EXTENSOR TENDON REPAIRS, RELEASES, RECONSTRUCTION, & REHABILITATION

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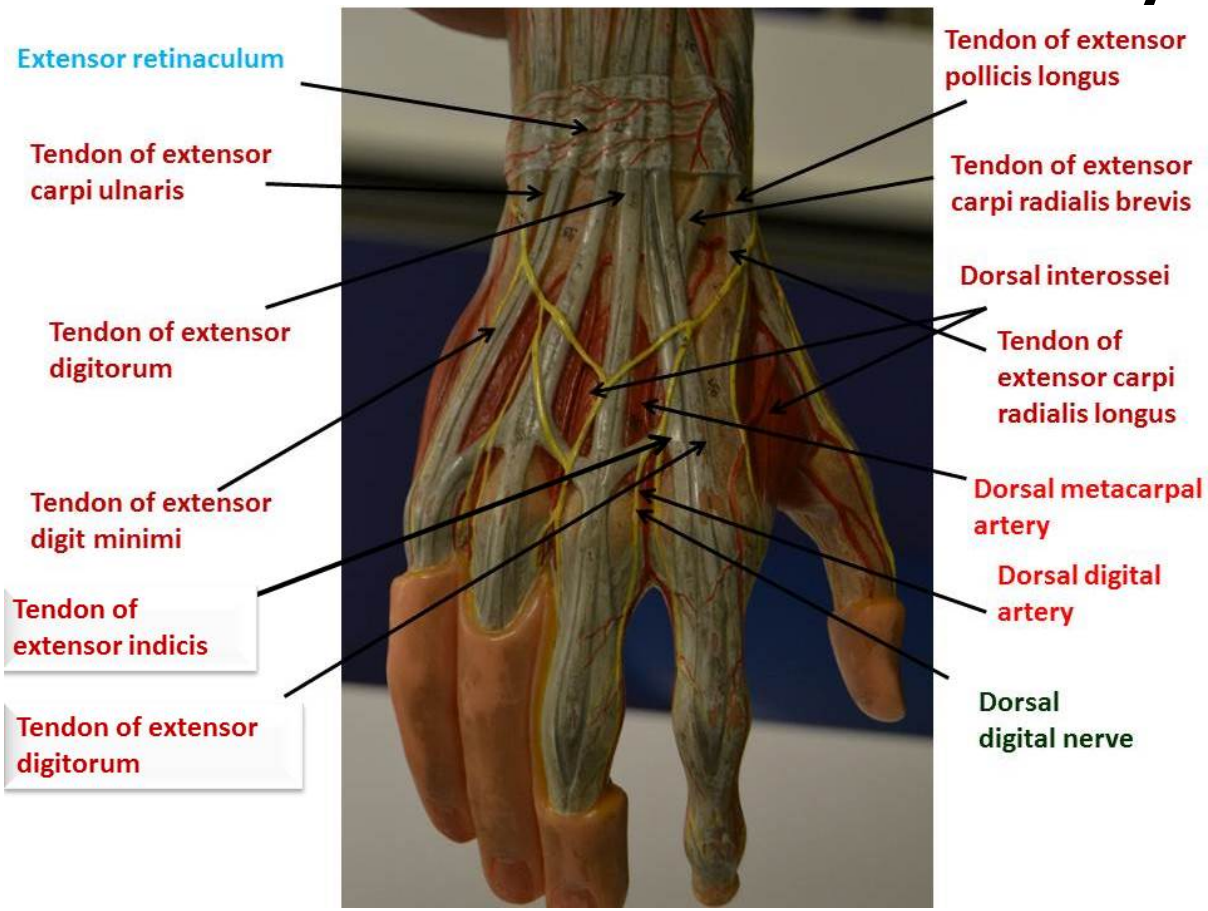
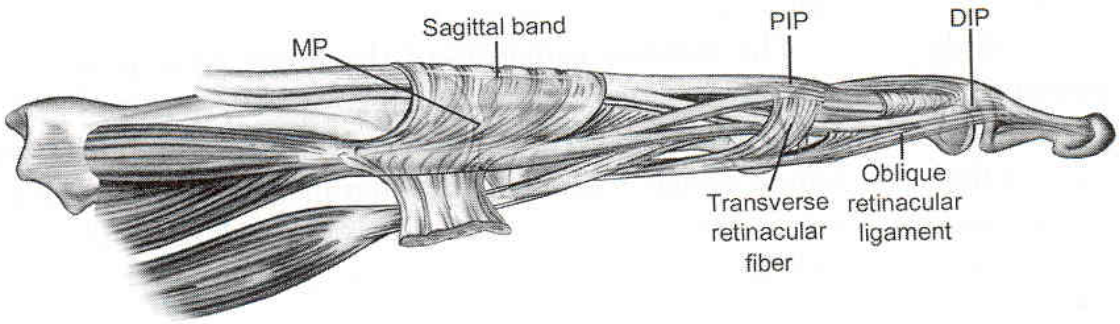
ASHT International Committee Virtual Education Webinar
September 6, 2025

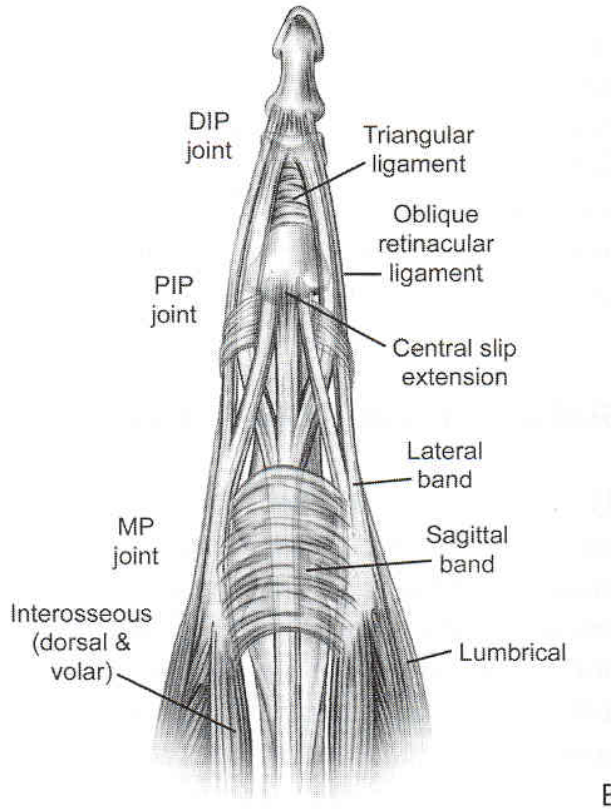
Therapy Management of Acute Extensor Lacerations

Extensor Tendon Anatomy



Extensor Mechanism





Extensor Tendon Zones

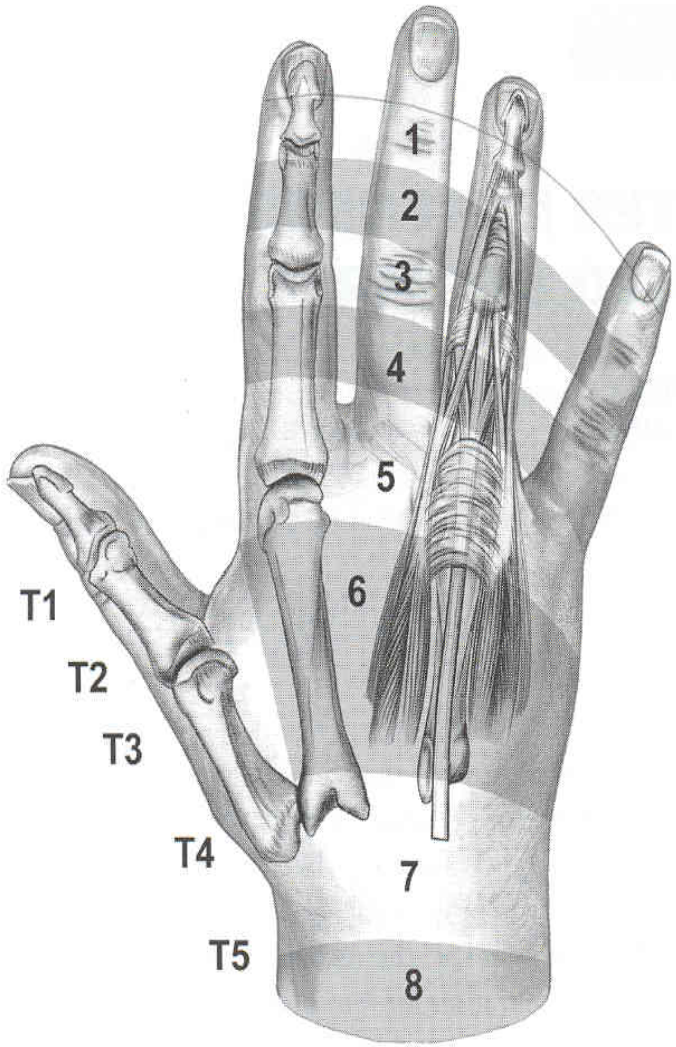
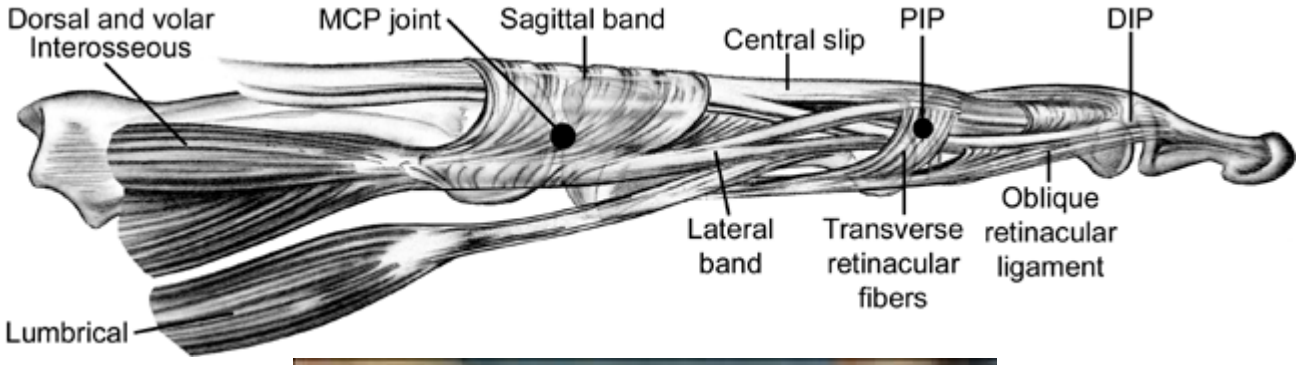


FIGURE 1. Extensor tendon zones as defined by the Committee on Tendon Injuries for the International Federation of the Society for Surgery of the Hand. (From Kleinert HE, Verdan C. Report of the committee on tendon injuries. *J Hand Surg* 1983;8A:794–798, with permission.)

- Zone I: DIP
- Zone II: Middle phalanx (P2)
- Zone III: PIP
- Zone IV: Proximal phalanx (P1)
- Zone V: MP
- Zone VI: Metacarpals
- Zone VII: Extensor retinaculum
- Zone VIII: distal forearm
- Zone IX: musculotendinous junction

Zone V: MP Joint



Juncturae Tendinum

- Broad intertendinous connections
- Connect RF to MF/SF
- Assist extension of adjacent digit by transferring forces during extension
- Laceration of an ET proximally to JT can mask the injury

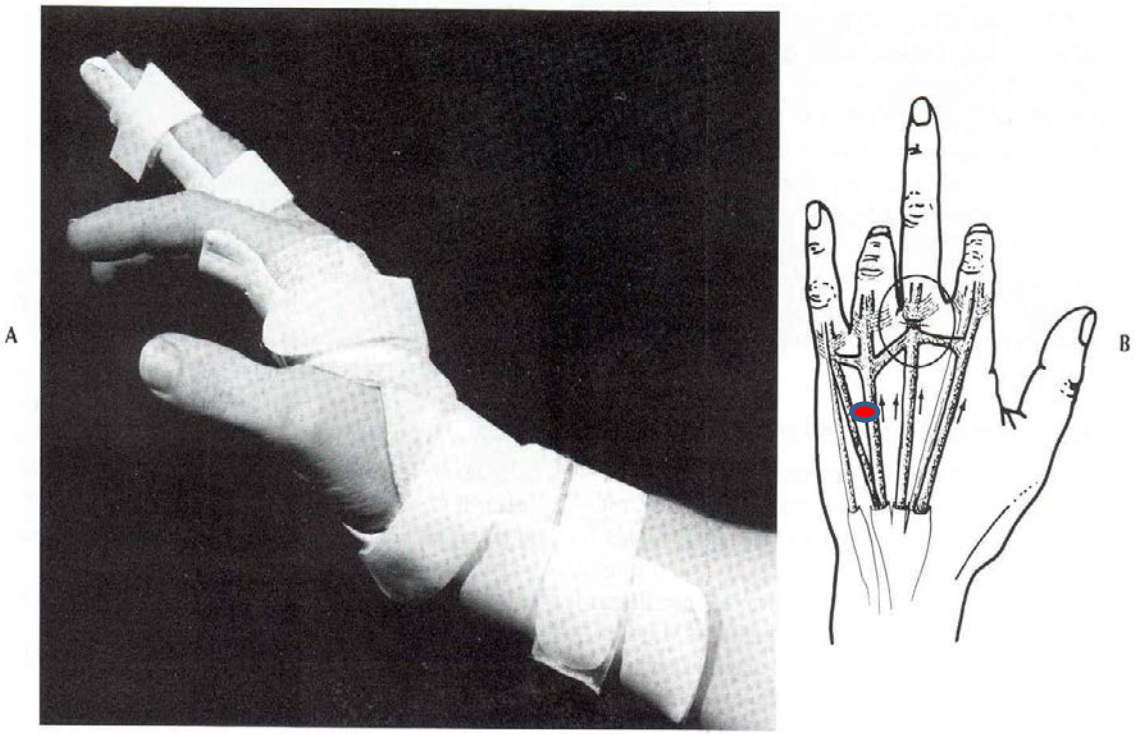


Fig. 32-20. A, Repair to the extensor digitorum communis distal to the juncturae in the long finger can be adequately protected with splinting that rests the long MP joint at 0 degrees and adjacent MP joints at 30 degrees of flexion. This position relieves tension at the repair site while maintaining some extensibility of the collateral ligaments of the uninvolved fingers. **B**, Tension can be reduced on the anastomosis of the extensor digitorum communis when the repair site is distal to the juncturae tendinum if the adjacent fingers are held in mild flexion. This position advances the proximal end of the severed tendon by a force of the intertendinous connection. (Redrawn with permission from Beasley RW: *Hand injuries*, Philadelphia, 1981, WB Saunders.)

Protocols = Guidelines

- Types of Protocols
  - Static immobilization
    - Used for young, cognitively impaired or uncooperative patients
  - Early Controlled Mobilization
    - Used for zones III-VIII
  - Early Active Mobilization
    - Used for zones III-VIII

It is much easier to prevent an extension lag than it is to fix one!

- **The emphasis in therapy for *all* zones of injury is on maintaining extension while making gradual gains in flexion.**

Work capacity

TABLE 2-1 Work Capacity of Muscles

Muscle	Mkg
Flexor carpi radialis	0.8
Extensor carpi radialis longus	1.1
Extensor carpi radialis brevis	0.9
Extensor carpi ulnaris	1.1
Abductor pollicis longus	0.1
Flexor pollicis longus	1.2
Flexor digitorum profundus	4.5
Flexor digitorum superficialis	4.8
Brachioradialis	1.9
Flexor carpi ulnaris	2.0
Pronator teres	1.2
Palmaris longus	0.1
Extensor pollicis longus	0.1
Extensor digitorum communis	1.7

From Von Lanz T, Wachsmuth W: Praktische anatomie. In Boyes JH: *Bunnell's surgery of the hand*, ed 5, Lippincott, 1970, Philadelphia.

- Flexors are 3-4 times stronger than the extensors
- Emphasize gradual gains in flexion while ***maintaining*** extension

Beware of the patient with that far away look in his eye

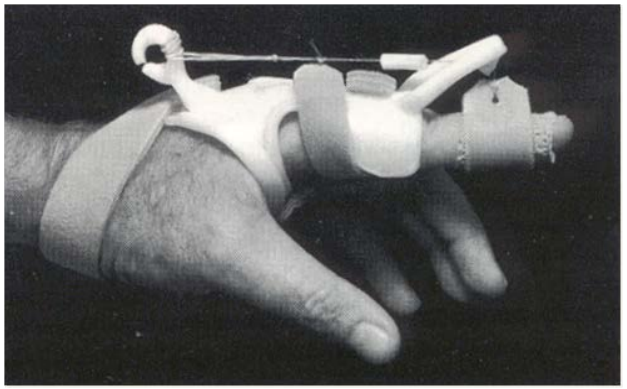
Compliance

Rehabilitation Zones III-IV

- Conservative management
  - PIP joint immobilization at 0° extension 6-8 weeks
  - Initiate AROM at 6-8 weeks
  - Orthosis use in between exercises and PM
  - Gradually increase flexion activities while monitoring extension lag
  - D/C of orthosis determined by AROM and response to exercise/functional use of hand

Rehabilitation zones III,IV

- Early Controlled Passive Mobilization
  - Thomes and Thomes used a hand based orthosis (*Thomes, 1995 JHT)*
    - Allows 30° PIP flexion the first week in the orthosis
    - Adds 10° / week for the next 3 weeks when the orthosis is discontinued
  - Walsh (*Walsh et al., 1994 JHT)*
  - used a hand based orthosis
    - Allows PIP joint 30° flexion for the first 3 weeks, then orthosis is discontinued



- Relative Motion Flexion orthosis blocking MP in slight flexion to facilitate IP ext through Interossei and lumbrical. (**not the standard of care for acute repairs)**
- This orthosis can be used following D/C of the dynamic orthosis to help decrease extension lag if present.

