosis for bathing and exercises	• No protective orthosis • Add night extension orthosis if loss of extension
Exercises	• Passive flexion • Active IP extension in orthosis	Remove orthosis, and add the following: • Wrist tenodesis • Place and active hold digital flexion • Gentle active digital flexion • Finger extension with wrist flexed, gradually bring wrist to neutral • Assess tendon gliding • If adherent, add gentle blocking and tendon gliding	Add the following: • Finger extension with wrist neutral, gradually extend wrist • Light resistance if adherent; if minimal adhesions, delay resistance until 8 to 12 weeks • Passive IP extension if needed

Immediate Passive Flexion

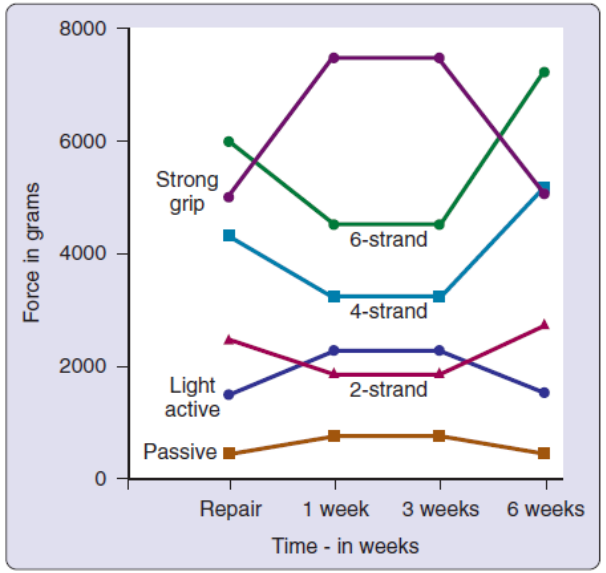


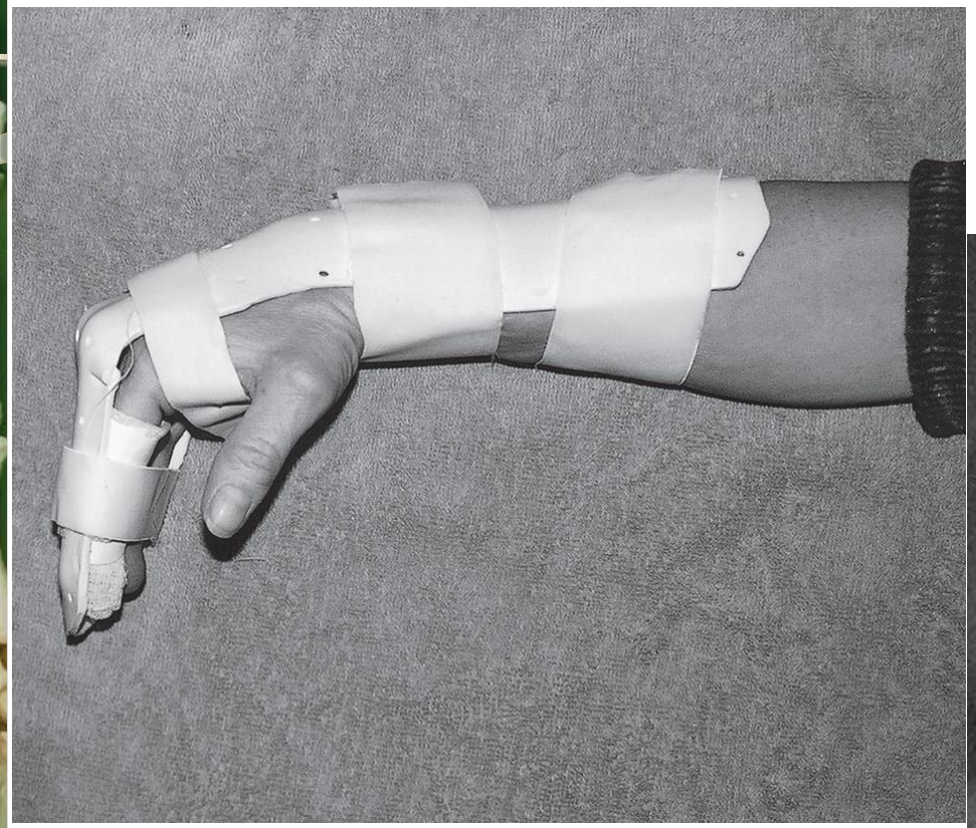
A, Place exercises for digital flexion. **B,** Hold exercises for digital flexion.

