High Yield Hand Diagnosis

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Disclosures

- We have no disclosures that are pertinent to this presentation

Objectives

At the end of this presentation, learners will be able to

- Describe injuries to the hand
- Identify structures at risk from those injuries
- Initiate care for those injuries, and arrange appropriate followup

Terminology

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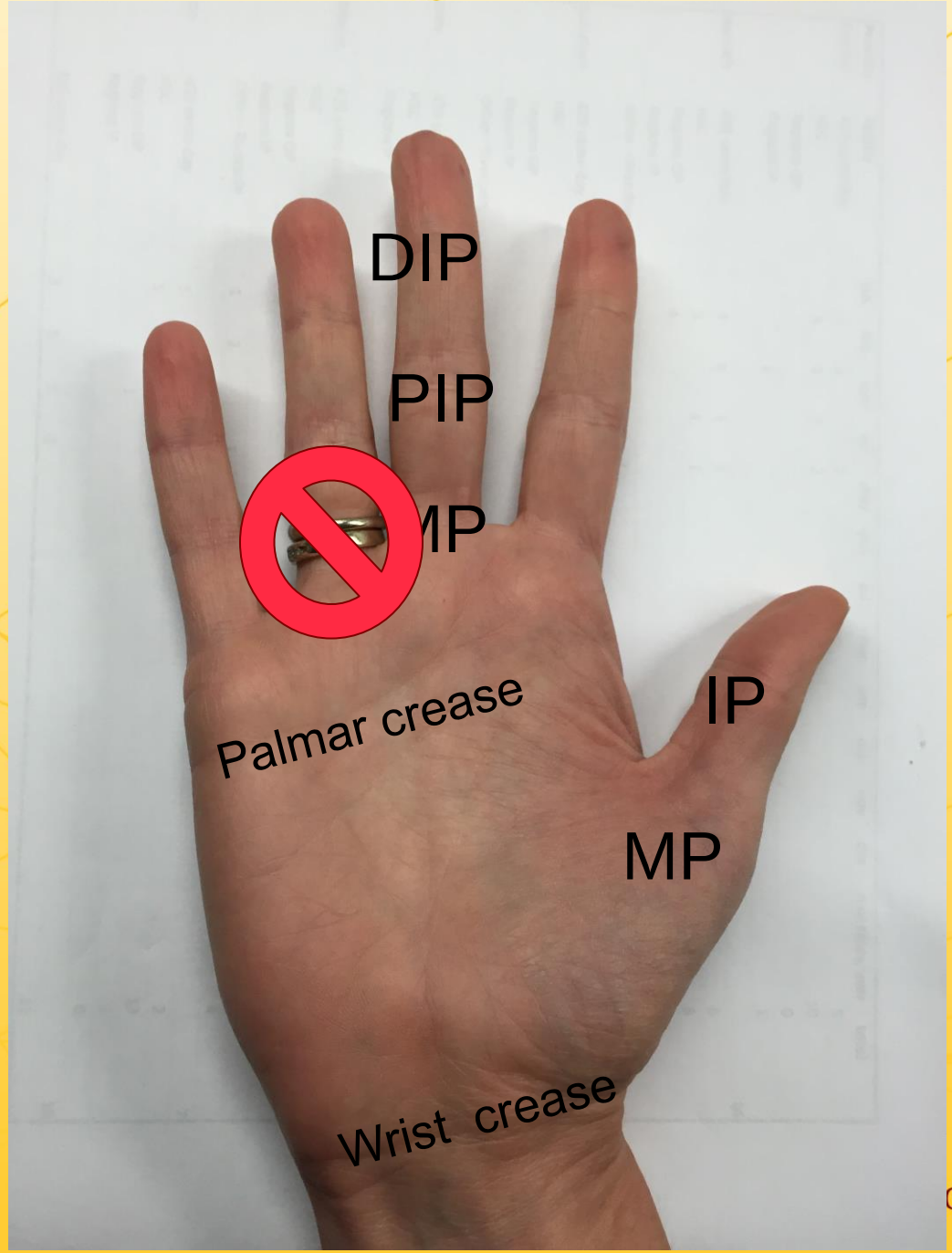
Terminology

DISTAL

ULNAR RADIAL

PROXIMAL



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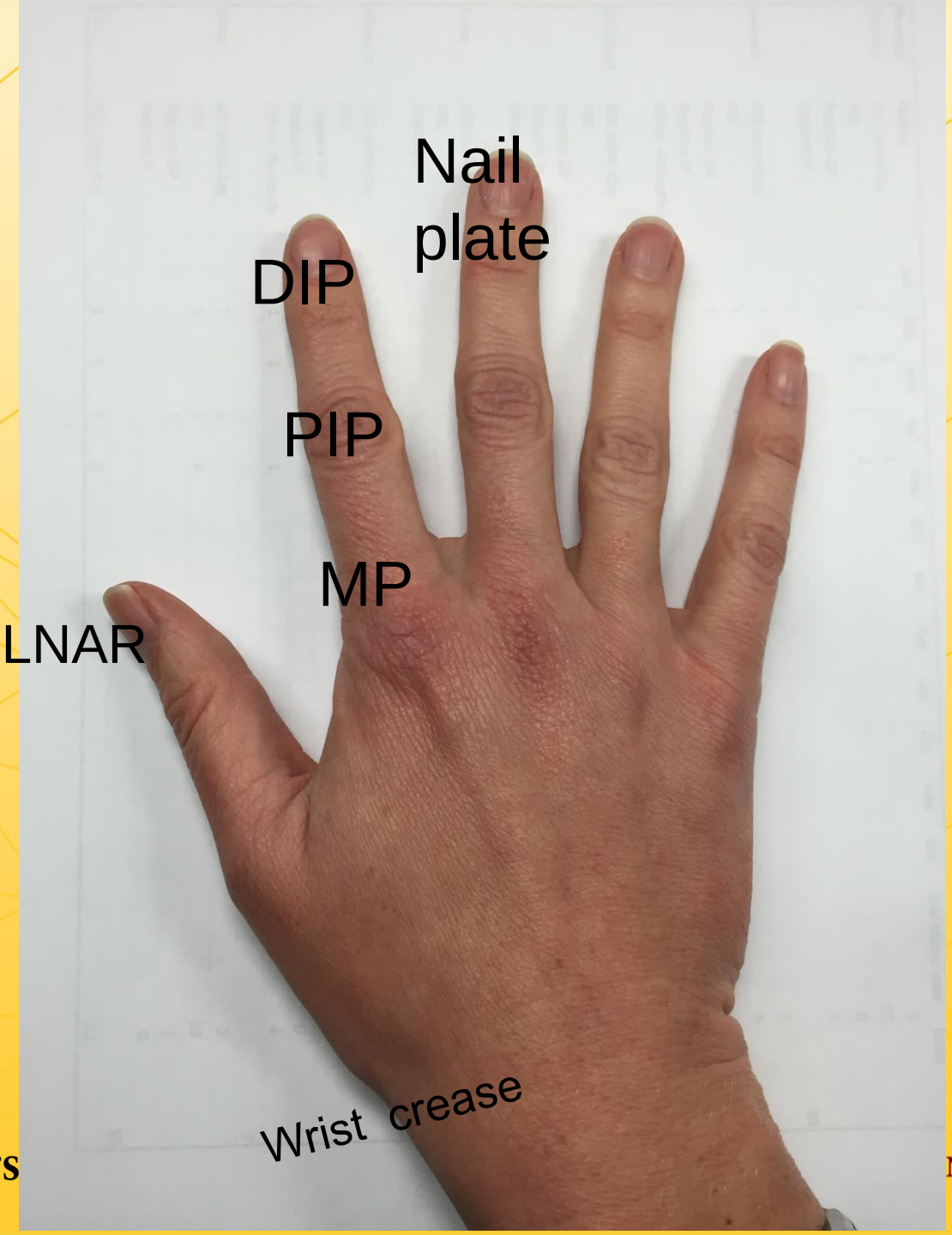
DISTAL