Early Short Arc Motion of the Repaired Central Slip *Evans JHS 1994*

Results	Group I Immobilization	Group II SAM	Statistical Significance or t-Test	
Mean day injury to D/C	76.07	51.38	<0.001	S
PIP ext lag 1st Motion day	13°	3°	<0.001	S
PIP ext lag at D/C	**8.13°**	**2.96°**	**<0.01**	S
PIP motion at 6 wks	**44°**	**88°**	**<0.001**	S
PIP motion D/C	**72°**	**88°**	**<0.01**	S
TAM at D/C	**110.7°**	**131.5°**	<0.01	S
DIP motion D/C	37.63	45	<0.01	S

Early Active Short Arc Motion Following Central Slip Repair John A. McAuliffe, MD JHS Jan 2011 V36 issue 1

Rehabilitation

- Short arc motion (SAM)
  - ***Evans JHS Nov 1994***
- PIP and DIP immobilized at 0˚ extension between exercise
  - Template with 30˚ PIP and 20˚ DIP flexion
  - Finger flexion to the template with active extension to 0˚
  - 10-20 reps every 1-2 hours
  - Template progressed weekly

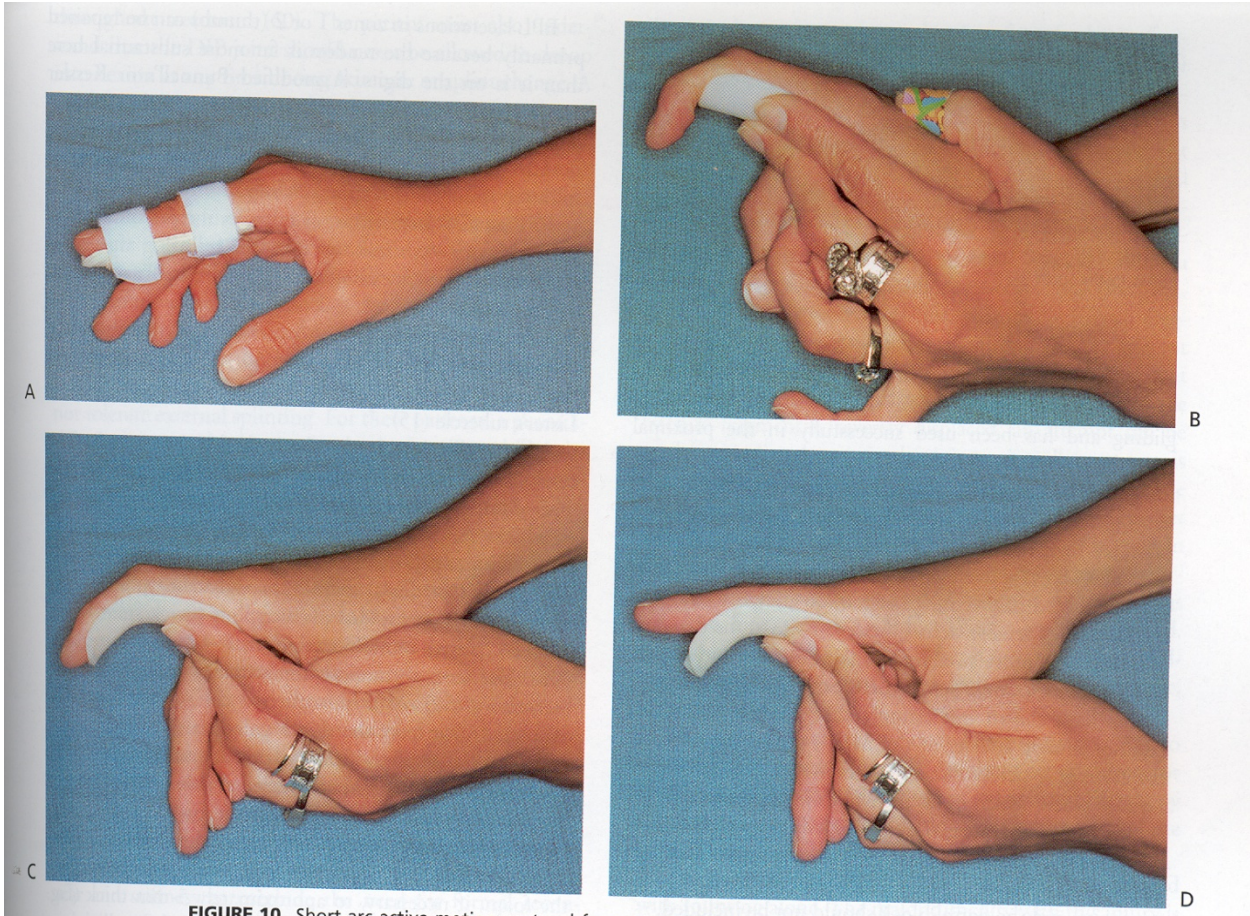


FIGURE 10. Short-arc active motion protocol for extensor injuries in zones 3 and 4. **A:** Resting splint. **B:** Distal interphalangeal exercises, holding the proximal interphalangeal (PIP) in full extension. This facilitates lateral band gliding, so that they remain in their normal position and can continue to contribute to PIP extension. **C:** Active flexion of the distal interphalangeal and PIP to the position that is molded by the splint. **D:** Active extension to 0 degrees.

Radians

Yikes!!

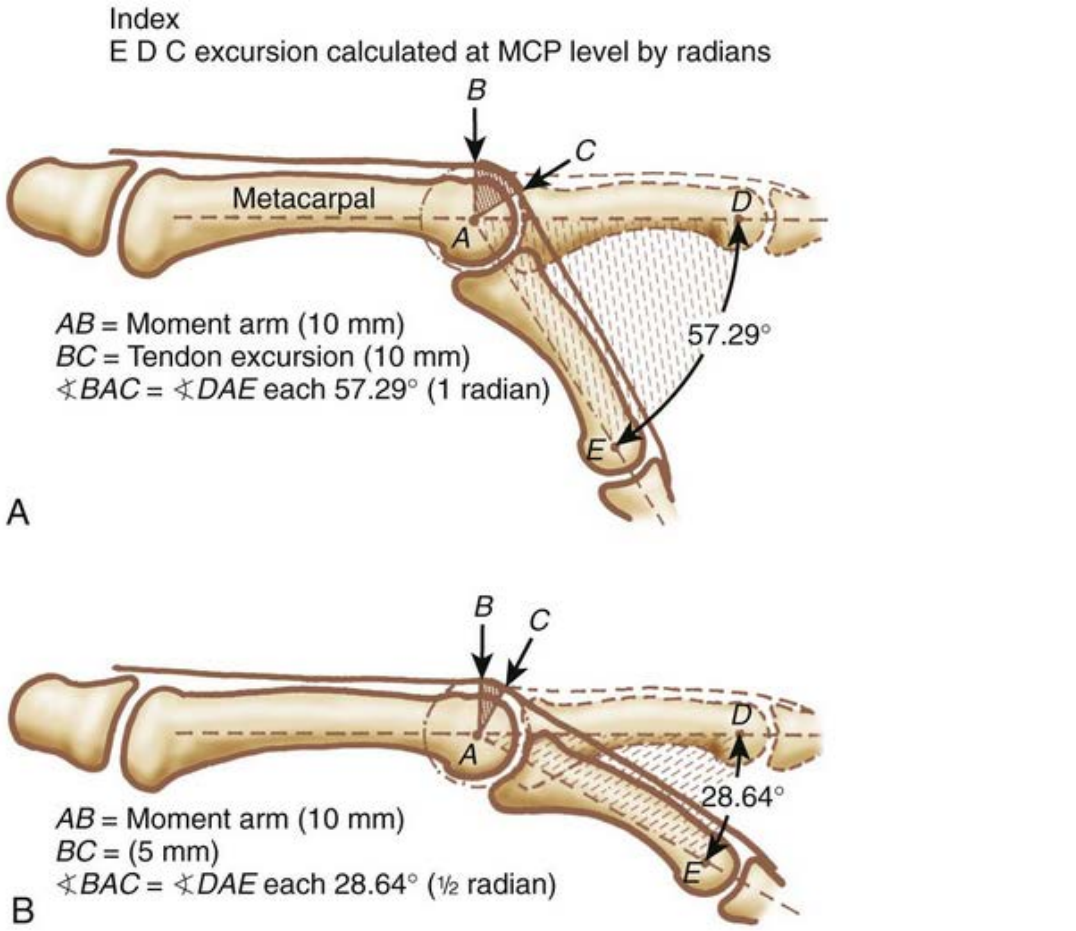


FIGURE 39-4 **A,** If the head of the metacarpal is considered in terms of a circle, the mo…

Based on intra-operative, cadaver and clinical studies of Evans and Burkhalter

MPJ: IF/MF 30º, RF/SF 40º create 3-5 mm glide in ZONE V

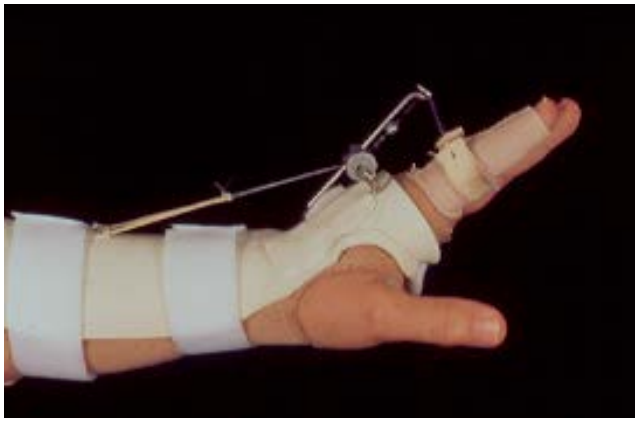
Zone V-VII
Conservative Management

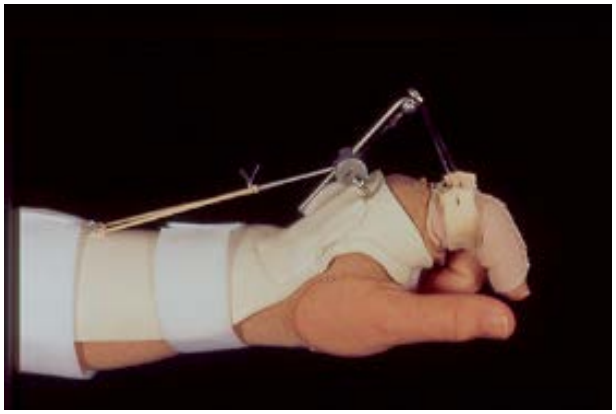
- Zone V
  - Wrist 30^{o} extension
  - MPs 0-20° flexion
  - IP's neutral or can be free with MP's neutral
- Zone VI-VII
  - Wrist in 30-40° extension

Minamikawa Y, et al: Wrist position and extensor tendon amplitude following repair *JHS17:268–271, 1992*

Zone V-VII:
Immediate Passive Flexion/Active Extension

- Dynamic extension splint
  - Volar block/stop allowing 30° MP flexion
- *Evans & Thompson, 1993*
  1. Passive wrist extension,
     MPs relax to 40°
  1. Passive digit extension,
     wrist relaxes to
     - 0° to 20° flexion (Zones V-VI)
     - 10° extension (Zone VII)
     - 20° extension if wrist extensors are repaired





Rehabilitation

- Initiate AROM carefully
  - MP flexion with IPs extended
  - “Hook fist”: PIP/DIP flexion with MP extension
  - Progress to composite digital AROM after 4 weeks
  - Progress to composite wrist and digital flexion at 5 weeks
  - Monitor extensor lags closely
  - Timely initiation of scar management

Immediate Controlled Active Motion Following Zone 4–7 Extensor Tendon Repair] Howell, Merritt, Robinson J HAND THER. 2005;18:182–190.

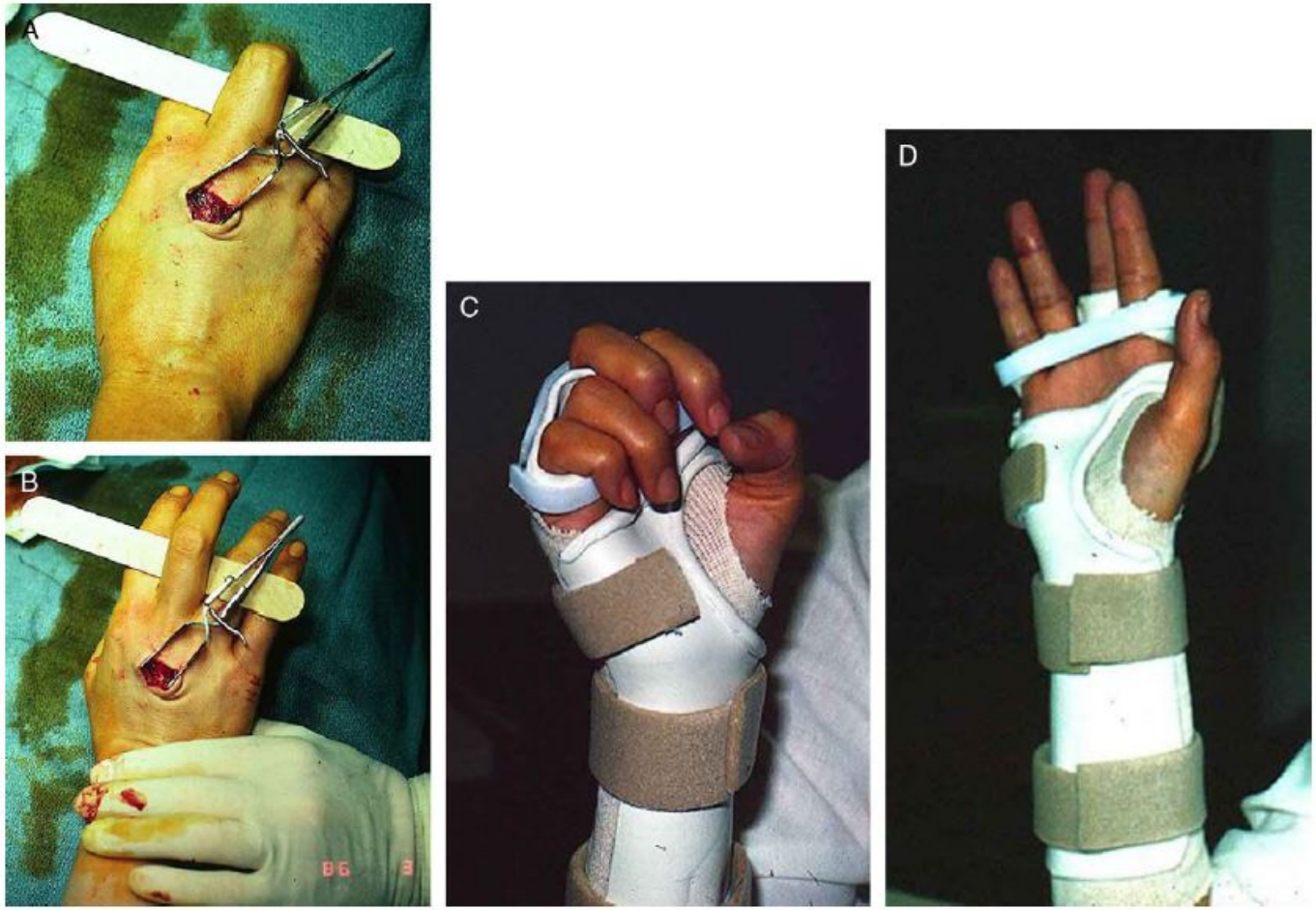


FIGURE 3. ICAM intraoperative patient trials with breakaway suture in zone 5 EDC laceration of the long finger. (A) The patient is actively flexing-extending the digits and tension on the suture is observed with simulated yoke and the wrist positioned in neutral. (B) The patient is actively flexing-extending the digits and less suture tension observed with the simulated yoke and the wrist positioned in 20 to 25 degrees of extension. (C) The patient demonstrates immediate postoperative controlled active flexion within the ICAM splint. (D) The patient demonstrates immediate postoperative controlled active extension within the ICAM splint.