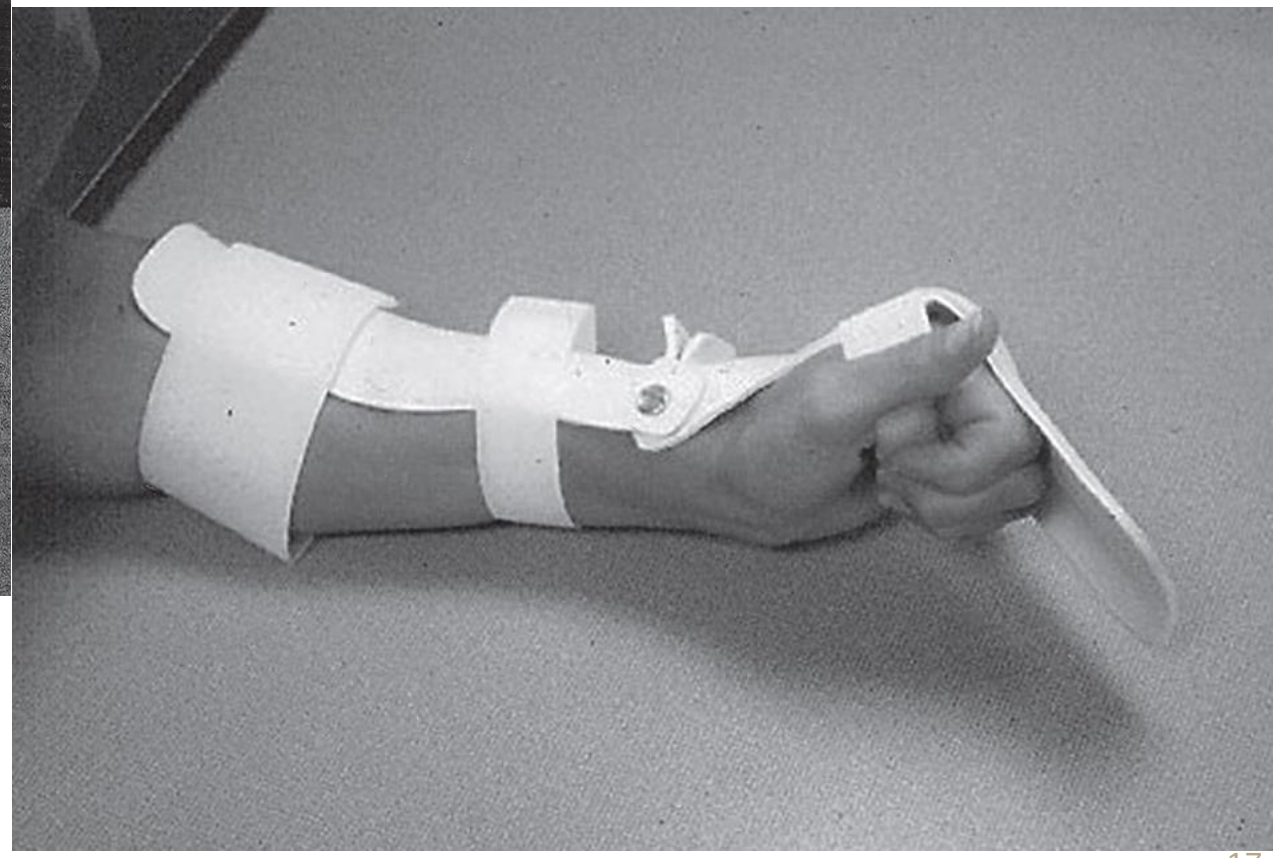
Immediate Active Flexion Protocols Following Flexor Tendon Repair

	Early Phase	Intermediate Phase	Late Phase
Orthosis options	• Wrist tenodesis orthosis and static dorsal blocking orthosis • Dorsal blocking orthosis wrist neutral, with or without elastic traction	• Continue orthosis wear to 6 weeks; if elastic traction was used, discontinue at 4 weeks	• No orthosis, or hand-based dorsal blocking orthosis during heavy activities, work • Dynamic IP extension orthosis after 8 to 10 weeks if IP flexion contracture exists

Exercises	• Wrist tenodesis
	• Passive digital flexion
	• Active IP extension with MP joints flexed
	• Place and active hold in flexion
		• Continue with early phase exercises, add the following:
		  • Gentle active flexion
		  • Straight fist
		  • Composite fist
		  • Blocking if adhesions present
		  • Passive IP extension if needed
			• Continue with intermediate phase exercises, and add the following:
			  • Hook fist
			  • Light gripping at 8 weeks if adhesions present, delay if good to excellent tendon gliding







Classification of Motion Results Following Flexor Tendon Repair

Formula

[(PIP + DIP flexion) – (loss of PIP extension + loss of DIP extension)] ÷ 175 × 100 = % of normal