RADIAL ULNAR

PROXIMAL



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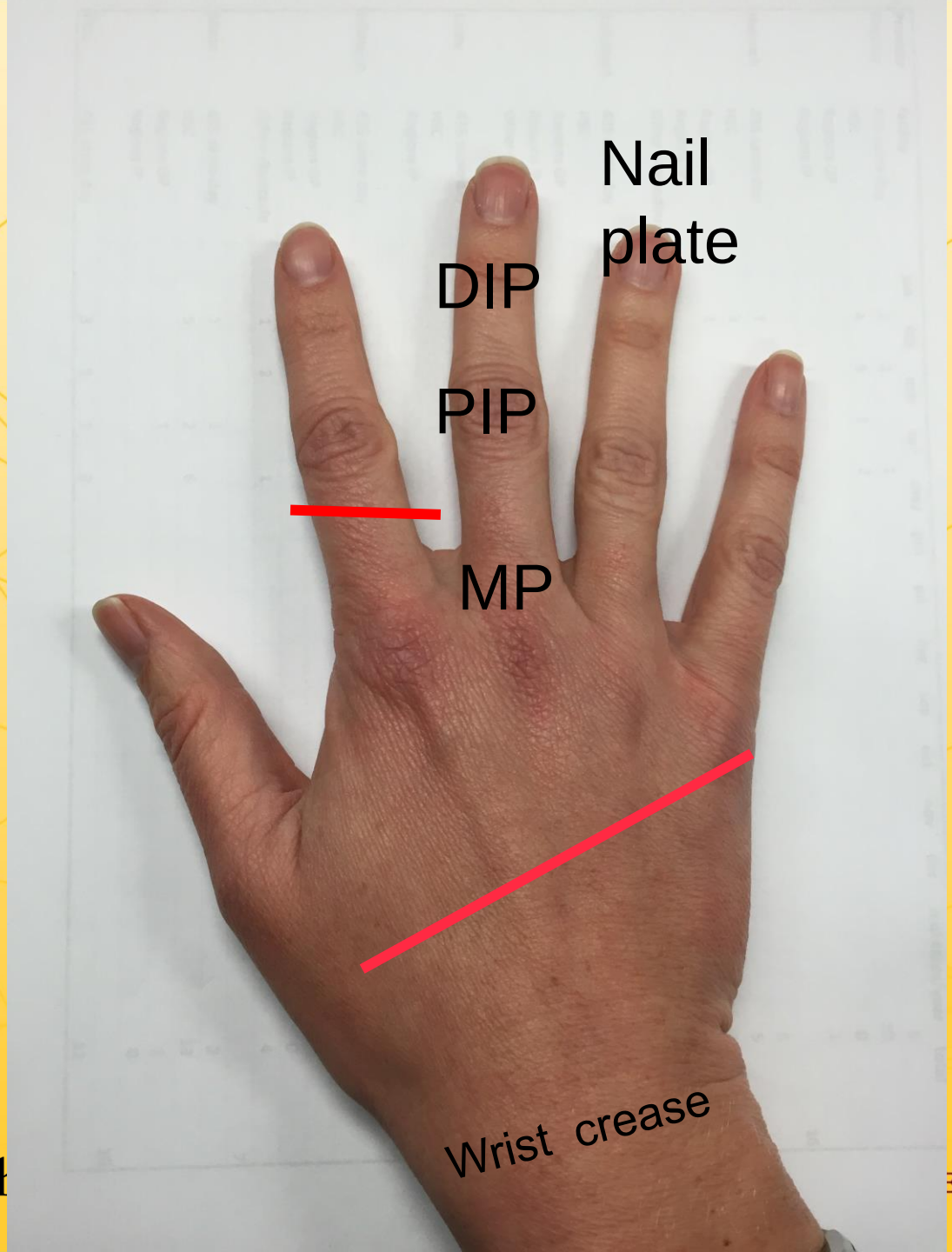
Nail plate
DIP
PIP
MP
Wrist crease

Other useful terms

- Near amputation
  - Bone completely cut, skin on one side cut
  - “dusky dangler”
- Complete amputation
  - Finger in a bucket
- Fingertip injury
  - Anything distal to the DIP
  - Not going to be replanted

A word on exploration . . .