Relative Motion Splint: Active Motion After Extensor Tendon Injury and Repair

Wyndell H. Merritt, MD

The relative motion splint was initially developed to facilitate postoperative rehabilitation after repair of extensor tendon injuries at the dorsum of the hand and forearm. It has subsequently been used for rehabilitation of sagittal band injuries and after repair of closed attrition extensor tendon ruptures in rheumatoid arthritis. This is much less awkward than other braces and can readily be worn during normal past-time and work activities. This so-called immediate controlled active motion splinting protocol has also more recently been applied to both operative and nonsurgical rehabilitation for boutonniere deformity. *(J Hand Surg Am. 2014;39(6):1187–1194.*

Key words Tendon therapy, extensor tendon, laceration, boutonniere, sagittal band.

Additional material is available online.

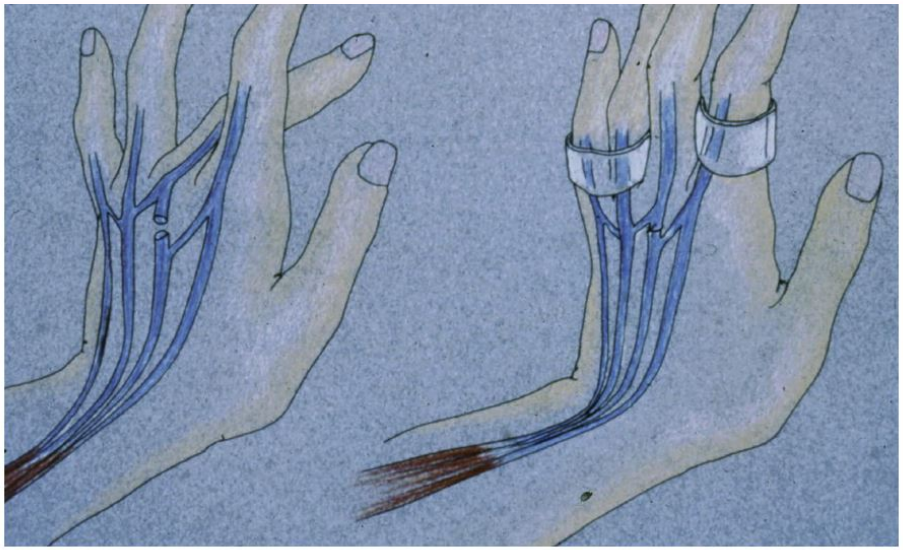
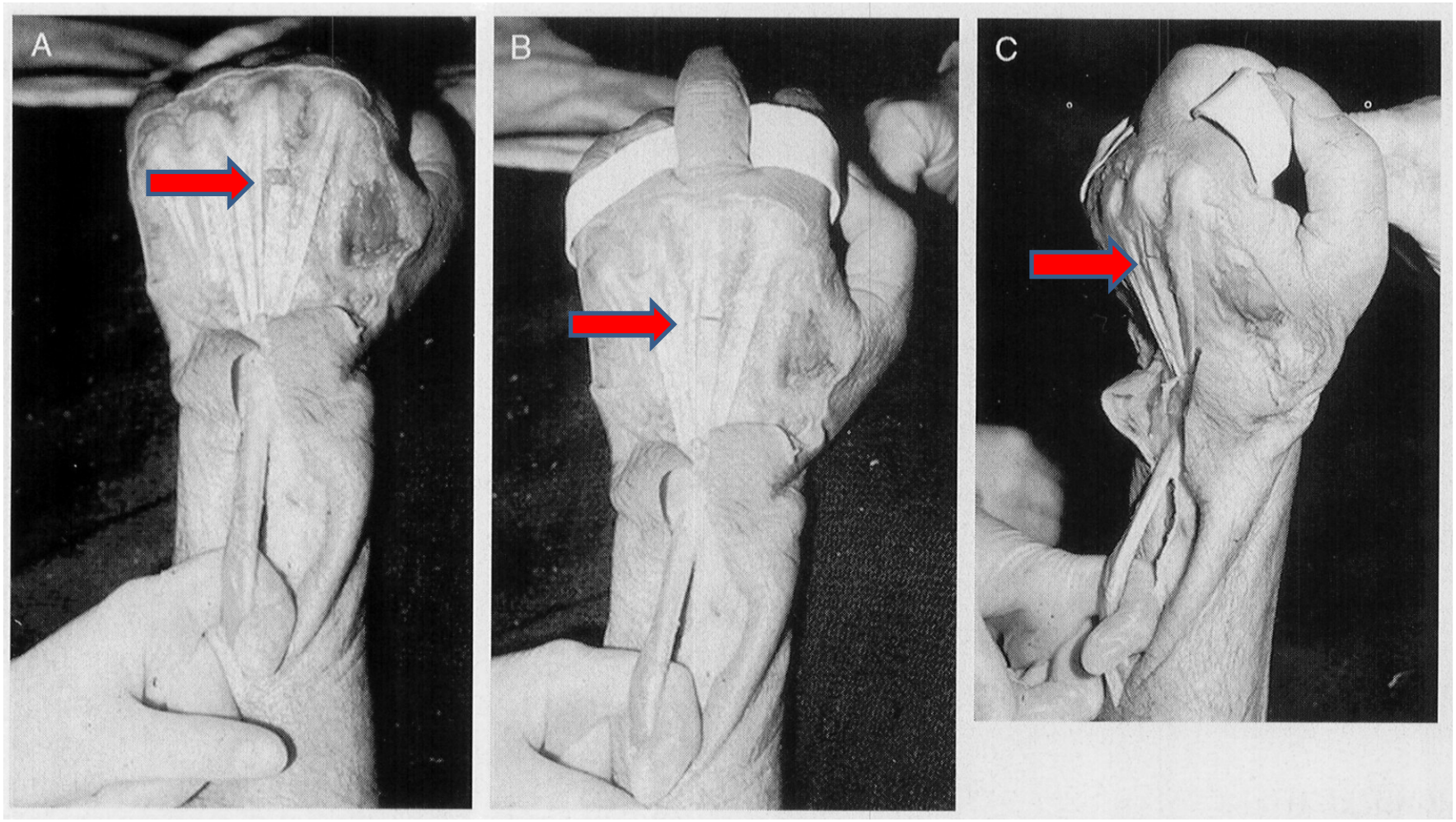


FIGURE 1: Because of the 1-motor system, a relative motion extension splint relaxes the repair regardless of the MCP and IP joint positions.

Immediate Controlled Active Motion (ICAM)

- Concept based on “relative motion” of the MP joint
- Wrist placed at 20-25° extension
- MPs in 15-20° more extension relative to other MP joints


A
B
C

ICAM Protocol

Injured Finger	Index	Middle	Ring	Small
Index	X			X
Middle		X		
Ring		X	X	
Small	X			X

Howell et al J HAND THER. 2005;18:182–190

- Inclusion criteria
  - Injury to at least one but not all extensor tendon(s) in zone 4-7
  - 2 visits in first 10 days
  - 1 visit per week thereafter
- Phase 1
  - 0-21 days post repair
  - Edema and scar management
  - Both splint components worn continuously
  - Use of hand for light ADL
  - Goal: Full active motion within limits of splint

ICAM Protocol

- Phase 2
  - 22-35 days post repair
  - Yoke splint worn at all times
  - Wrist splint removed for active wrist motion
  - Goal: Composite wrist/digit flexion and extension without extensor lag
- Phase 3
  - 36-49 days post repair
  - Wrist splint discarded; yoke or buddy strap worn during activity
  - Yoke splint removed for active digital motion

ICAM Outcomes

- Robinson et al., 1986
  - ASHT Annual Meeting, New Orleans
  - 22 patients
  - ***"full ROM within 5 weeks of surgery, joint stiffness was nonexistent and no patient required a therapy program after removal of the splint"***

- Howell et al., 2005
  - 140 patients
  - No extension lag: 114 patients
  - 5-10° lag: 21 patients
  - 11-44° lag: 5 patients
  - **Average discharge 49 days**
  - **No complications or secondary surgeries**

HAND (2013) 8:17–22
DOI 10.1007/s11552-012-9488-z

MULTIMEDIA ARTICLES

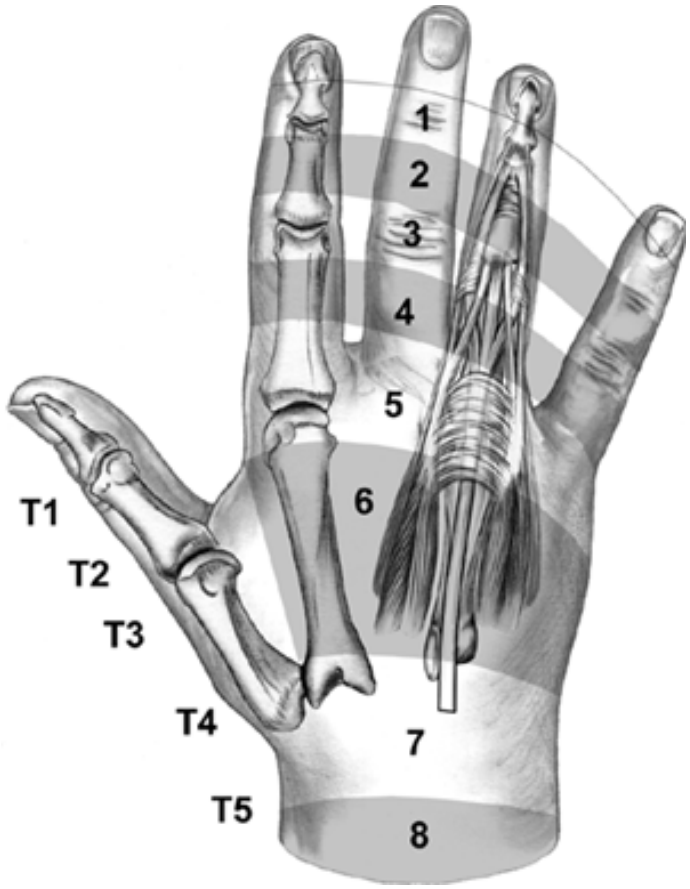
Wyndell merritt immediate controlled active motion (ICAM) protocol following extensor tendon repairs in zone IV–VII: review of literature, orthosis design, and case study—a multimedia article

Mary C. Burns · Brian Derby · Michael W. Neumeister

Published online: 9 January 2013

Fig. 4 "Wyndell Merritt" ICAM digital yoke orthosis for extensor tendon repair. This design will be used for EDC repair to one of the border digits, the index or small finger

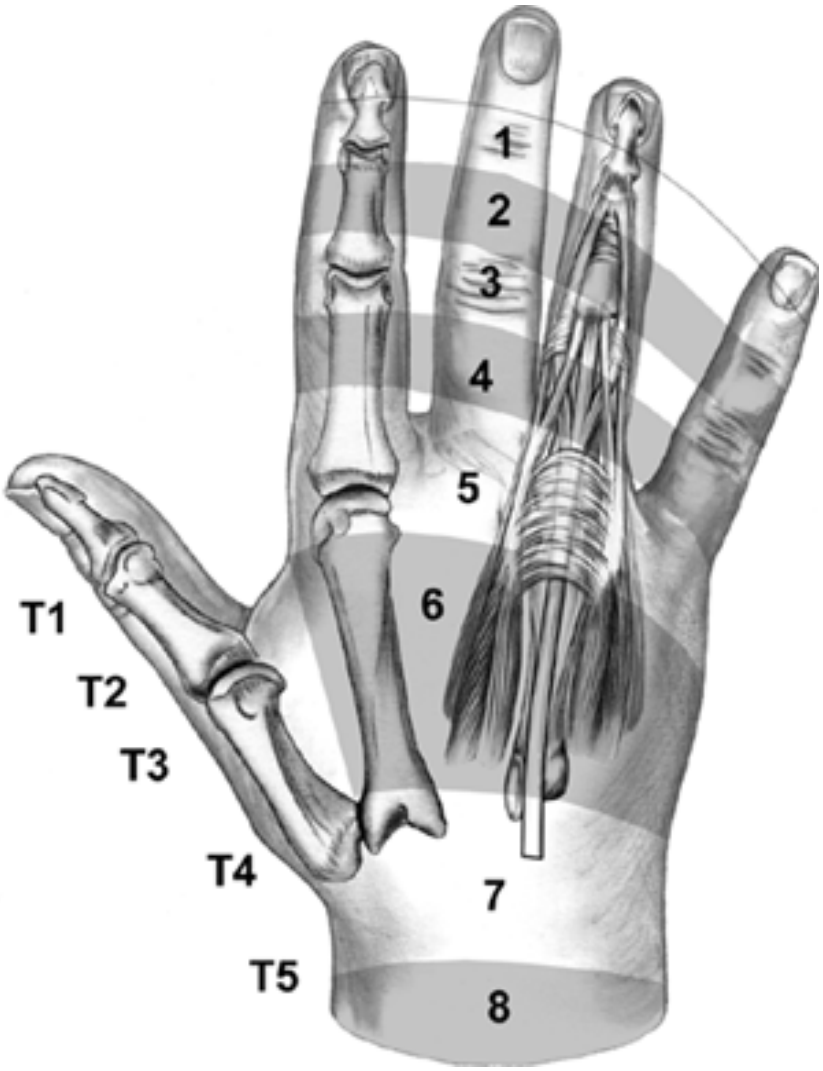
Thumb zones



- T1 – treat similar to mallet if closed, 6-8 wks continuous immobilization; if repaired 5-6 weeks of immobilization
- Always check the amount of MP and IP ext present on the uninjured thumb
- Require 4 more weeks of orthotic use once mobilized
- Gradual increments of flex as long as extension is maintained
- Mild resistive pinch/grip between 6-8 weeks dependent on if a lag is present
- T2 – hand based splint MP/IP at neutral with radial extension
- Short Arc active motion 25-30◦ at 3 wks; continue orthotic use PM and post ex for 6 weeks

Evans RB: Clinical management of extensor tendon injuries in Skirven et al: Rehabilitation of the Hand 6th ed
Evans RB: Managing the Injured Tendon: Current Concepts J Hand Ther: 2012

Thumb zones



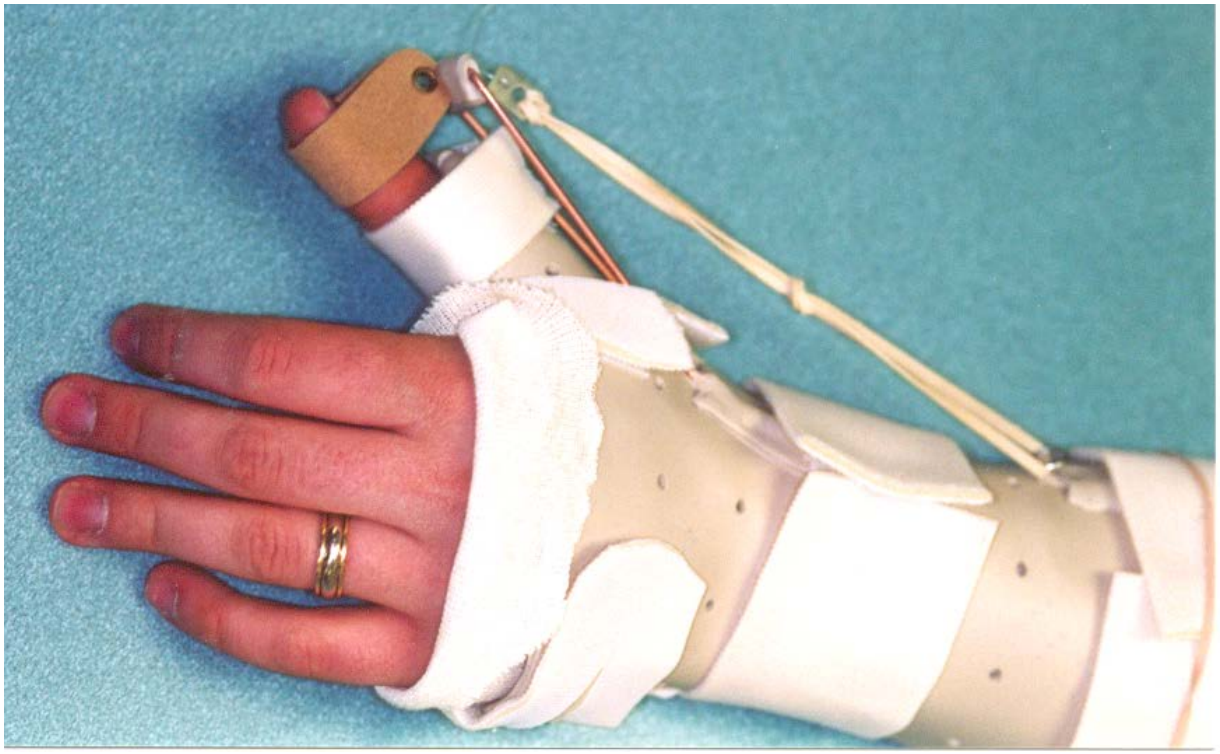
- T3,4 – forearm based splint wrist 30 degrees, MP neutral and slight CMC abduction
- T5 early motion should be considered to prevent dense adhesions at the retinaculum
- Evans and Burkhalter found intraoperatively that with wrist neutral and MP neutral 60◦ IP flex created 3-5 mm glide at Lister's tubercle
- Use dynamic ext orthosis
- Passive motion in therapy of 30◦ MP flex with wrist/IP extended; wrist tenodesis with thumb in ext from full ext to 0◦;

Zone T-5: Conservative Treatment

- Begin gentle motion at 3-4 weeks for conservative treatment.
- Dense adhesions form to the thumb extensors.
  - Tendon at this level is synovial

Early Controlled Passive Motion Protocol: Thumb T5

Thumb IP will need 60° of flexion to achieve 5mm of tendon gliding with wrist in neutral & MP at 0°



Thumb T5: Early Controlled Passive Motion

- 0-3 weeks
  - Dynamic extension splint with wrist in 30-40° extension and MP at 0°
  - A volar block allows 60° of IP flexion with sling returning the IP to 0° between reps and at rest
- 3 weeks
  - Remove volar block to allow IP flexion as tolerated
  - Add active thumb IP extension
- 4-5 weeks
  - Continue dynamic splinting at home
  - In therapy, begin gentle composite flexion/extension of thumb
- 6 weeks (d/c dynamic extension splint
  - Begin PROM to thumb as needed
  - If extensor lag is present, add night extension splinting

Zones V-VII: EPL, EPB, APL

Orthosis – Thumb: EPL

- Wrist 20° extension, CMC RAb, MP/IP 0° ext

Exercise - In clinic:

- Passive wrist extension with thumb supported; IP flexion to 60° (5 mm glide)
- Wrist in 20° flexion, Place/hold IP extension

Orthosis – Thumb: EPB, APL

- Wrist 20° extension, Thumb functional position

The benefits of early active motion on thumb range of motion following extensor pollicis longus tendon repair in zones TIII–TV: A prospective comparison pilot study

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Abstract

Introduction Extensor pollicis longus (EPL) is the most commonly injured extensor tendon in the hand. Following repair of this tendon, whilst early active motion within a volar orthosis is simple and inexpensive, it is not known whether it is more effective at regaining thumb motion than immobilisation.