Classification

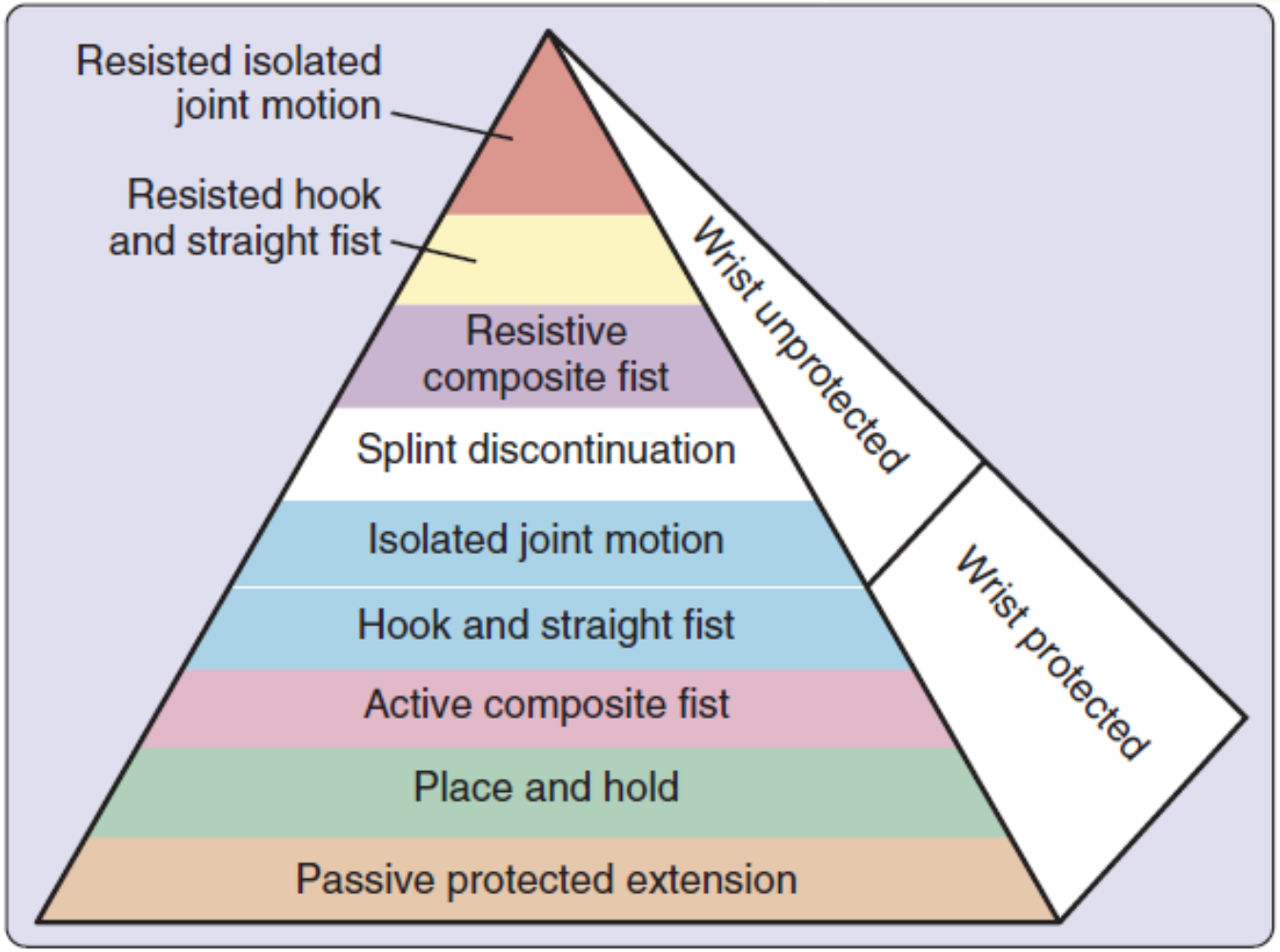
Excellent: 85% to 100%

Good: 70% to 84%

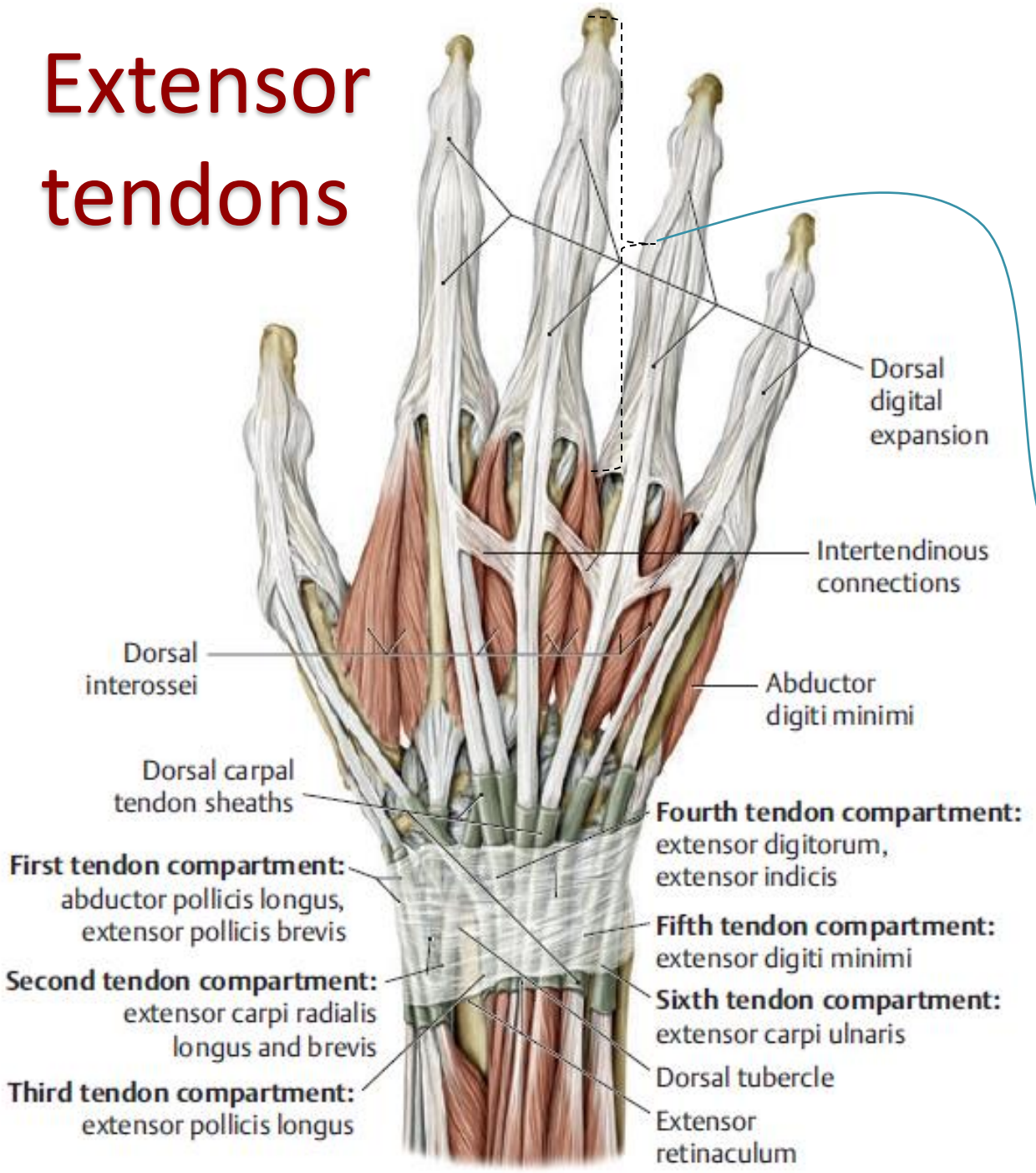
Fair: 50% to 69%

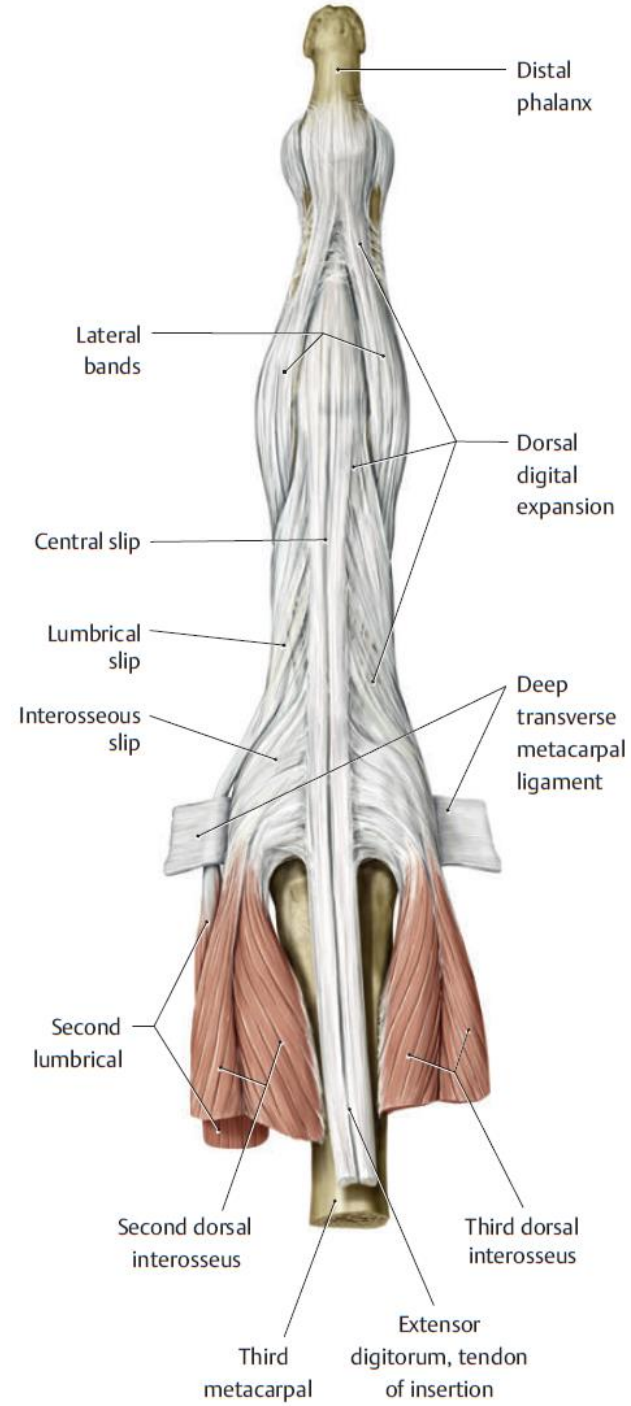