- Decision for operative intervention is based on clinical exam NOT what is seen in the wound

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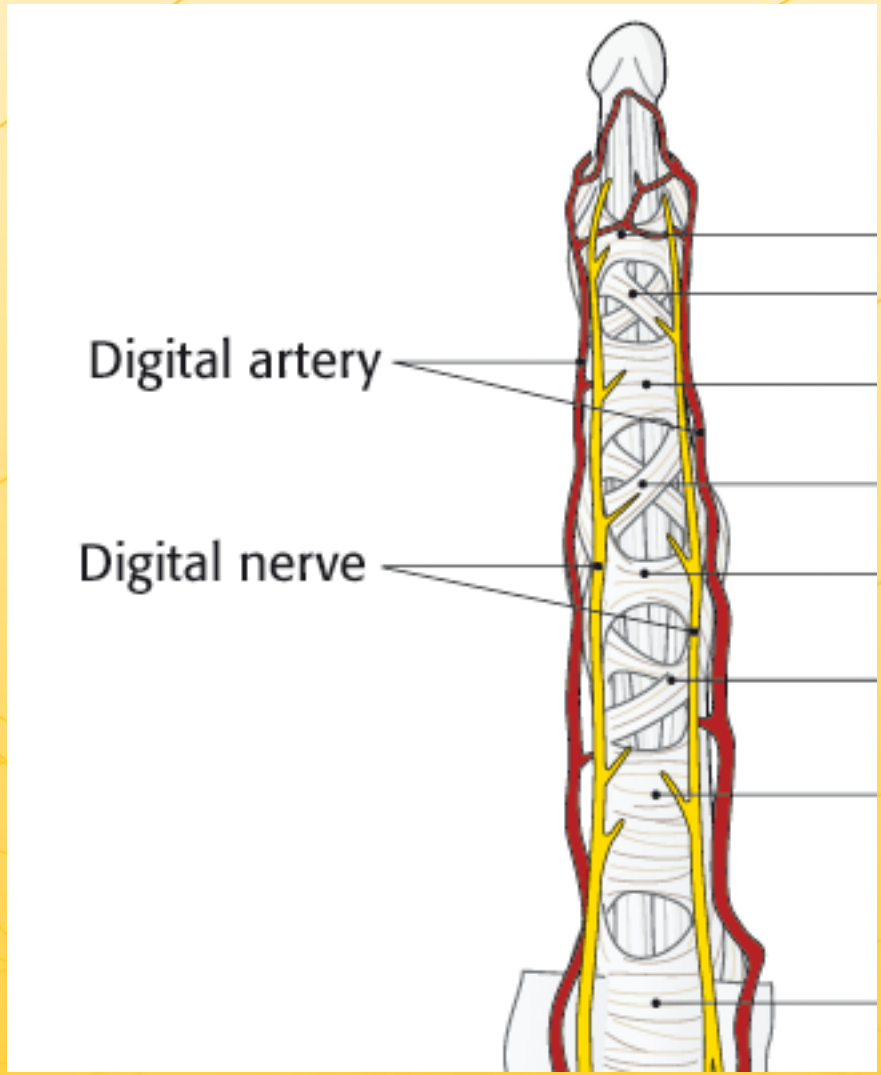
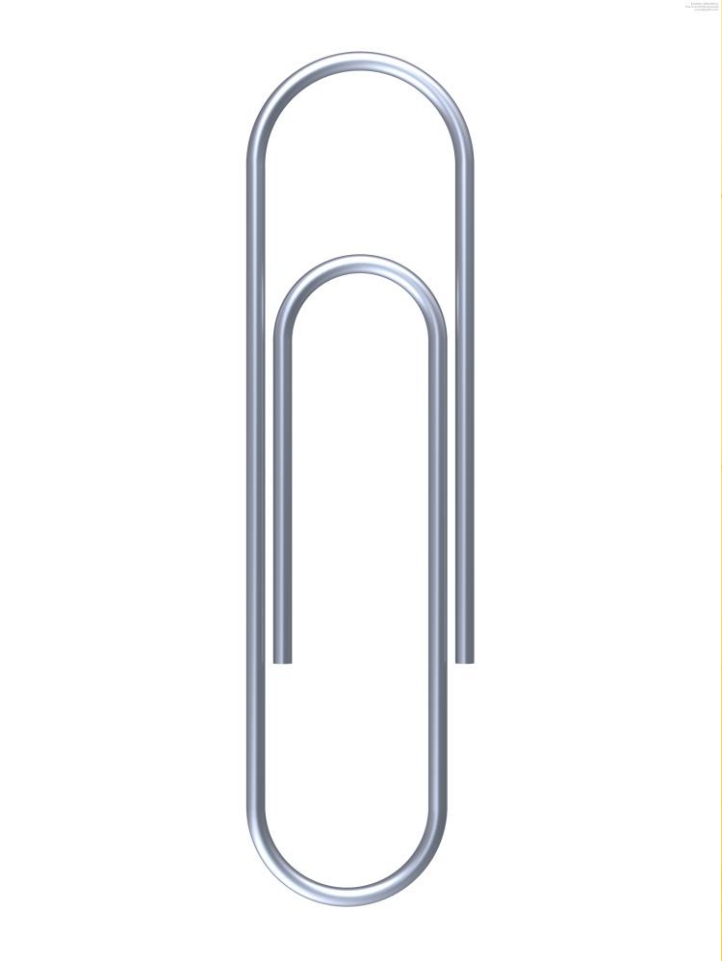
Volar finger

- Digital nerve
- Digital artery- usually can't cut the digital artery without cutting the digital nerve
- Flexor tendon



Testing digital nerves

- Do not numb up the finger first
- Check both ulnar and radial sides



Digital artery injury

- Only need one intact digital artery to survive
- Check cap refill
- Fingertip color
- Turgor