Methods A prospective comparison pilot study including 20 outpatients with repaired EPL tendon lacerations in zones TIII–TV was undertaken. Participants were non-randomly allocated to either immobilisation group or early active motion. The primary outcome measure was thumb interphalangeal joint active extension–flexion. Secondary outcome measures were metacarphalangeal joint active extension–flexion, composite active thumb opposition and retropulsion, the patient-rated wrist/hand evaluation and return to work.

Results At 8 weeks, the mean between-group differences for interphalangeal joint extension (−10°; 95% CI −1 to −19), metacarphalangeal joint extension (−12°; 95% CI −23 to −0.4) and composite thumb retropulsion as a percentage of uninjured side (42%; 95% CI 3–81) were all clinically important. There were no other significant between-group differences at 6 or 8 weeks, and no ruptures in either group.

Conclusion This pilot comparison study indicated that early active motion has an effect on thumb interphalangeal joint extension, metacarphalangeal joint extension and composite thumb retropulsion by 8 weeks post-operatively. This study lends weight to the need for a properly conducted randomised controlled trial.

Difference in early active group clinically significant at 8 wks for IP and MP extension and thumb retropulsion

No ruptures in either group

Early active motion for EPL Zones TIII-V

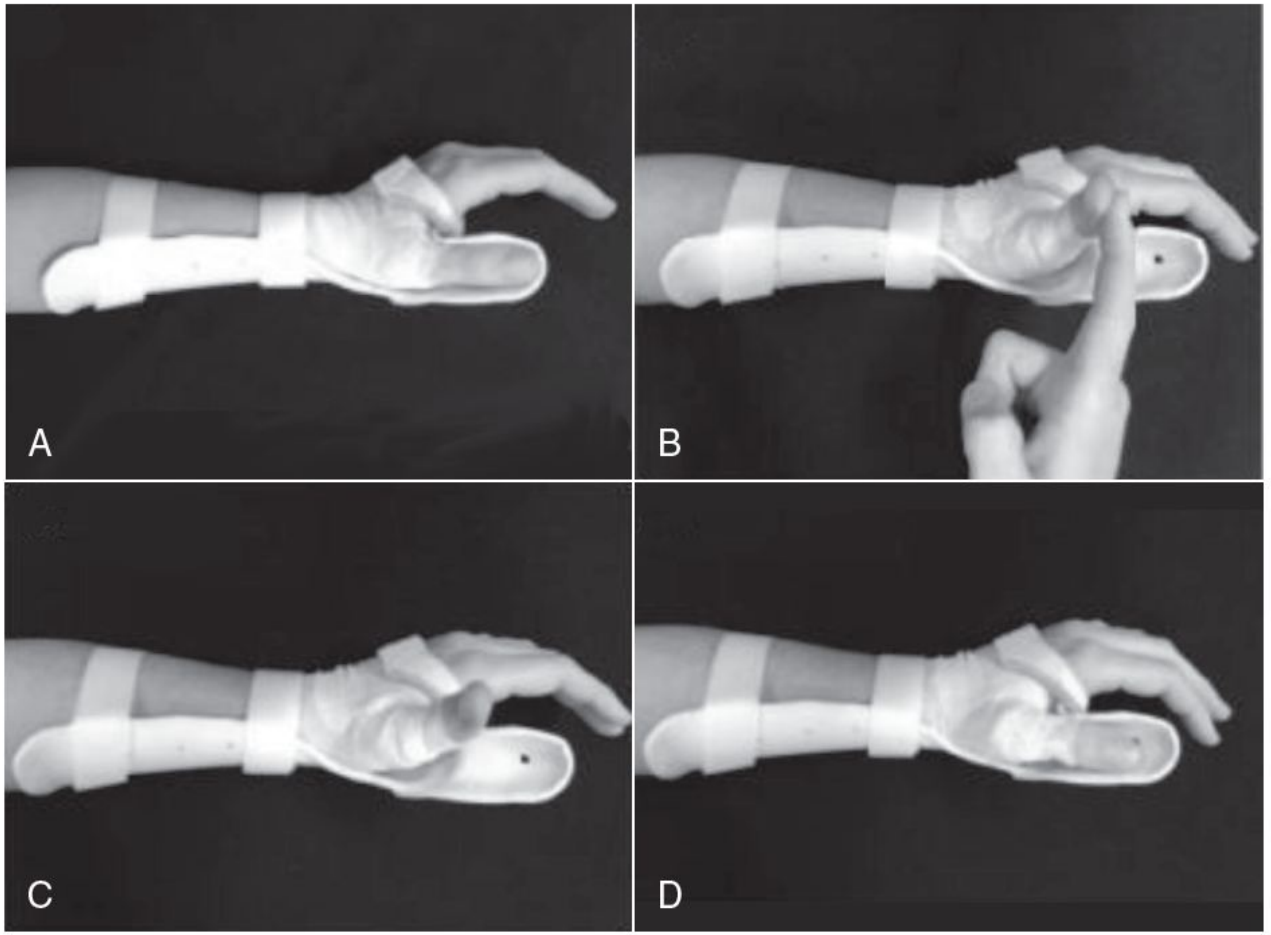


FIGURE 20-13 A, Volar orthosis supporting wrist and thumb in extension. B-D, Early active motion group exercises: (B) early active motion group exercise 1—passive retropulsion from orthosis, (C) early active motion group exercise 2—active retropulsion from orthosis, and (D), early active motion group exercise 3—active interphalangeal (IP) joint flexion. (From Miller L, Crosbie J: The benefits of early active motion on thumb range of motion following extensor pollicis longus tendon repair in zone TIII-TV: A prospective comparison pilot study. Hand Ther 2013;18:2013.)

Evaluating outcomes

TABLE 20-1 Miller's Classification of Results

Results	Total Extensor Lag (Degrees)	Total Flexion Loss (Degrees)
Excellent	0	0
Good	≤10	≤20
Fair	11-45	21-45
Poor	≥45	≥45

From Miller H: Surg Gynecol Obstet 1942;75:693-698.

Outcomes of Extensor Tendon repair
Newport, Blair et al JHS Nov 1990

- % of digits losing flexion > % losing extension
- More distal zones have significantly > number of poor results (I-IV)
- Zone V: 83% Good – Excellent
  - When associated with a fracture results dropped to 50% (G-E)

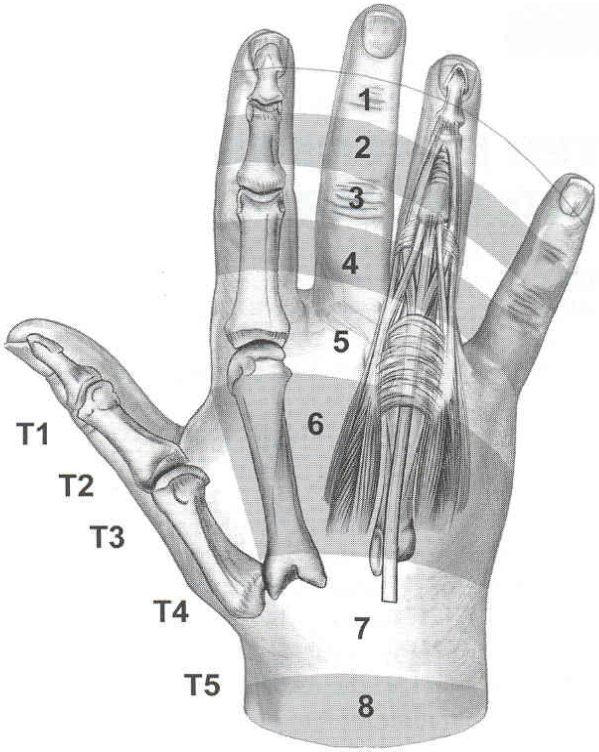


FIGURE 1. Extensor tendon zones as defined by the Committee on Tendon Injuries for the International Federation of the Society for Surgery of the Hand. (From Kleinert HE, Verdan C. Report of the committee on tendon injuries. *J Hand Surg* 1983;8A:794–798, with permission.)

Conclusion

- Zone I-II needs immobilization ≥ 6 weeks
- All other zones may have better outcomes with early controlled AROM
- Injuries involving fractures, crush, or other soft tissue involvement need early controlled AROM to decrease the likelihood of secondary complications
- Allowing 3-4 days before initiating therapy minimizes inflammatory response

Therapy Management of Acute Extensor Tendon Ruptures

Mallet injuries Zone I and II

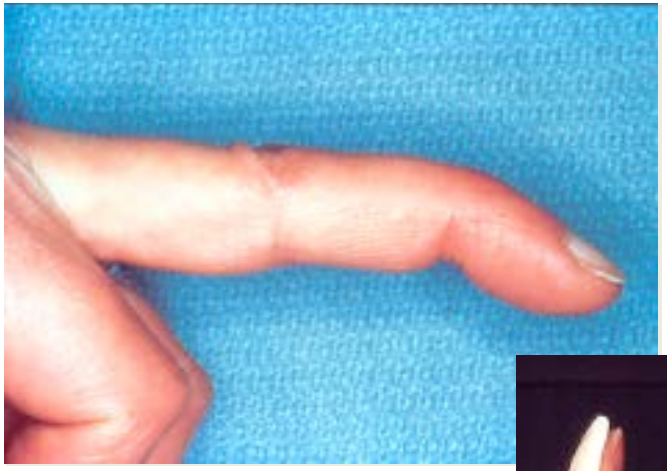
- need to monitor splint and skin integrity
- avoid extreme hyperextension- may affect circulation
- Rayan and Mullins suggest splint position of hyperextension just short of skin blanching and that circulation was compromised at splinting beyond 15° hyperextension
- DIP 0° extension to slight hyperextension - PIP free
- Stack splints, molded thermoplastic, casting
- usually volar - may be dorsal
- 2 splint regimen

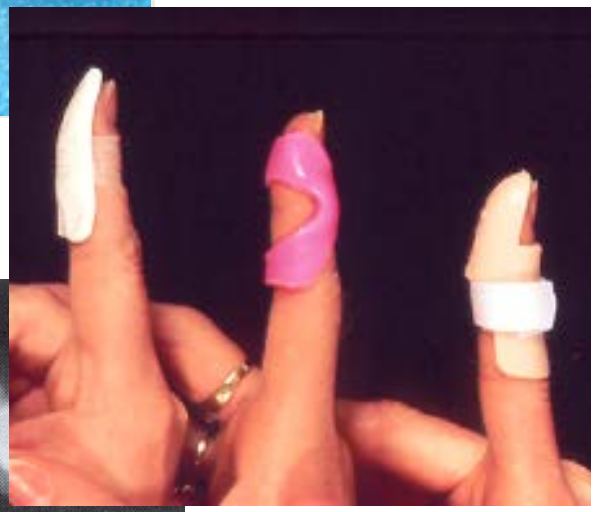
Zone I and II

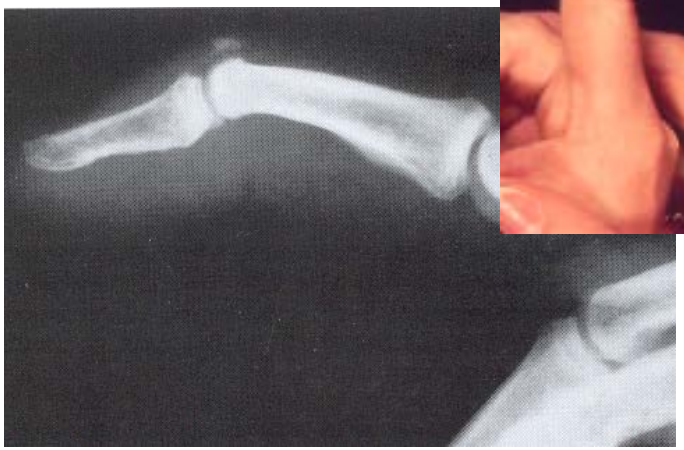
- skin maceration can be a problem
- pts. must be careful to avoid flexion during hand washing
- can line splints with moleskin to absorb perspiration
- can issue 2 splints- one for showering
- must adjust splint for edema

Zone I/II: Mallet Finger

- Immobilize for 6-8 weeks in full extension
- Dorsal or volar splints must support the DIP joint continuously in full extension
- PIP mobilization in splint day 1





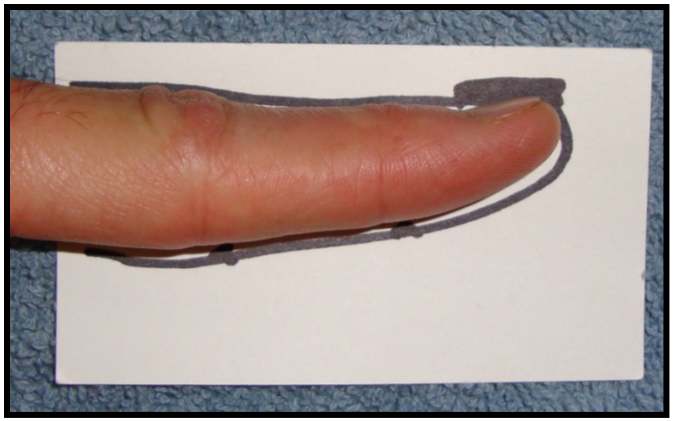


Mallet Deformity with Swan Neck

- Watch for development of swan neck posture with hypermobile patients
- Splint PIP in 30-40 degrees of flexion, can be separate component
- Dorsal PIP splint makes performing PIP flexion ROM easier

Rehabilitation

- Gradual orthosis weaning
- 1st 2 weeks use PM and between exercises
- Gradually decrease wearing time
  - Morning, afternoon, evening,
  - Continue night splinting

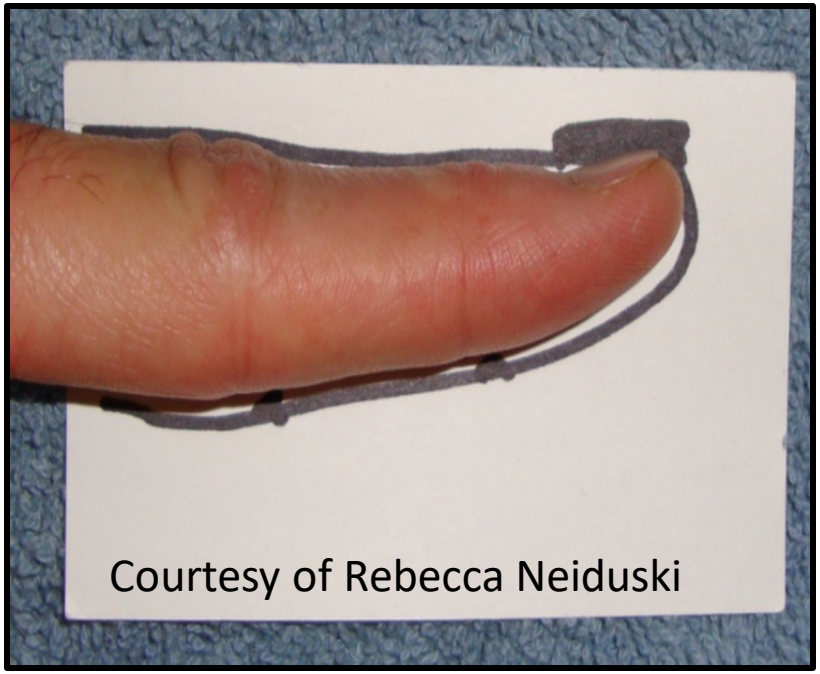


- Composite flexion
  - Avoidance of isolated joint motion - 2 schools of thought here!
- Lateral tracing of digit