Poor: Less than 50%

Tendon rehabilitation pyramid



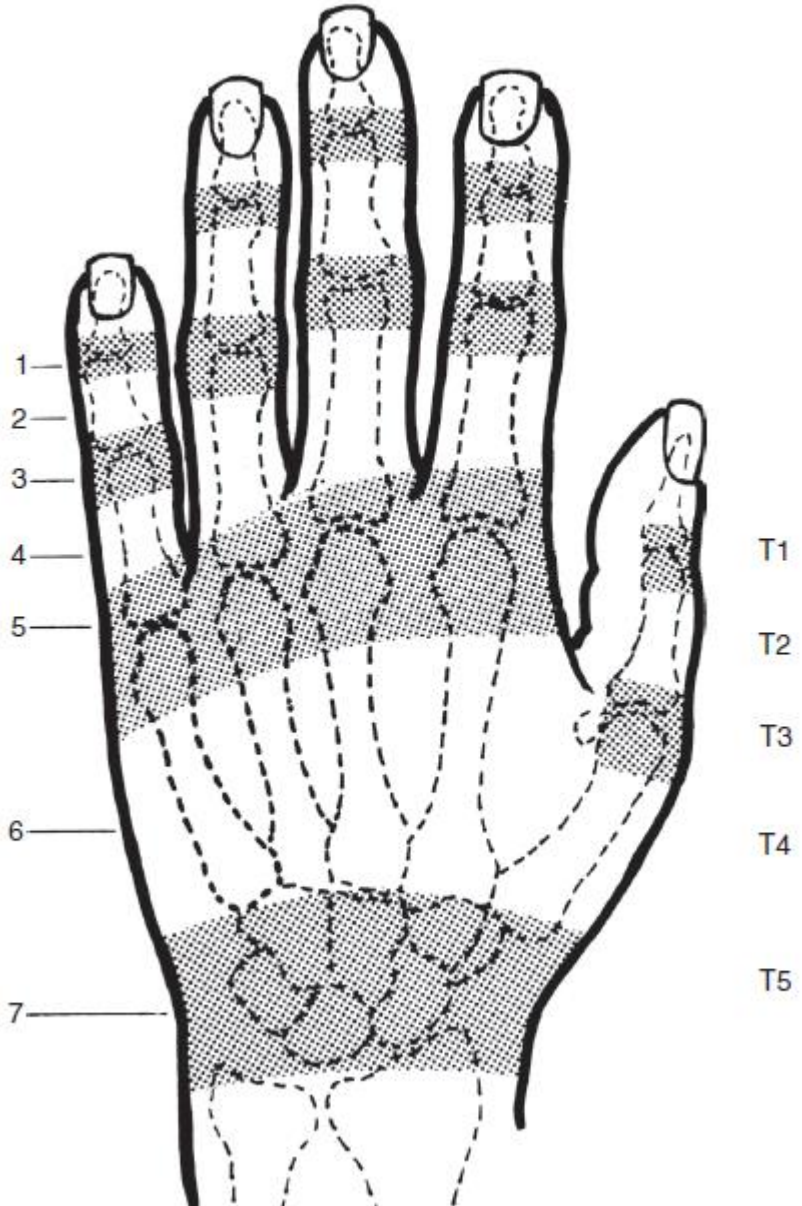
Extensor tendons





EXTENSOR ZONES

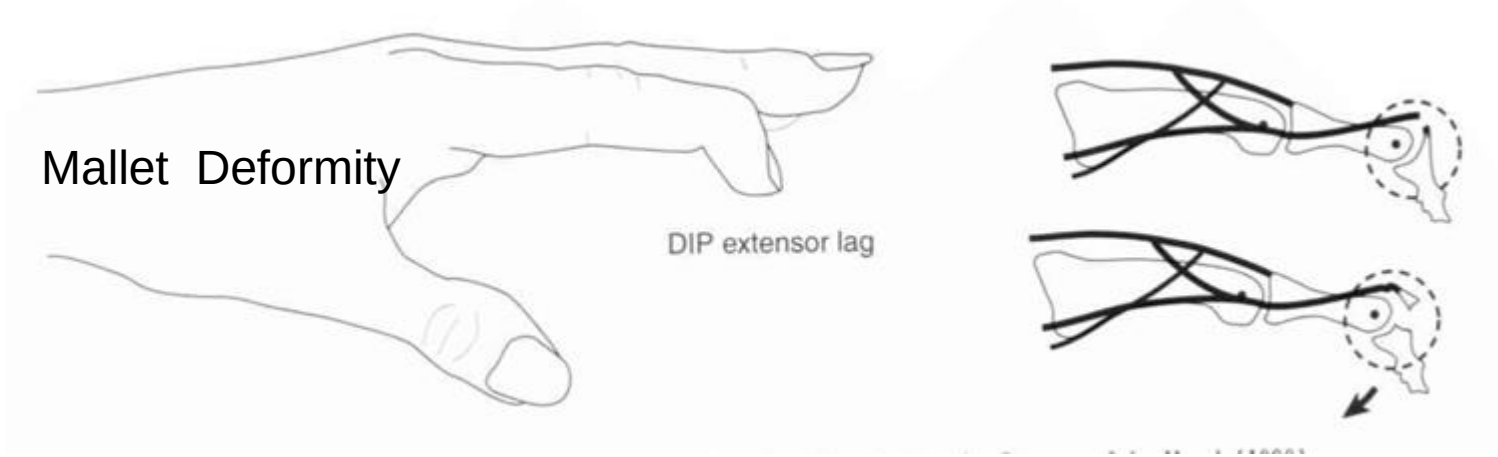
- 1- distal interphalangeal joint
- 2 - middle phalanx
- 3 - proximal interphalangeal joint
- 4 - proximal phalanx
- 5-metacarpophalangeal joint
- 6 – metacarpal
- 7 – dorsal retinaculum