Testing flexor tendons

Rests in extension

No flexion with tenodesis

Squeeze test

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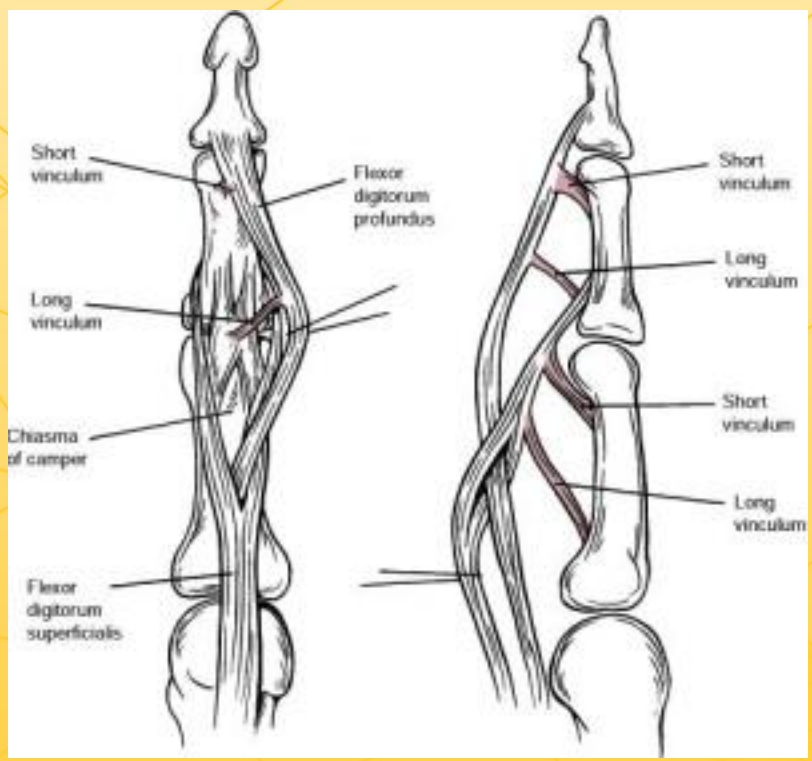
Each finger has two flexor tendons



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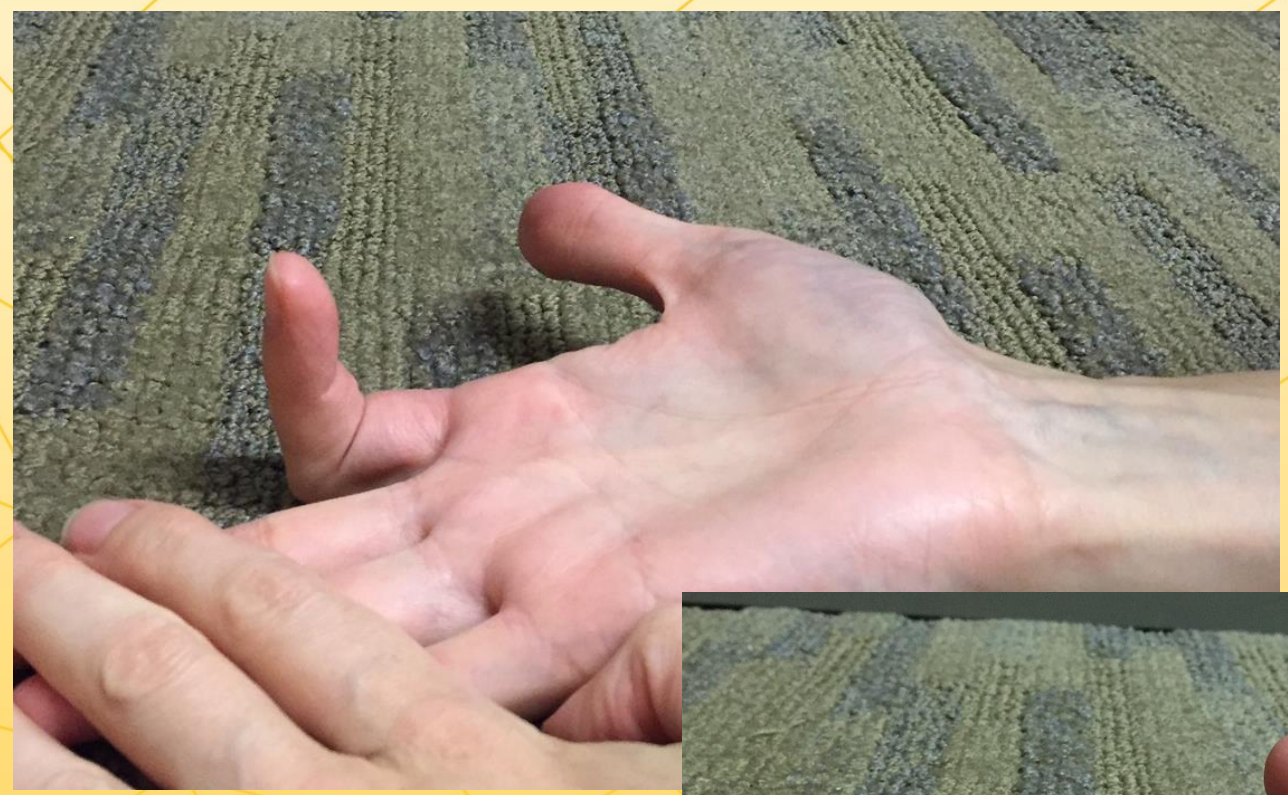
Testing FDS



Testing FDP

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Lacs on the volar finger injure…

Digital nerve	Surgical repair ideally within 10-14 days
Digital artery	One artery: no treatment (but digital nerve is likely cut) Two arteries: dysvascular finger SURGICAL EMERGENCY
Flexor tendon	Surgical repair within 7-10 days

Initial care

- Antibiotics
- Tetanus
- Dorsal block splint
- Primary wound closure
- Arrange follow up with hand surgeon
  - **If you leave follow up to the patient, make sure they understand the importance of timely follow up**