LAG

- Can be measured by:
  - goniometry
  - lateral tracings

- if lag increase by 5° or more, immobilize for 2 add'l weeks then restart protocol



Gradually increase flexion

- Begin with rolling large cylinders
- progress to rolling smaller cylinders
- Emphasis on maintaining extension

Zone I and II

- Wk 7: 20-25° flexion
  - 10 reps every 1 ½ to 2 hours
- Wk 8: 35° flexion IF NO LAG!
  - use templates
  - resplint if lag develops
- continue splint between exercise periods for 2 weeks and at night for 4 weeks after day use has been D/C'd

Exercises:

- 7-8 weeks:
  - full fisting / hook fisting
  - blocking for DIP extension / flexion
- 10-12 weeks:
  - gentle passive DIP flexion

Contents lists available at SciVerse ScienceDirect

Journal of Hand Therapy

journal homepage: www.jhandtherapy.org

JHT Read for Credit Article #269.
Scientific/Clinical Article

Effectiveness of cast immobilization in comparison to the gold-standard self-removal orthotic intervention for closed mallet fingers: A randomized clinical trial

Silvio Tocco BSc [a,*,g], Paolo Boccolari BSc [b], Antonio Landi MD [c], Chiara Leonelli BSc [d,g], Catia Mercanti BSc [b], Francesco Pogliacomi MD [e], Silvana Sartini MD [b], Lucia Zingarello BSc [b], Bernadette Nedelec PhD [f]

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[c] *Hand Surgery and Microsurgery Unit, Policlinico of Modena, Modena, Italy*
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Journal of Hand Therapy 27 (2014) 325–329

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JHT Read for Credit Article #329.
Practice Forum

A novel way of treating mallet finger injuries

Dershnee Devan BOcc (UKZN), Dip in Hand Therapy (UP) *

Occupational Therapy Department, University of Witwatersrand, 7 York Rd., Parktown, South Africa

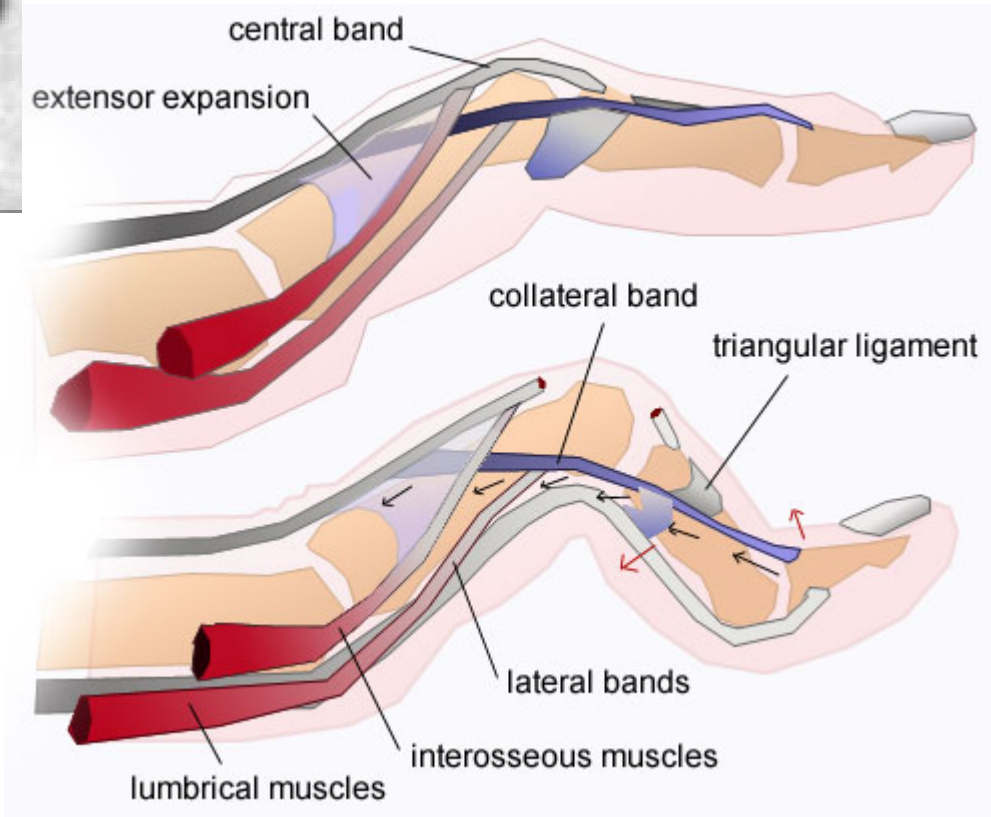
Fig. 4. Application of the elastic tape to the dorsum of the finger.

Fig. 6. Completed technique.

Table 1
Results of pilot study on 16 patients

Patient	Systemic conditions/late presentation	Severity of injury	Age	Range of motion on discharge
1	None	Closed	20	0°–65°
2	None	Closed	27	Noncompliant
3	Late presentation 6 wks post injury	Closed	45	0°–65°
4	None	Closed	13	0°–60°
5	Prior malignancy and chemotherapy	Closed	99	−10° extensor lag
6	None	Closed, avulsion of extensor tendon	29	Noncompliant
7	None	Closed, k wire fixation	27	0°–50°
8	Diabetes	Closed	57	−5° extensor lag
9	None	Closed	41	−15° extensor lag
10	None	Closed, k wire	40	0°–50°
11	None	Closed	37	0°–55°
12	None	Closed, k wire	15	0°–65°
13	None	Closed	23	0°–60°
14	None	Closed, k wire	49	0°–55°
15	None	Closed	38	0°–50°
16	None	Closed, fracture	12	0°–50°

Boutonniere Deformity



Zone III/IV: Boutonniere Deformity

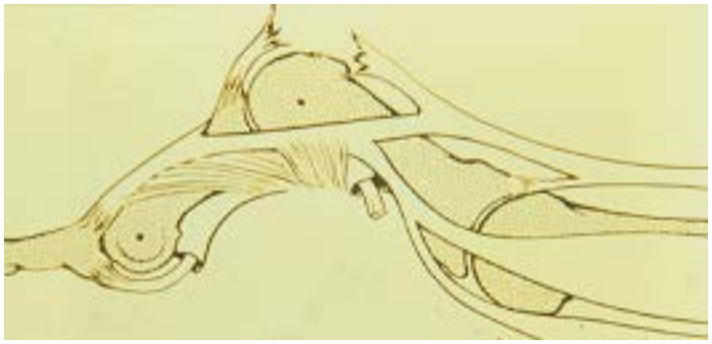
- Stage I
  - Dynamic boutonniere that is passively mobile
- Stage II
  - Established deformity that cannot be corrected passively
  - Immobilization of PIP in full extension for 6-8 weeks
  - Active flexion of DIP to maintain length of oblique retinacular ligament and facilitate gliding of lateral bands
  - Recommend reassessing the central slip function at 3 weeks and then start gradual remobilization using SAM or a relative motion MP flexion splint with continued use of PIP ext orthosis at between exercises/PM

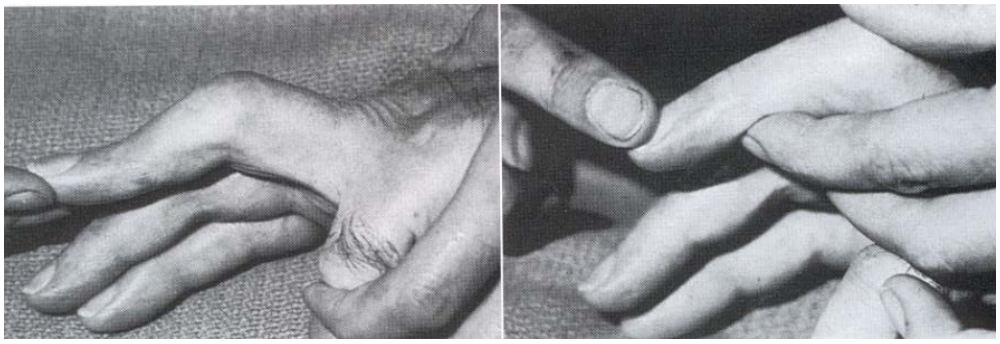
Zone III/IV:
Boutonniere Deformity

- Stage III/IV
  - Established deformity with resultant structural changes of the PIP joint
  - Surgical release of PIP and correction of extensor mechanism as needed

Zone III/IV: Boutonniere Deformity

- Lateral bands transmit force towards PIP flexion and DIP hyperextension
- PIP flexion contracture
  - Pseudoboutonniere
    - *the DIP joint remains passively flexible*
  - True boutonniere
    - *the DIP joint cannot be passively flexed*





Relative motion splinting for boutonniere

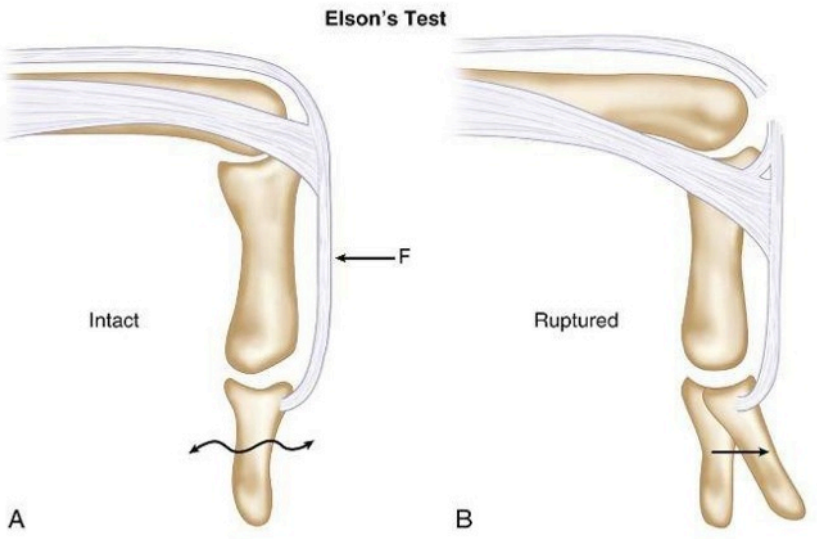
For the passively supple boutonniere

- Splint MP of affected digit in 15-20 ◦ less MP extension and allow full excursion
- Splint PIP's in extension at night for 10-12 weeks after initiating mobilization
- Splint PIP in ext intermittently daytime if there is a lag
- Chronic boutonnieres – require orthotic or casting to restore passive ext first; may require use of relative flexion splint for 3 months after initiating mobilization phase
- Merritt recommends accepting a 30 ◦ lag with chronic bouts who plateau during attempts at regaining full extension; then full time use of Relative Extension splint for 3 months

Wendell Merritt J Hand Surg Am 2014

Acute Extensor Ruptures

- Central slip injury with or without triangular ligament rupture
  - Elson's test can help determine if a boutonniere deformity is likely to occur if the PIP joint is not splinted/protected for a s



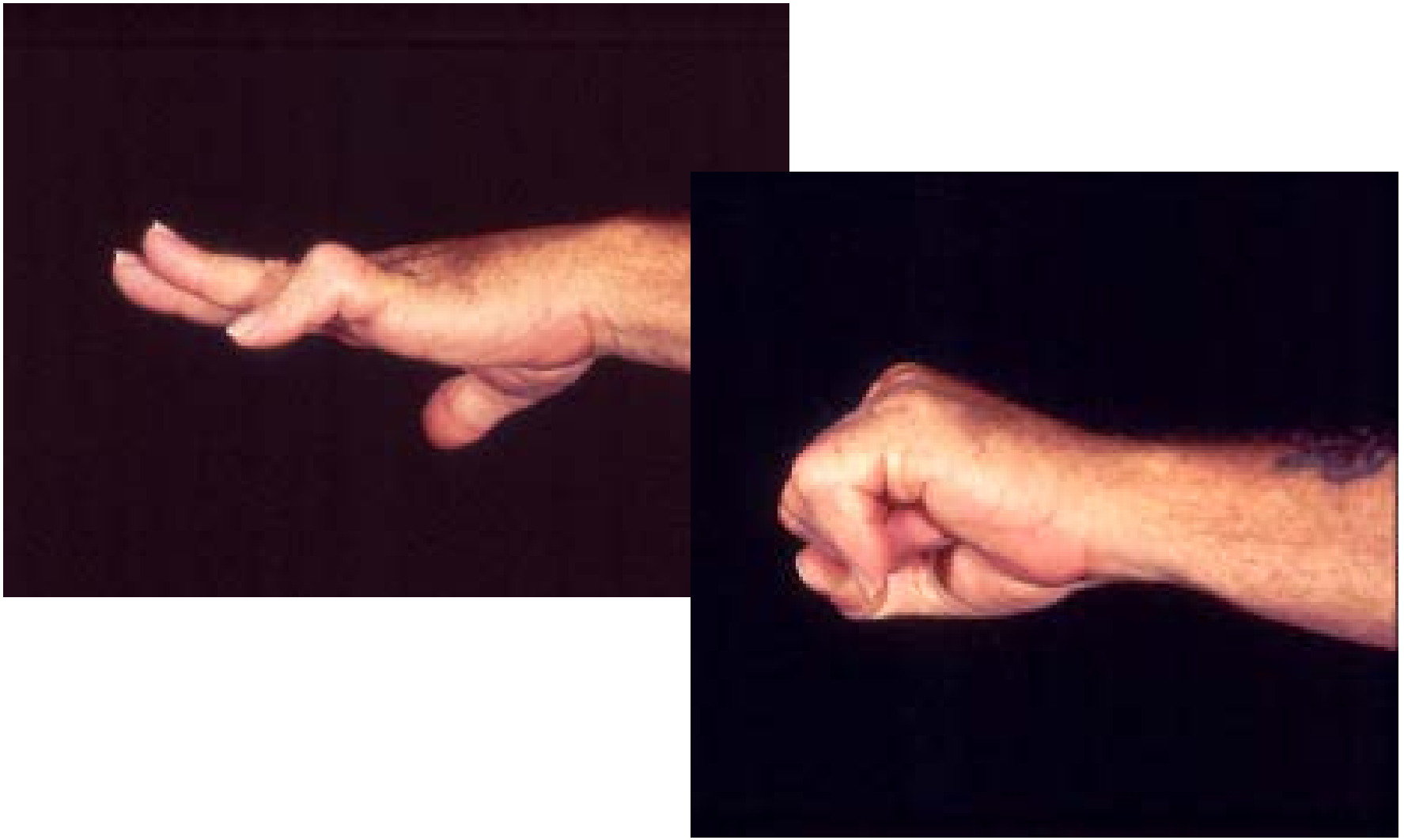
  - When in doubt, assume w[illegible] otherwise

Elson's Test

- PIP is full flexed and held in the fully flexed position
- The patient is asked to extend the fingertip with the PIP joint held in flexion
- If central slip is intact, the lateral bands will be slack and incapable of extending the DIP
- If central slip is injured, tension will be transmitted through the lateral bands to the DIP and extend, which would be POSITIVE

(Image courtesy of Donald Sammut)

Therapy management of Chronic Boutonniere



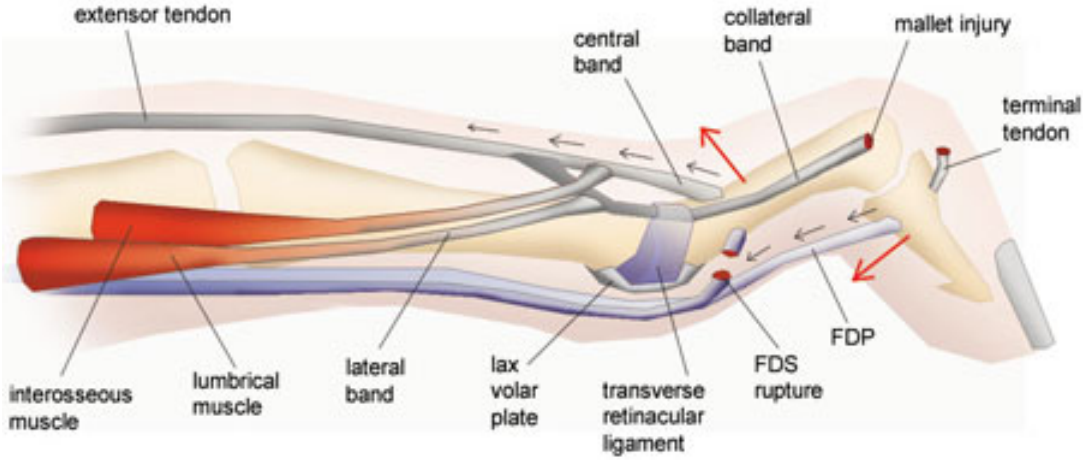
Rehabilitation

- Aggressive DIP flexion with PIP supported in full extension
- Add passive PIP flexion
  - Two weeks or more after splinting is discontinued
  - *If flexion is not increasing (and extension remains good)*

Rehabilitation

- Achieve full passive PIP extension using dynamic, static progressive, serial static splints or casts
- Must be held in extension for 6 weeks prior to remobilization

Swan neck deformity



Four possible causes:

Terminal tendon rupture

PIP hyperextension from lax volar capsule
2° to synovitis or rupture of volar plate

FDS rupture (loss of dynamic PIP stabilization)

Intrinsic tightness 2° to MP pathology

Mallet Deformity with Swan Neck

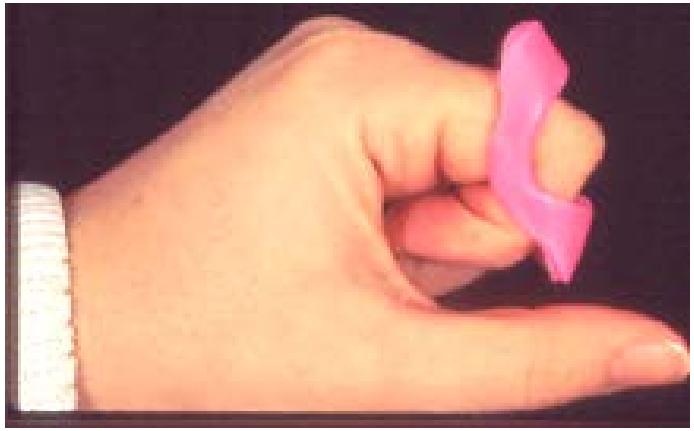
Which digit do you think she was referred for?