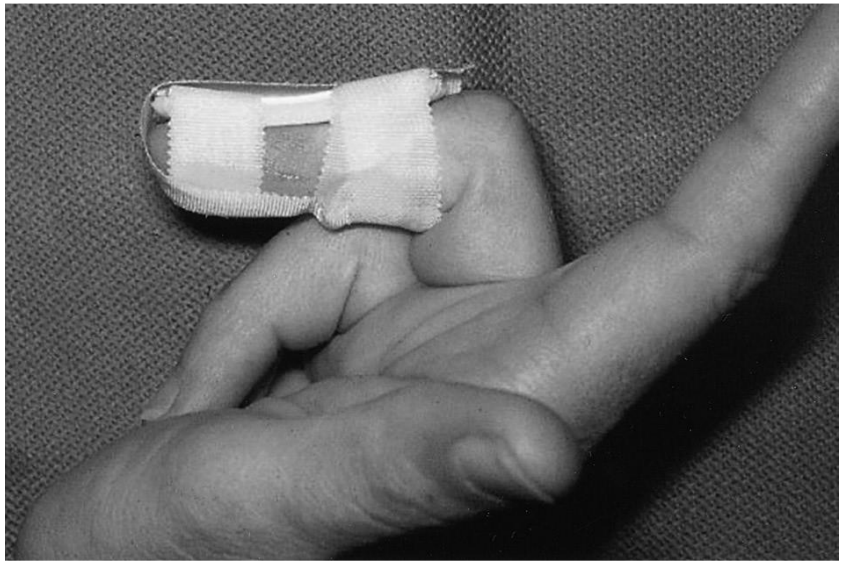


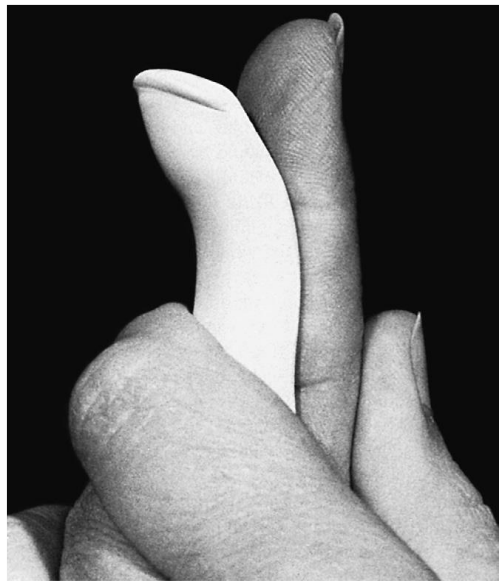
INJURIES

- injury to extensor tendons
- Inability to extend the fingers as in opening the hand.