Case example

Transverse laceration over volar long finger just distal to the PIP joint

Finger is well perfused

Unable to flex at DIP or PIP joints

Diminished sensation on ulnar digit

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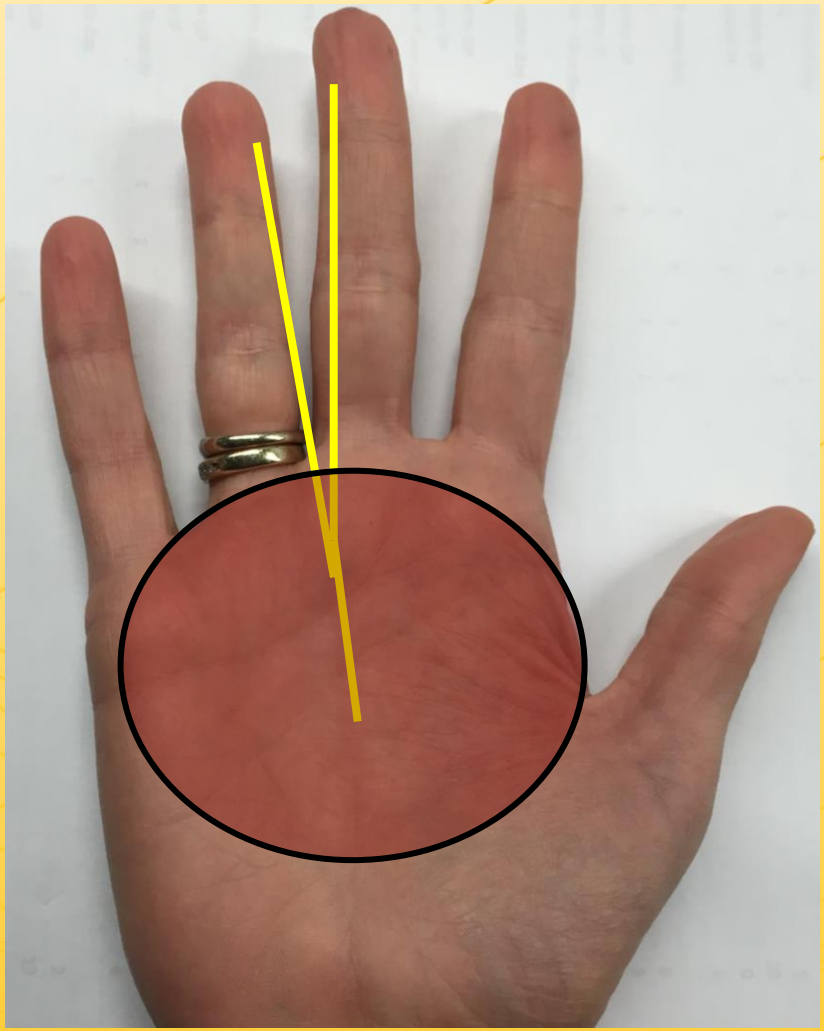
Volar hand- distal to carpal tunnel

- Common or proper digital nerve
- Digital artery- or superficial arterial arch
- Flexor tendon: FDS and FDP

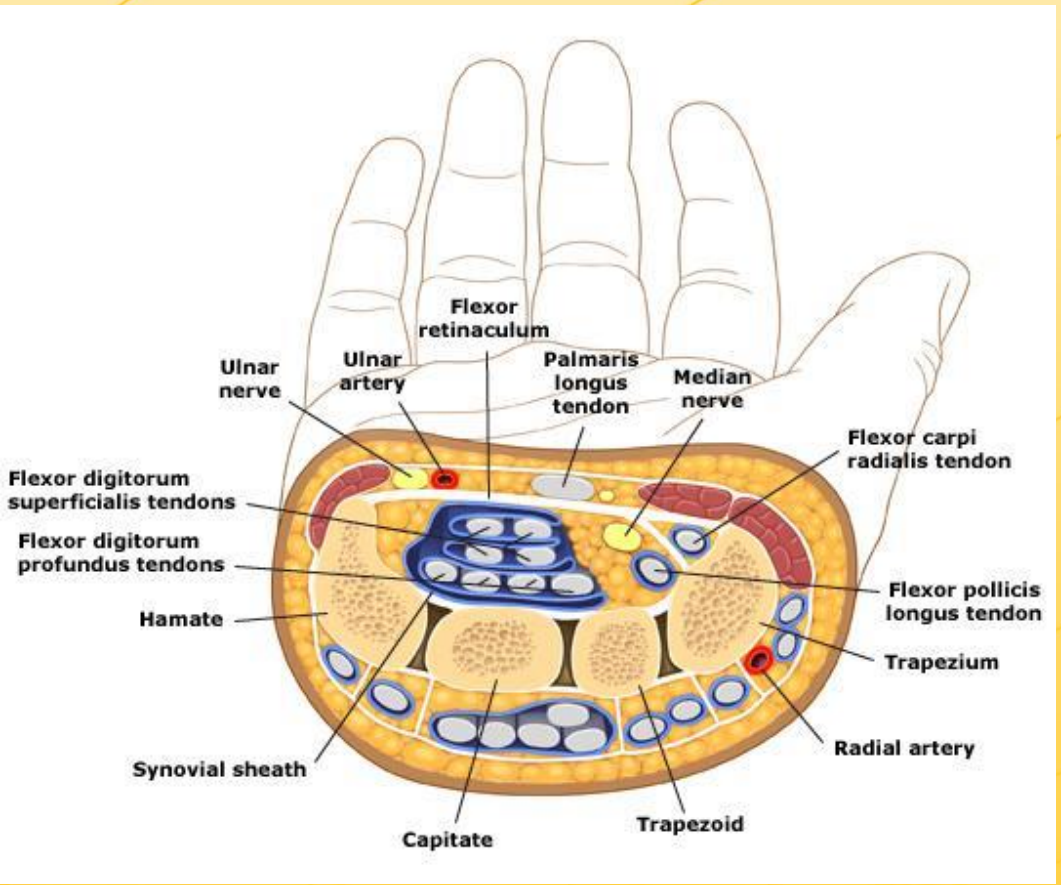


Lacs to the palm injure . . .