Mallet Deformity with Swan Neck

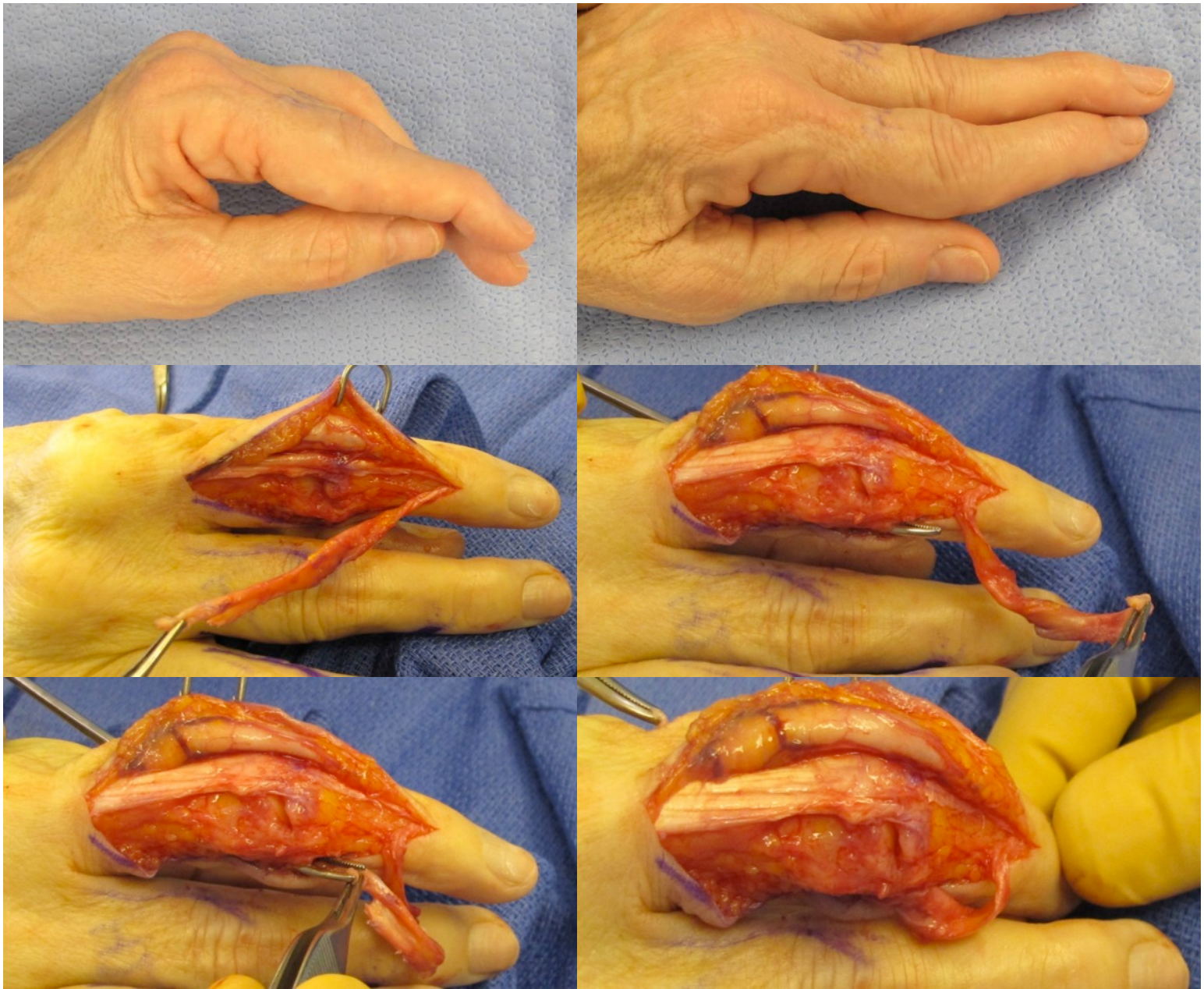
Splinting for Swan Neck Deformity

Thermoplastic Figure 8

Silver Ring Splint

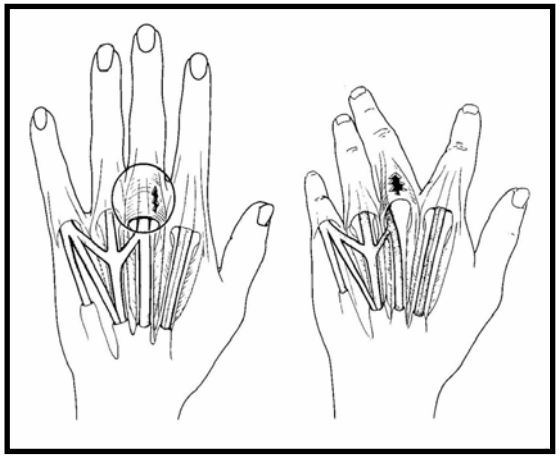


SORL Reconstruction



Video 1

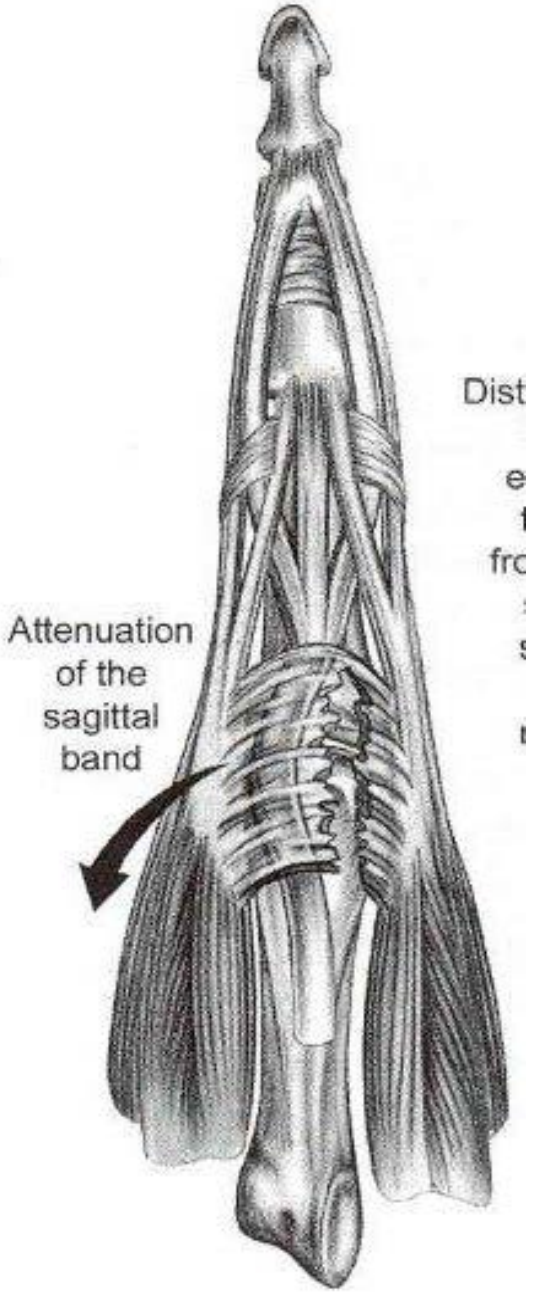
Sagittal Band Rupture



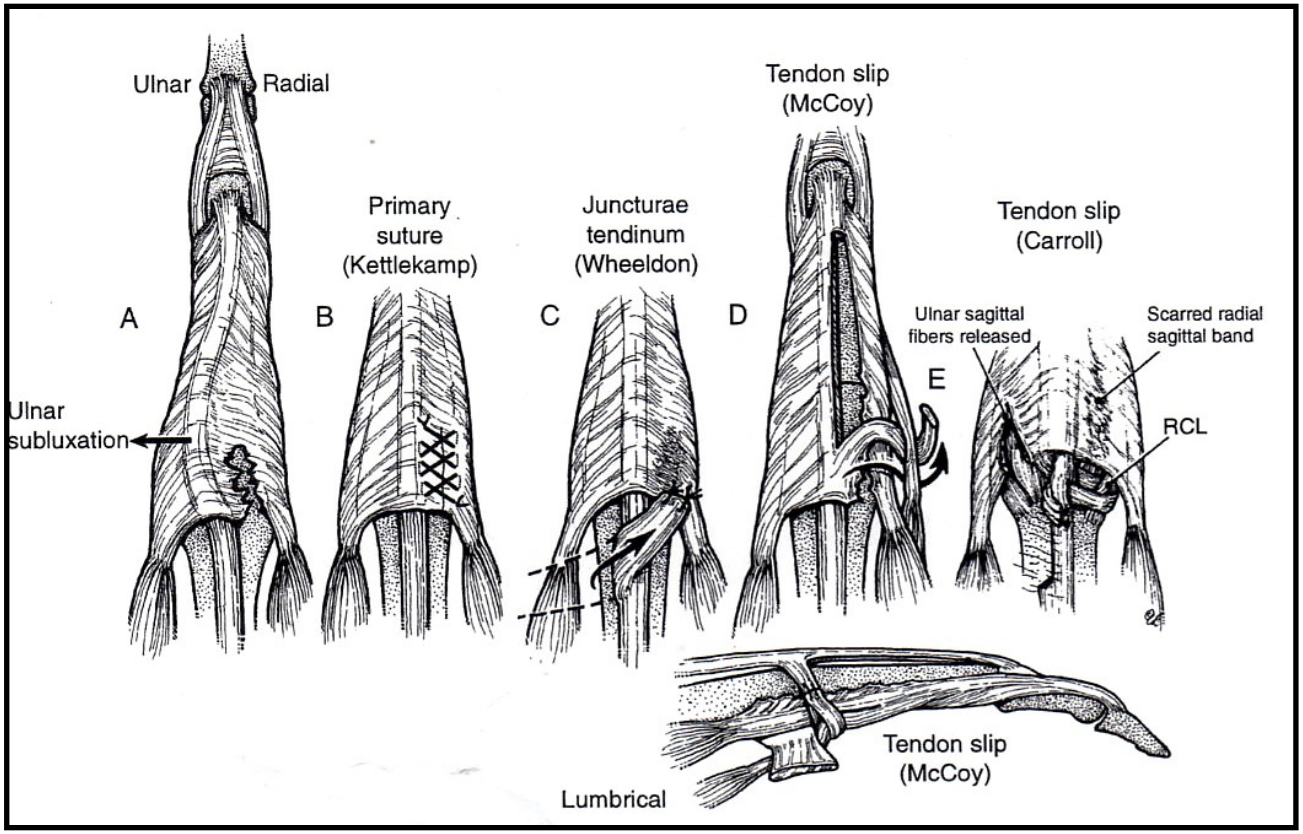
- The sagittal bands prevent bowstringing of the ED during extension, centralize ED at midline during flexion
- Rupture is usually atraumatic, involving radial fibers
- Can cause ED to sublux ulnarly and can cause incomplete extension

Zone V: Sagittal Band Rupture

- Most often observed at the radial aspect of the long finger
- Clinical findings:
  - Edema over the affected MP joint
  - Localized tenderness
  - Pain with resisted digit extension
  - Incomplete MP joint extension
  - Deviation of the involved digit

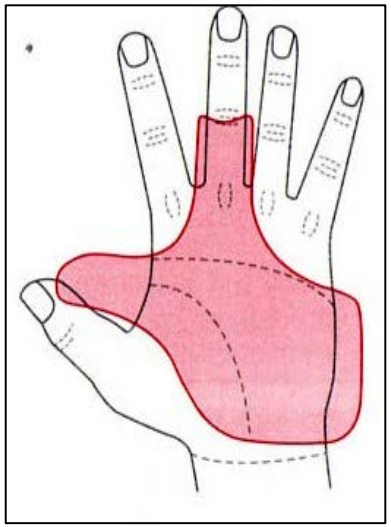


Sagittal Band Repair Techniques



Sagittal Band Splinting

Splint to immobilize a sagittal band rupture



Zone V: Sagittal Band Rupture

- Treatment:
  - Immobilization of MP in full extension for 6-8 weeks

VS

- Relative motion extension orthosis for 6-8 weeks with MP 15-20◦ more extended than unaffected digits