Zone I and II

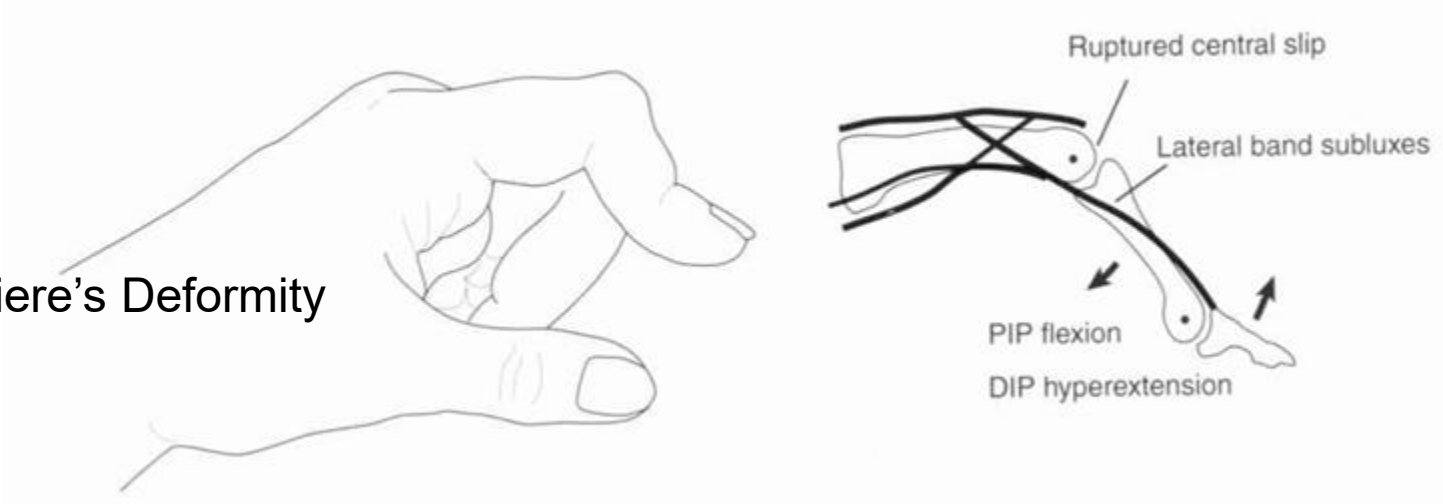


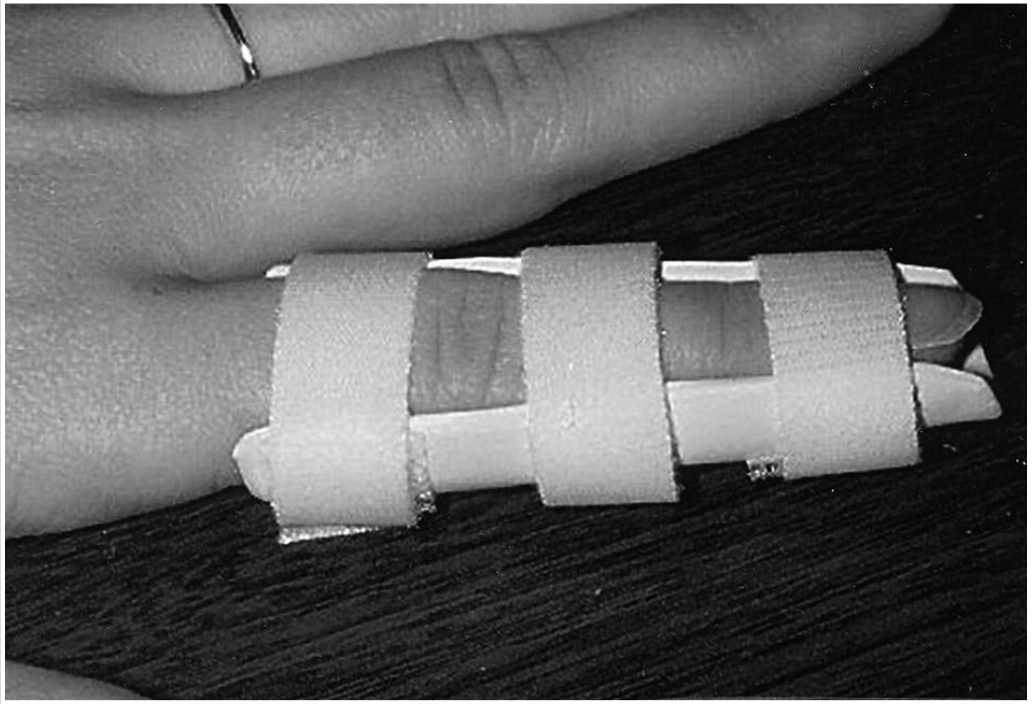


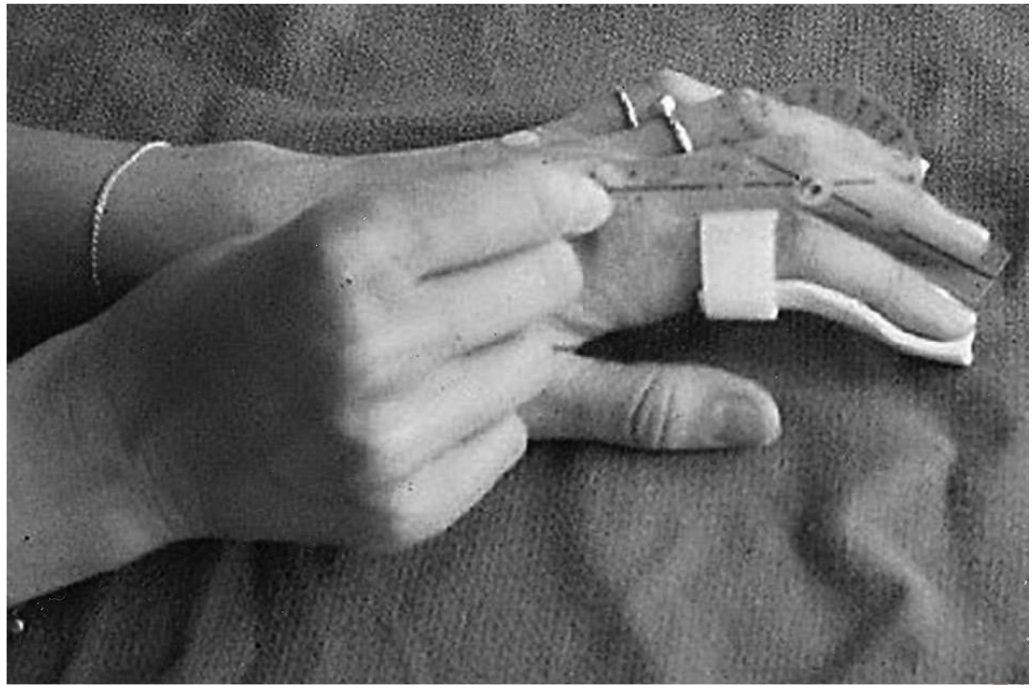


Zone III, IV

Boutonniere's Deformity







zone V to VII.

Full-length resting pan extension orthosis used in an immobilization approach following repair in