Digital nerve	Surgical repair ideally within 10-14 days
Digital artery	One artery: no treatment (but digital nerve is likely cut) Two arteries: dysvascular finger SURGICAL EMERGENCY
Flexor tendon	Surgical repair within 7-10 days

Volar hand- carpal tunnel and proximal

- Median nerve
- Ulnar nerve
- Radial artery
- Ulnar artery
- Flexor tendon: FDS and FDP



RARE TO CUT ONLY ONE STRUCTURE

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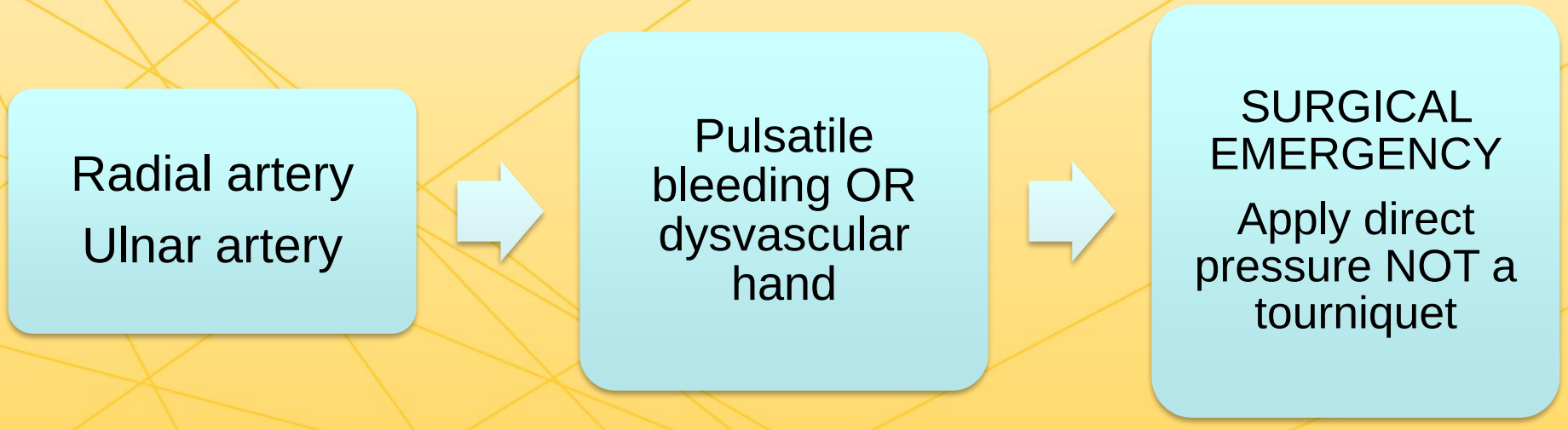

- Rarely injure only the ulnar artery- almost always injure ulnar nerve as well

Median nerve → Lack of sensation over volar thumb, index, long finger → Surgical repair in 10-14 days

- Median nerve injury can result from small puncture wound.
- Partial median nerve injuries are COMMON
- Often associated FDS injury

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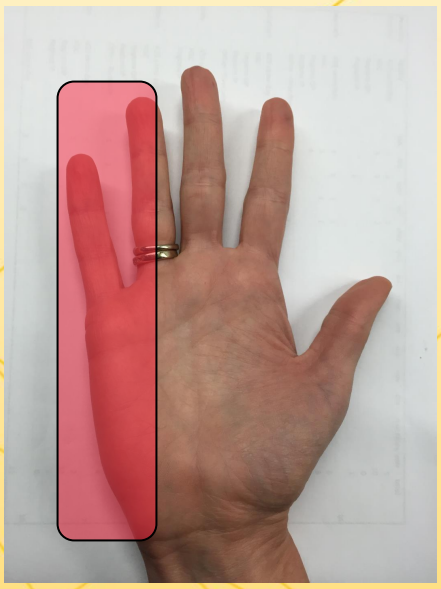

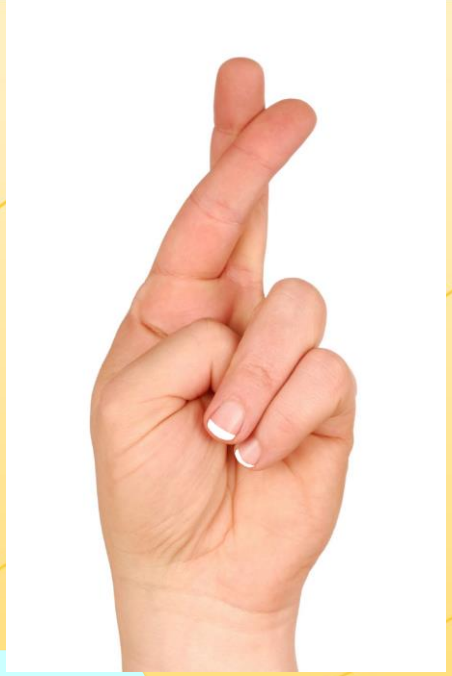

Ulnar nerve

Lack of sensation over small and ring fingers

Inability to abduct/adduct digits (cross fingers)

Surgical repair in 7-10 days

- At this level, can have partial injury of ulnar nerve (either motor or sensory)

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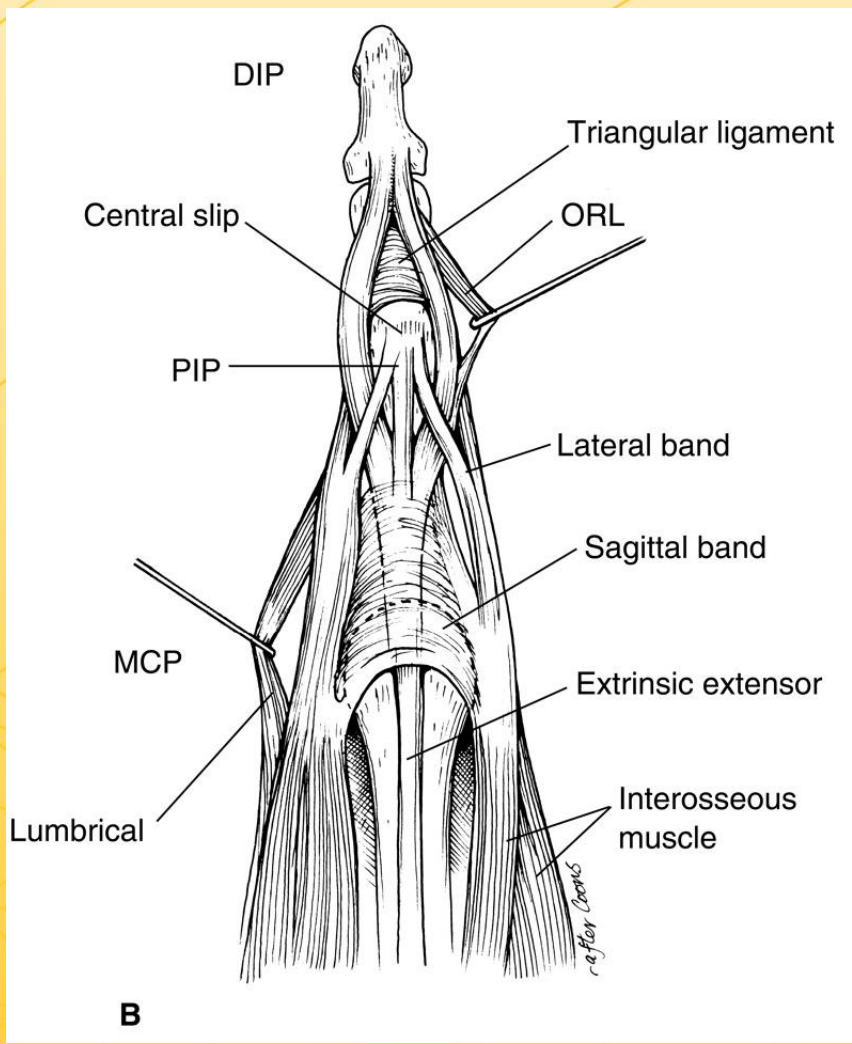
Dorsal finger