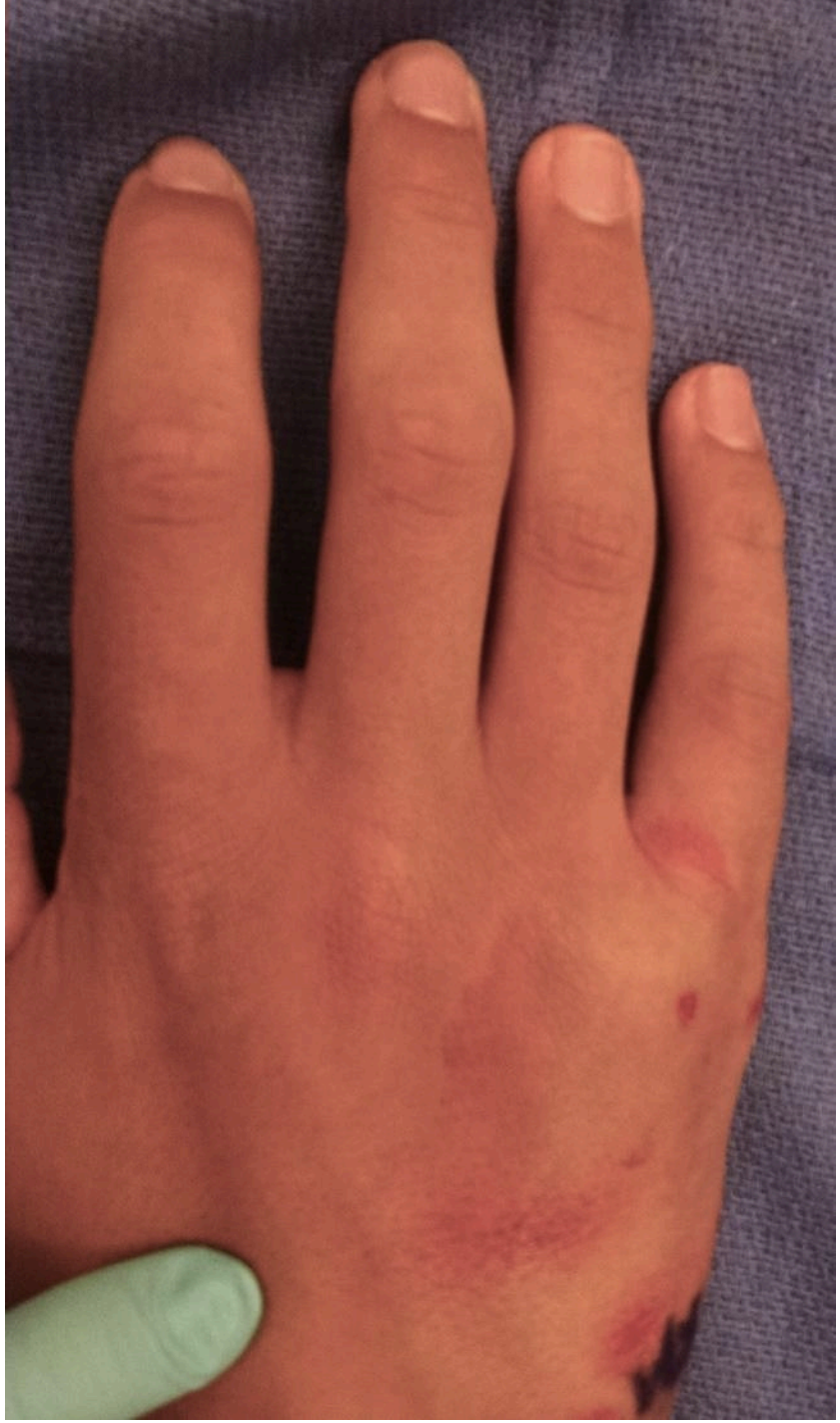
OR

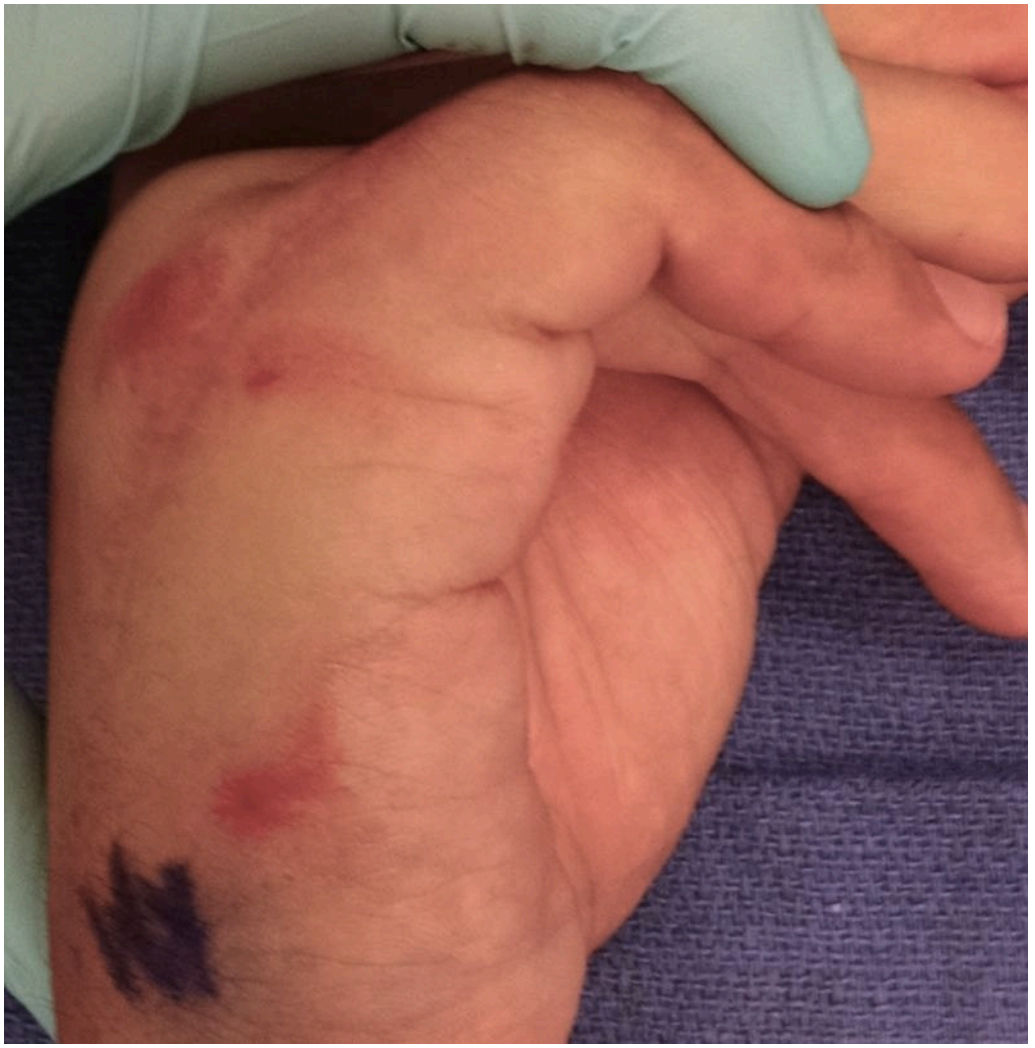
- Reconstruction/repair of sagittal band with centralization and stabilization of the extensor tendon
- Can use same treatment options as for acute tears

Surgical Releases for Posttraumatic Extensor Issues

- Wait….wait…….wait…….wait
- Make sure joint(s) are appropriate for release
- Extensor tenolysis first
- If still insufficient ROM, then joint capsulectomies
- If still insufficient ROM, then joint ligament releases
- If still insufficient ROM, try to determine reason, consider extensor lengthening (carefully!), etc.

Extension Contracture @ PIP



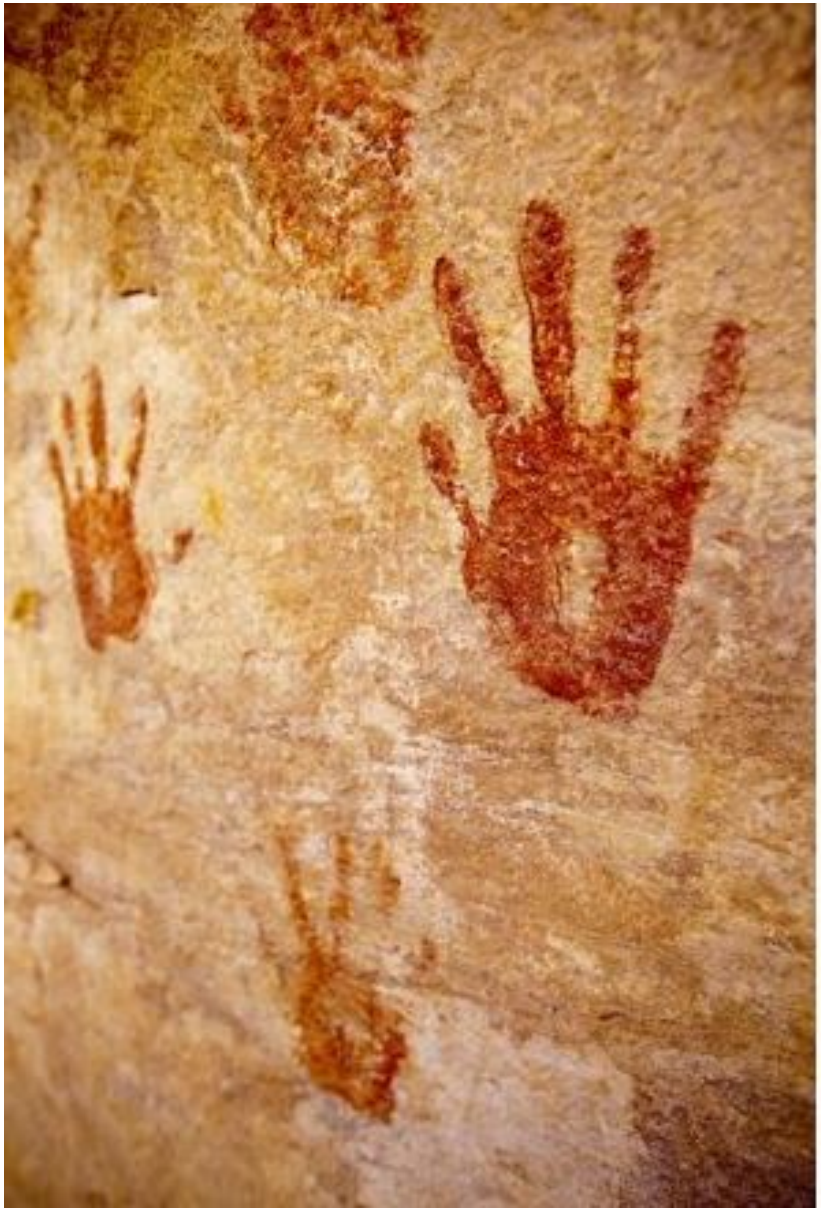


Extension Contracture @ MCP

Contracture Releases Post-op

- My preferences: Kenneth Means MD
  - Awake testing
  - Immediate edema control as able
  - Long-acting anesthestic for early ROM
  - Nylon skin sutures
  - Give patients/therapists pictures

Therapy Management following surgical releases and reconstruction



Therapy Management following Surgical Releases

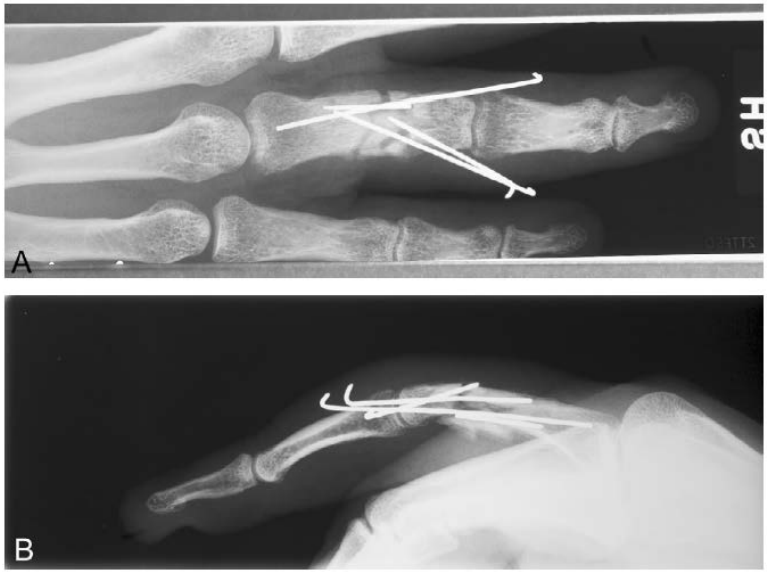


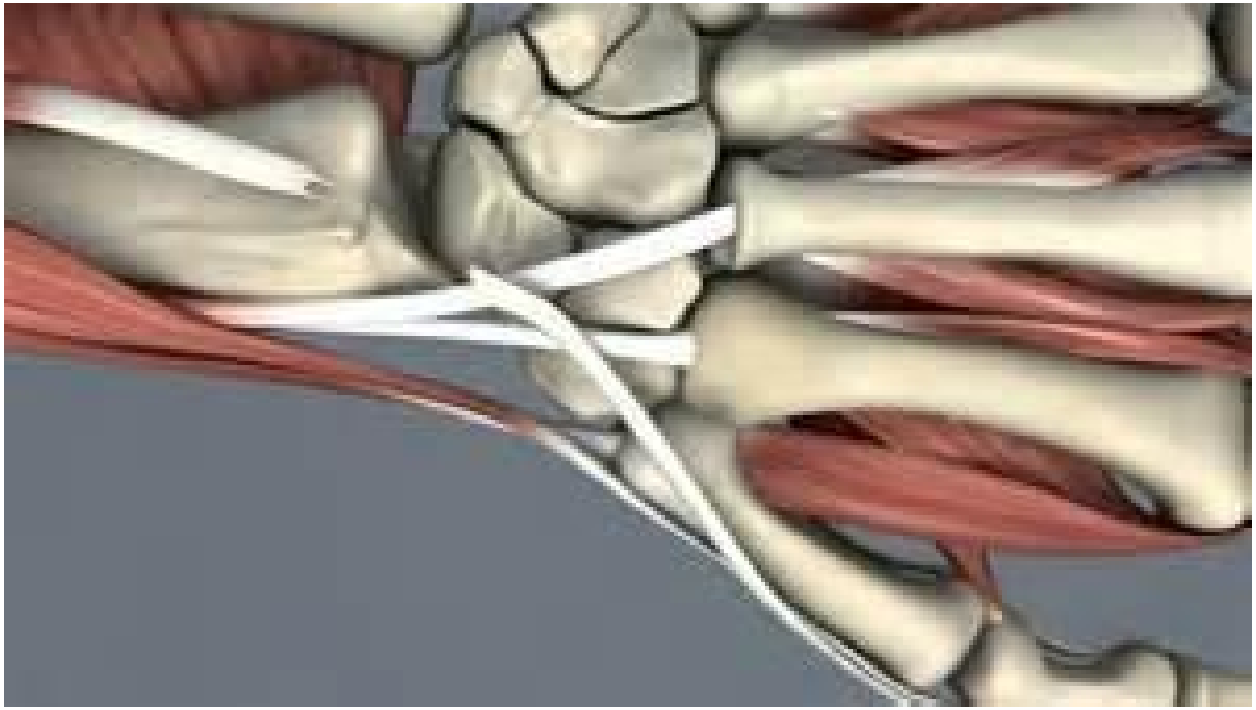
FIGURE 22-3 A, Anterior/posterior view of comminuted proximal phalanx fracture after Kirschner wire fixation. B, Lateral view.

FIGURE 22-4 Extensive scarring over the proximal phalanx secondary to a comminuted fracture.

FIGURE 22-5 Active range of motion under local anesthesia after extensor tenolysis and dorsal capsulotomy of the ring finger.

FIGURE 22-6 Active range of motion available at 24 hours after surgery.

EPL Rupture with Distal Radius Fracture




PA
R
B
M
L

Therapy management of complex extensor tendon reconstruction

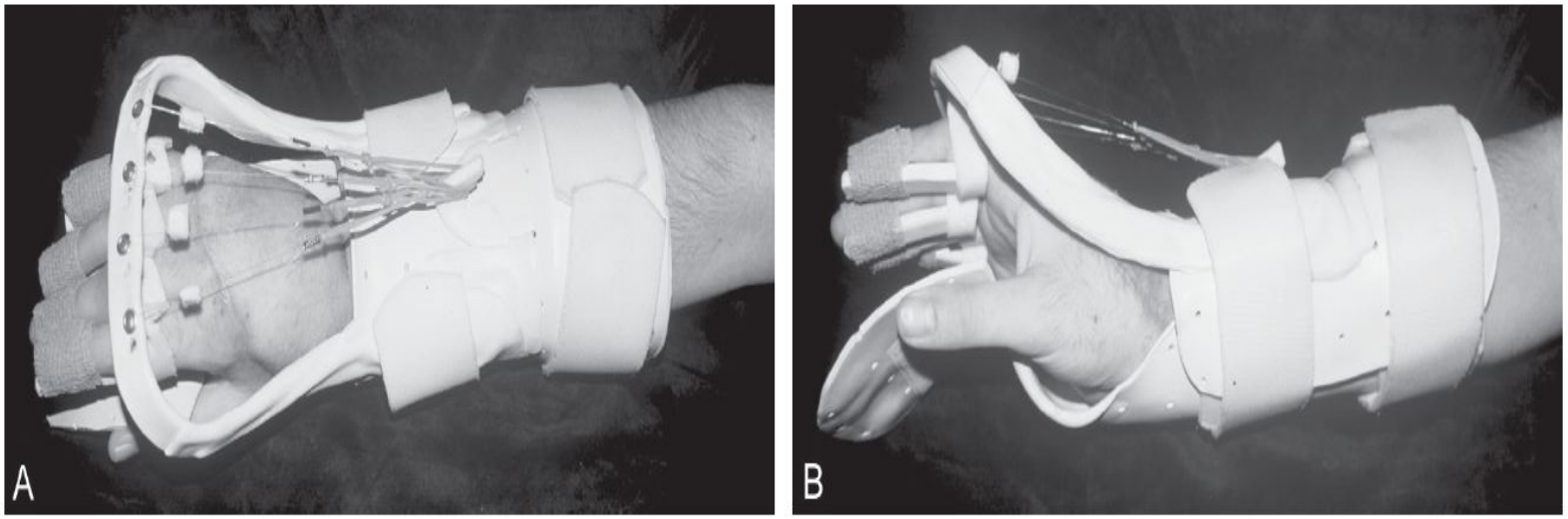


FIGURE 23-2 **A and B,** Dynamic metacarpophalangeal (MCP) extension orthosis with interlocking volar component and limited MCP flexion excursion. Interphalangeal joint blocking orthoses are used to facilitate blocked MP flexion and are sometimes required to protect the distal tendon graft juncture.

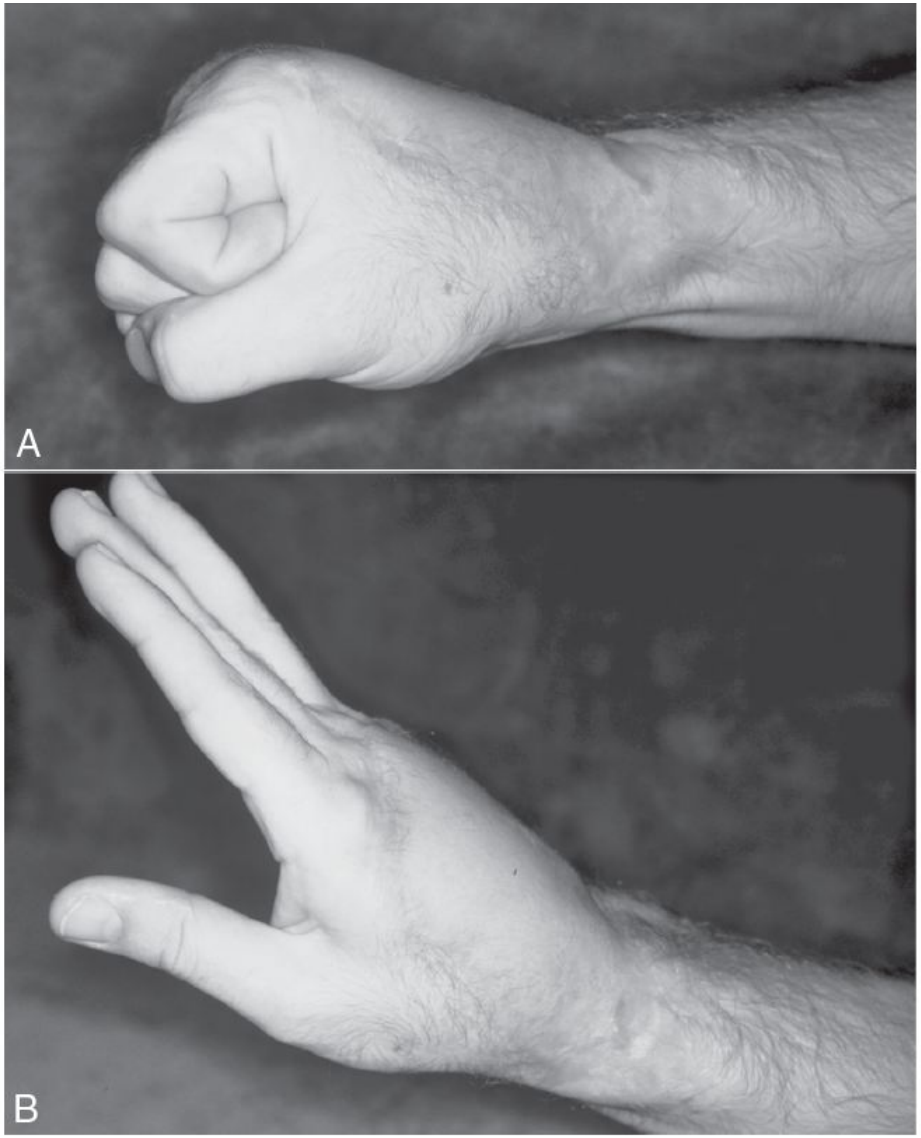


FIGURE 23-5 A, Active flexion after staged extensor reconstruction of digits 2 through 5 with a flexor carpi ulnaris (FCU) transfer. B, Active extension of metacarpophalangeal joints performed in wrist extension.