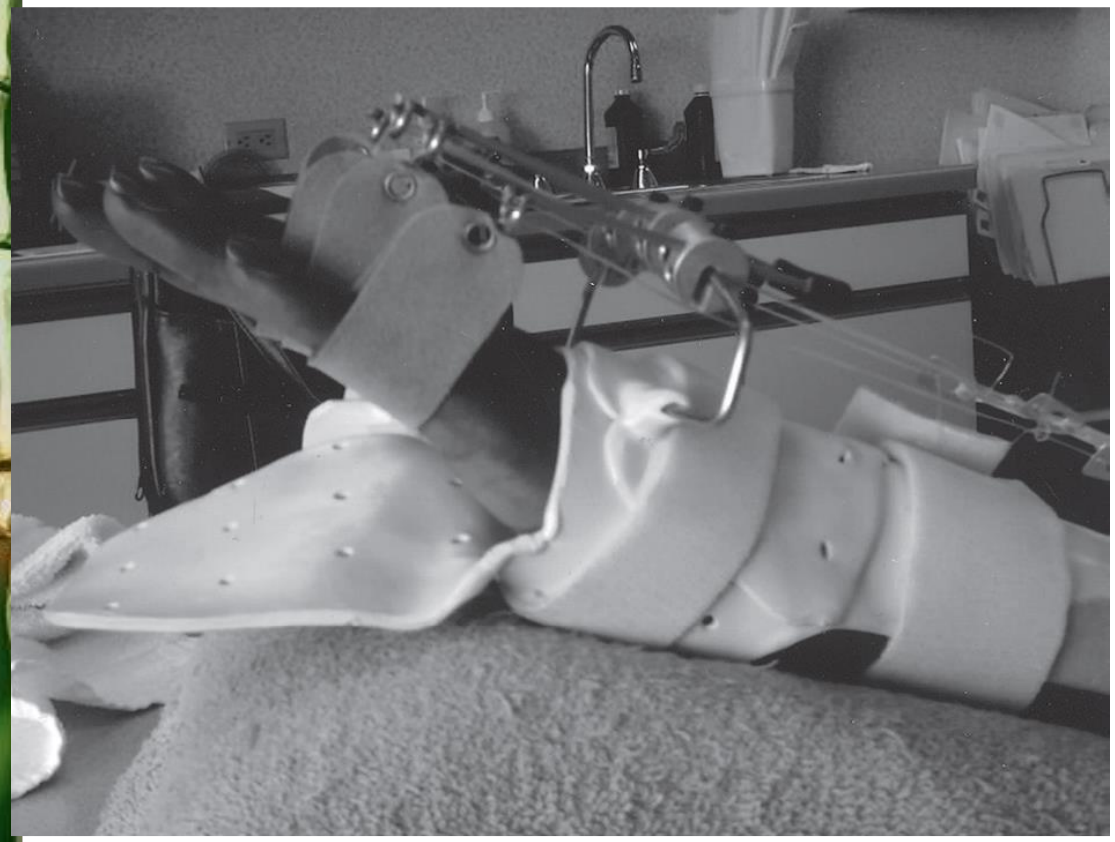
zone V to VII

4 Weeks
• Active ROM exercises are initiated to the wrist and digits out of the splint 10 min/h.
• The splint is continued between exercises and at night.
• Isolated EDC exercises are emphasized, as well as composition flexion and extension.

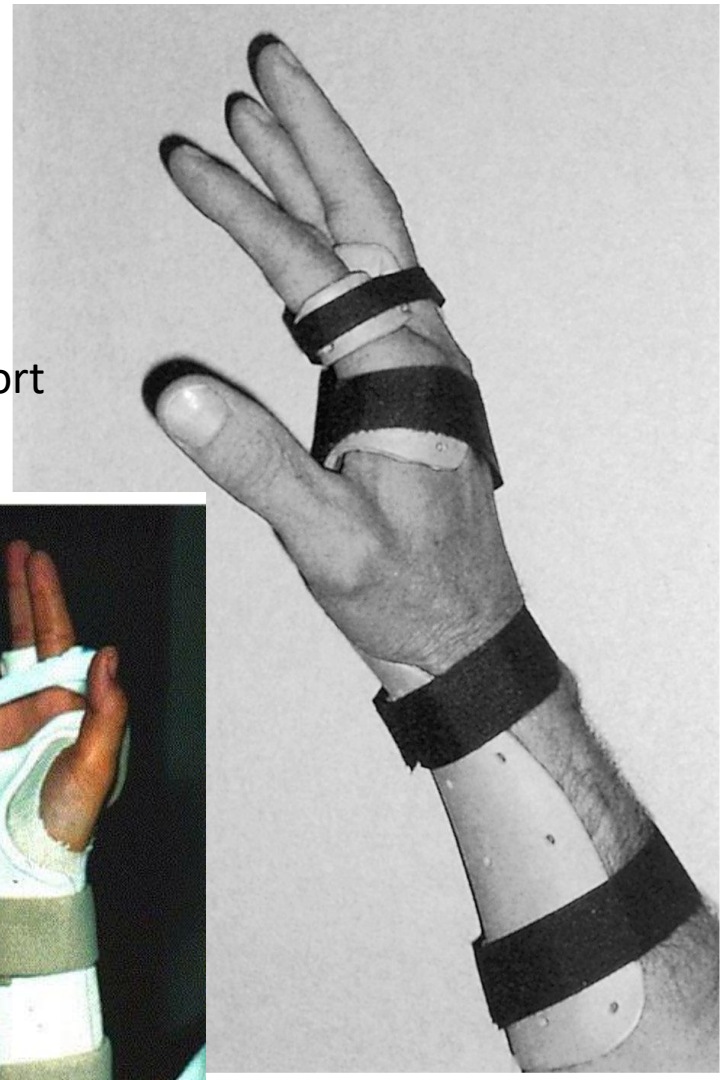
6 Weeks
• Passive flexion exercises are initiated to the wrist and digits.
• Taping and/or dynamic flexion may be initiated PRN to increase passive ROM.
• The splint is continued between exercises and at night.

7–8 Weeks
• The splint is decreased or discontinued if there are minimal extensor lags (≤15°).
• Gentle, progressive strengthening may be initiated for both flexors and extensors.
◦ *Note* : Hold on splinting if extensor lags 25° are present. If the MP extensor lags are greater than 20° it is recommended to decrease exercise sessions to 4–6 times a day.

Dynamic metacarpophalangeal (MP) extension outrigger allowing 30° MP flexion



Immediate controlled active motion (ICAM) orthosis using wrist support and yoke.



THANK YOU