- Nailplate/ nail bed
- Extensor tendon



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“Tuft” fractures

- Common tip of distal phalanx fractures, usually from a crushed finger
- Almost never require surgical intervention
- Nail plate acts as splint

Tuft fractures

- Often associated with subungual hematoma
  - DO NOT need to remove the nail plate if it is intact
  - Nail trephination does NOT turn it into an open fracture (does not need antibiotics)
  - Just splint at DIP joint, not PIP joint to prevent finger stiffness

Proximal nailplate sitting on top of nail fold

Nailplate removed and cleaned

Trim the edges of the nail AND the proximal feathery end

Suture repair along edges of finger first,
then nailbed if absolutely necessary
Establish nailfold with elevator.
Irrigate thoroughly

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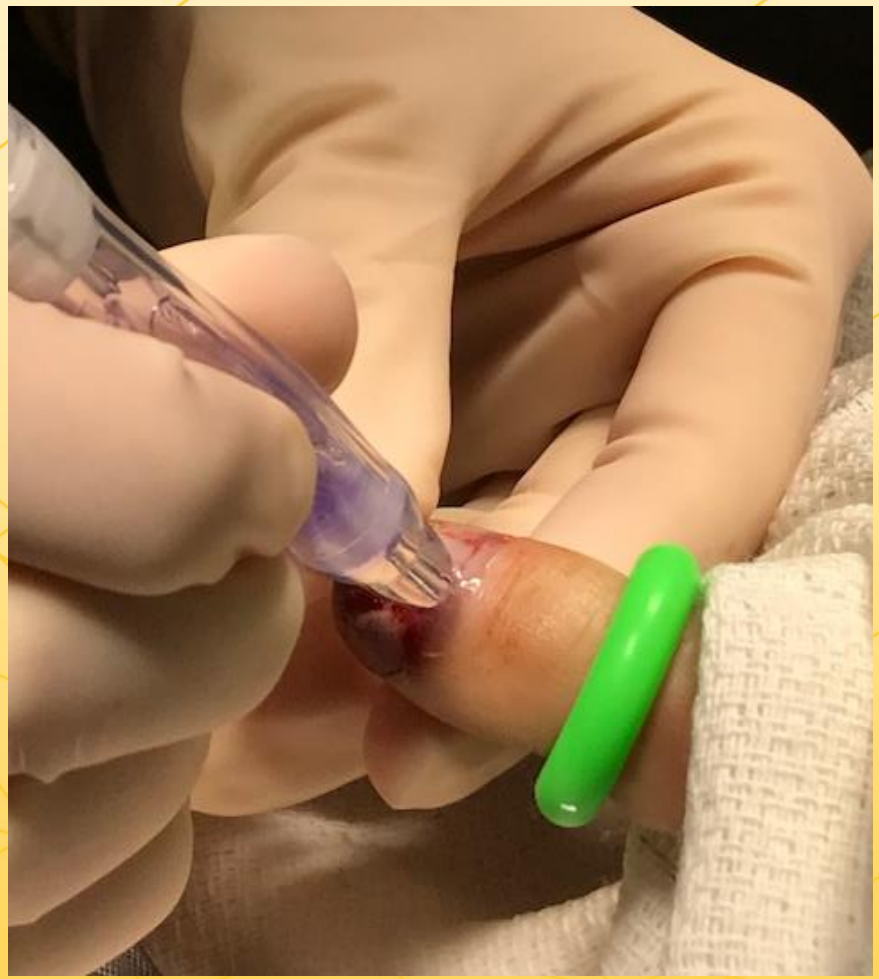
A dot of dermabond on the sterile supporting matrix



Nail plate under the nailfold and dermabond at the fold

Finger tourniquet controls bleeding so dermabond can dry

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Leave tourniquet until the dermabond is dry- but don’t forget to remove it before the patient leaves

Nail under the nail fold

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3 weeks later.