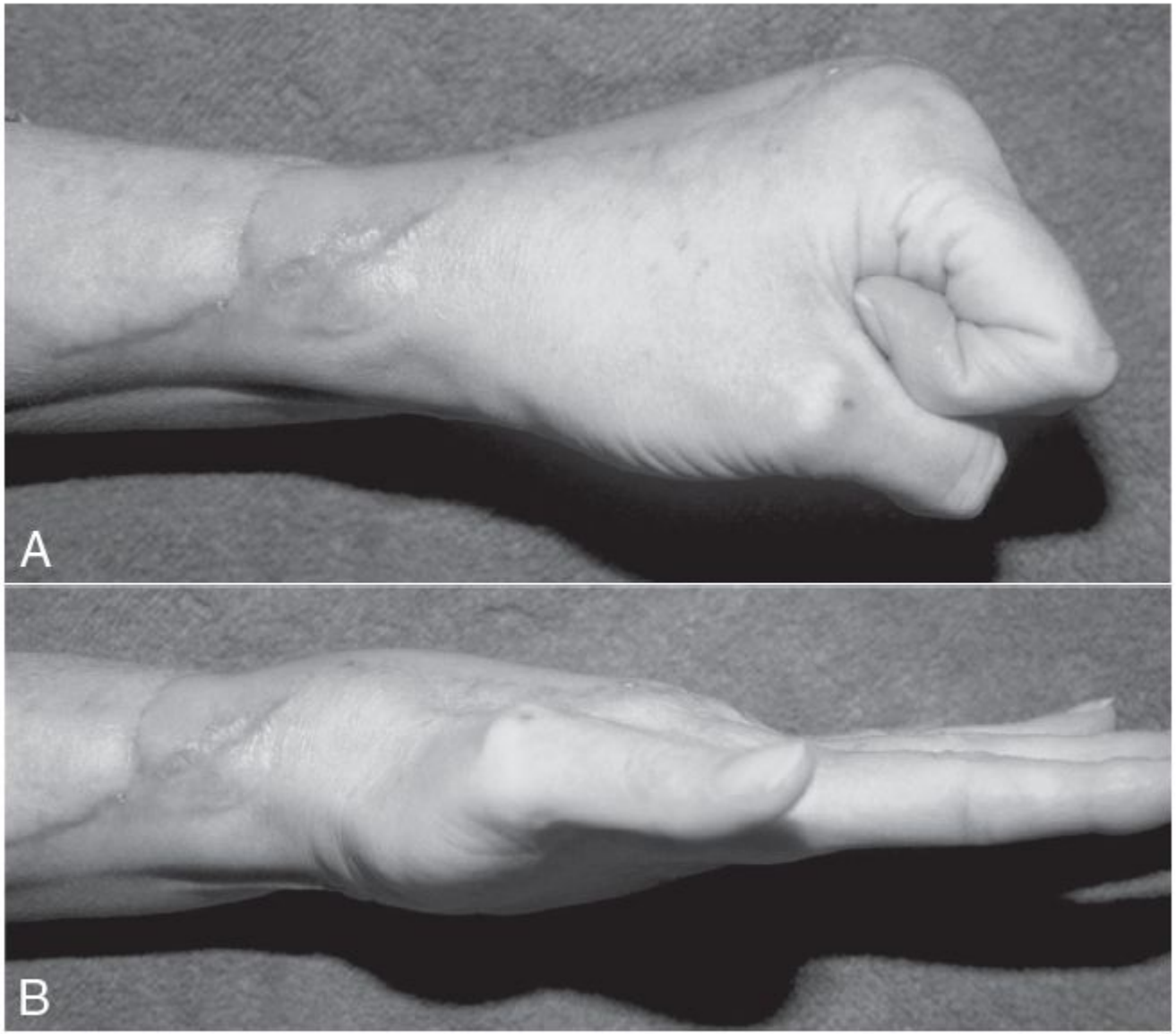


FIGURE 23-6 **A,** Active flexion after staged reconstruction of digits 2 to 5 with tendon transfer. **B,** Active metacarpophalangeal extension.

I didn’t mean to do it!

Dx: L RF Boutonierre Deformity

20 wks misplaces splint and loses ext again; now -45/35
serially casting resumed to gain ext

22 wks resume flex but pain is severe- back to DR “progress limited by pain”

What would you do now?

25 wks CT scan scheduled – slight palmar and ulnar subluxation of P2 relative to P1 head; tiny bone fragment adjacent to the base of P2

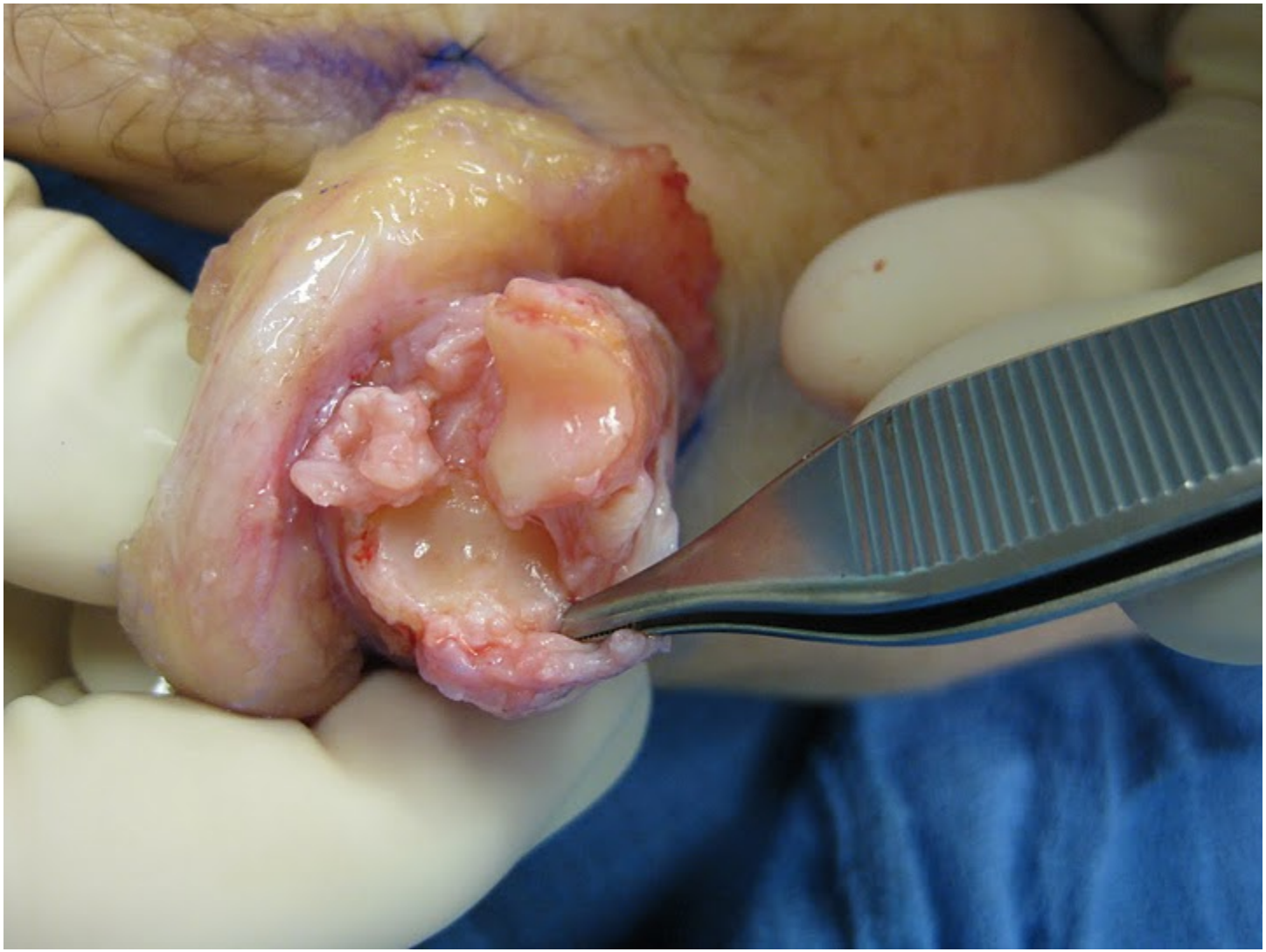
30 wks ext -30/-15 flex 70; referred back to DR “progress limited by pain”


amazonbasics

OR 1/5/11 (8 months post injury)

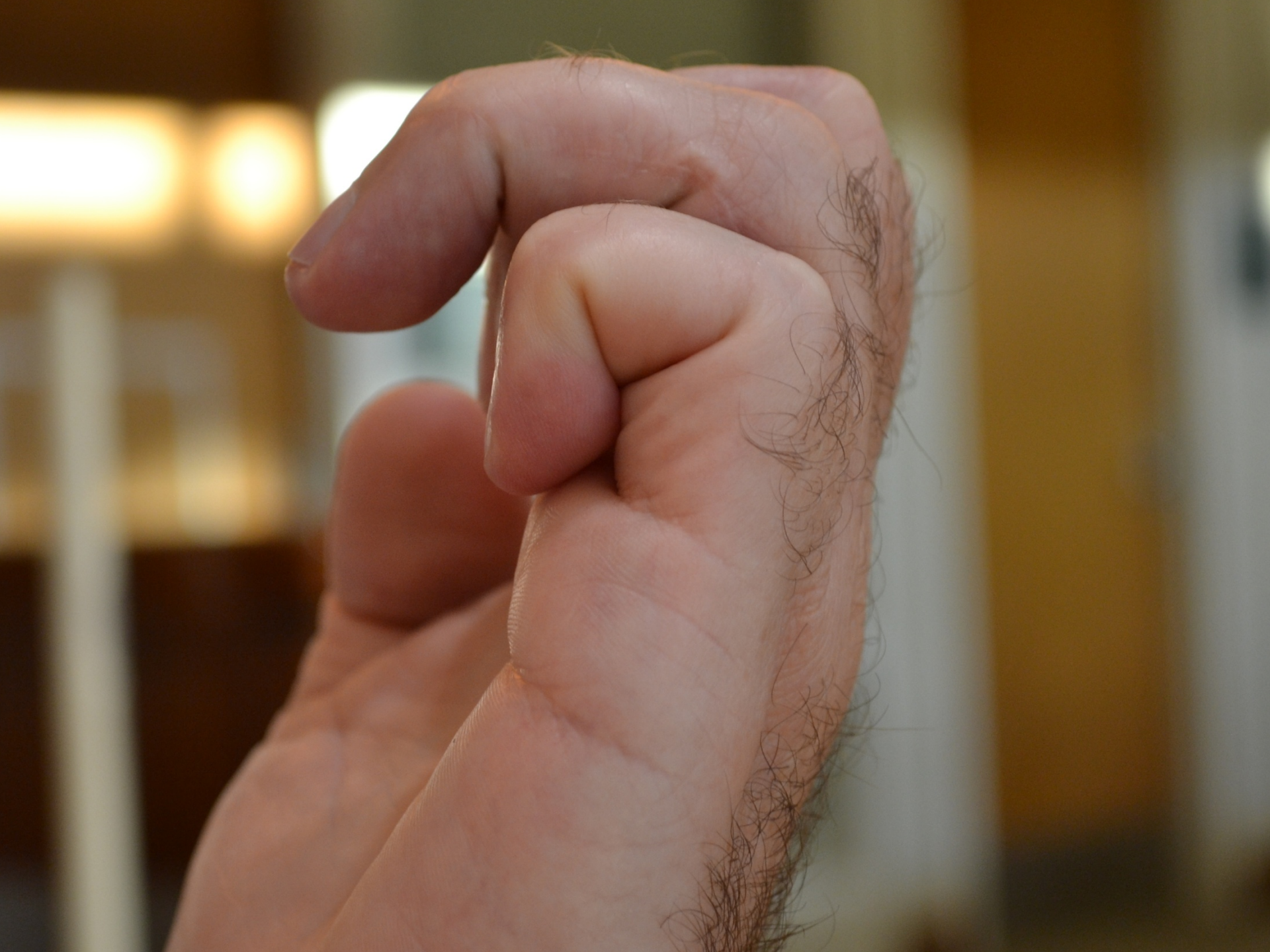
- Preop plan: exploration of PIP for potential total joint arthroplasty, hemiarthroplasty or hemihamate arthroplasty

- Procedure performed: pip arthrotomy with radial collateral ligament repair and realignment of the lateral bands



- *Postoperative management decision*

  6 wks immobilization vs. SAM

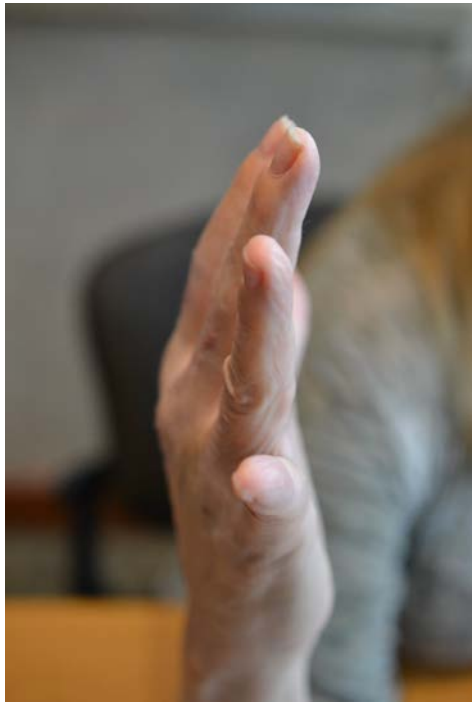


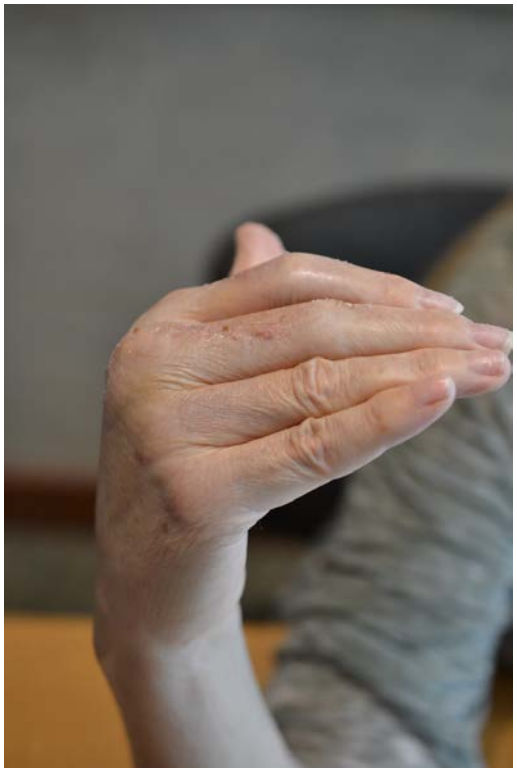
Other PIPJ indications for SAM protocol

Early motion of closed boutonniere injuries
Central slip reconstructions
Early mobilization of P1 ORIF
Mobilization of hemihamate arthroplasty – for the fearful surgeon or patient
Volar PIPJ dislocations
Collateral ligament reconstructions

You had what done?

MP arthroplasty replacements IF,MF with extensor tenolysis and centralization of extensor tendons, IF/MF PIP capsulectomies and extensor tenolysis, history of CRPS following initial MP arthroplasties





The End

Thank you for your attention!

“A specialist knows the worst mistakes which can be made in his field and how best to avoid them”
- Nils Bohr


Thank You
Questions & Discussion
Welcome
Contact: Rebecca.Saunders@medstar.net

Extensor Tendon Management References

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