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Seymour fractures

- Pediatric fracture through the physis
- Needs to be washed out within 24 hours, typically in the OR (to facilitate pinning)

  <24 hours → 0 infections

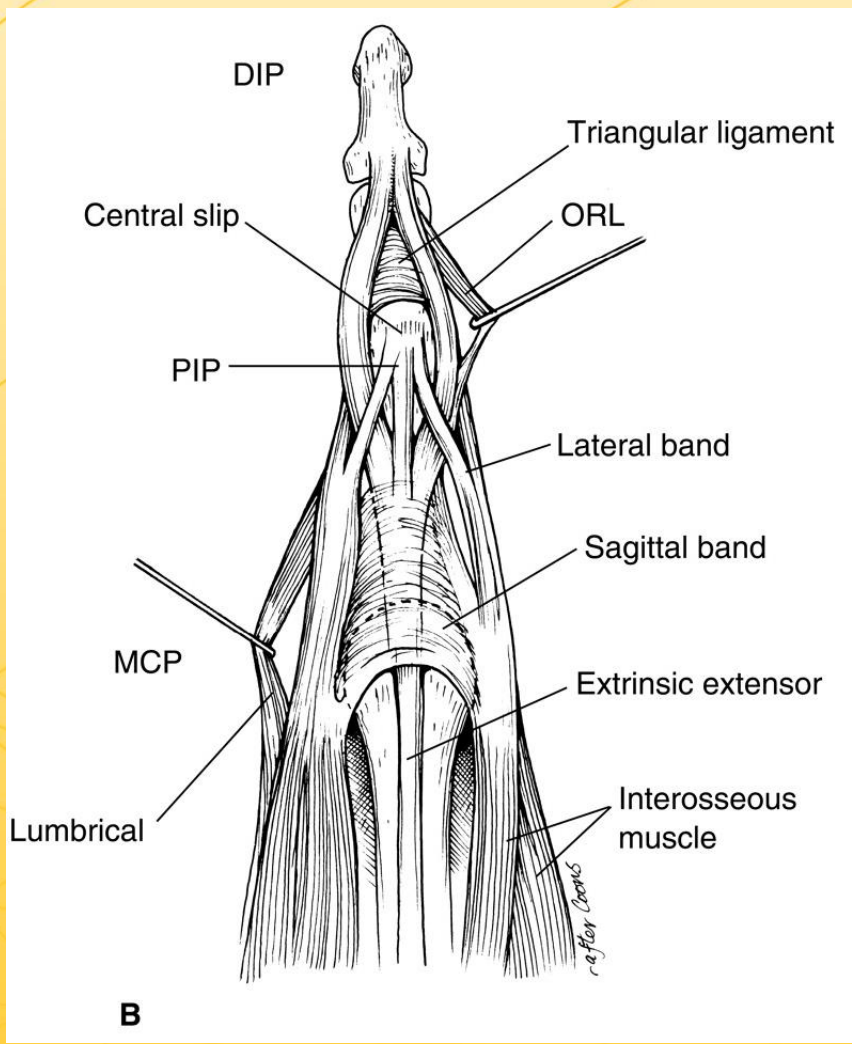
  acute, partial treatment→ 15% infections

  delayed treatment→ 45% infections

Extensor tendons

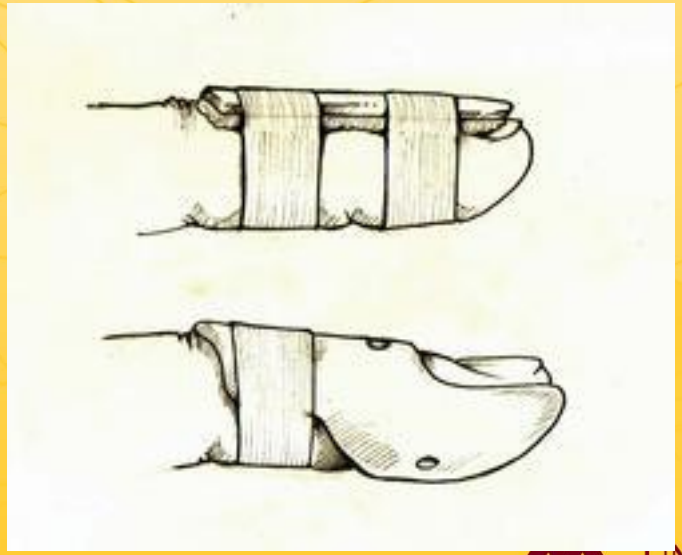
- At the PIP (boutonniere)

- At the DIP (mallet)



Mallet finger (minus laceration)

- disruption of distal end of extensor tendon
- Common even with minor trauma
- Splint with the DIP in extension and the PIP free. FULL TIME SPLINT X 6-8 WEEKS.

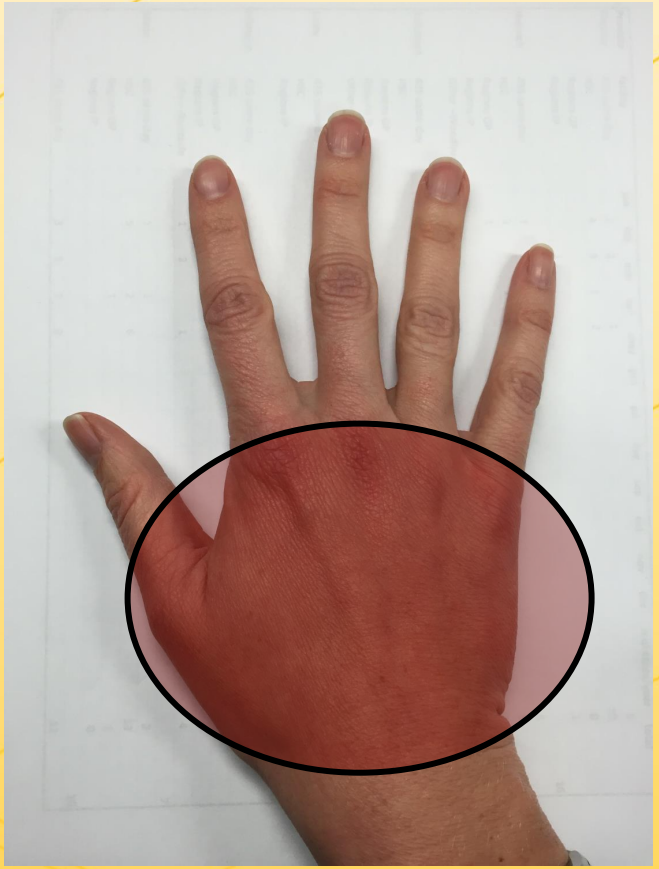


Lacs to the dorsal finger injure…

Subungual hematoma (+/- tuft fracture)	Decompress or nothing
Nail plate disrupted	Same day repair in the office or ER vs f/u in clinic
Extensor tendon	Surgical repair within 7-10 days

Dorsal hand

- Extensor tendon…..
  that's about it



Extensor tendon → Surgical repair within 7-10 days

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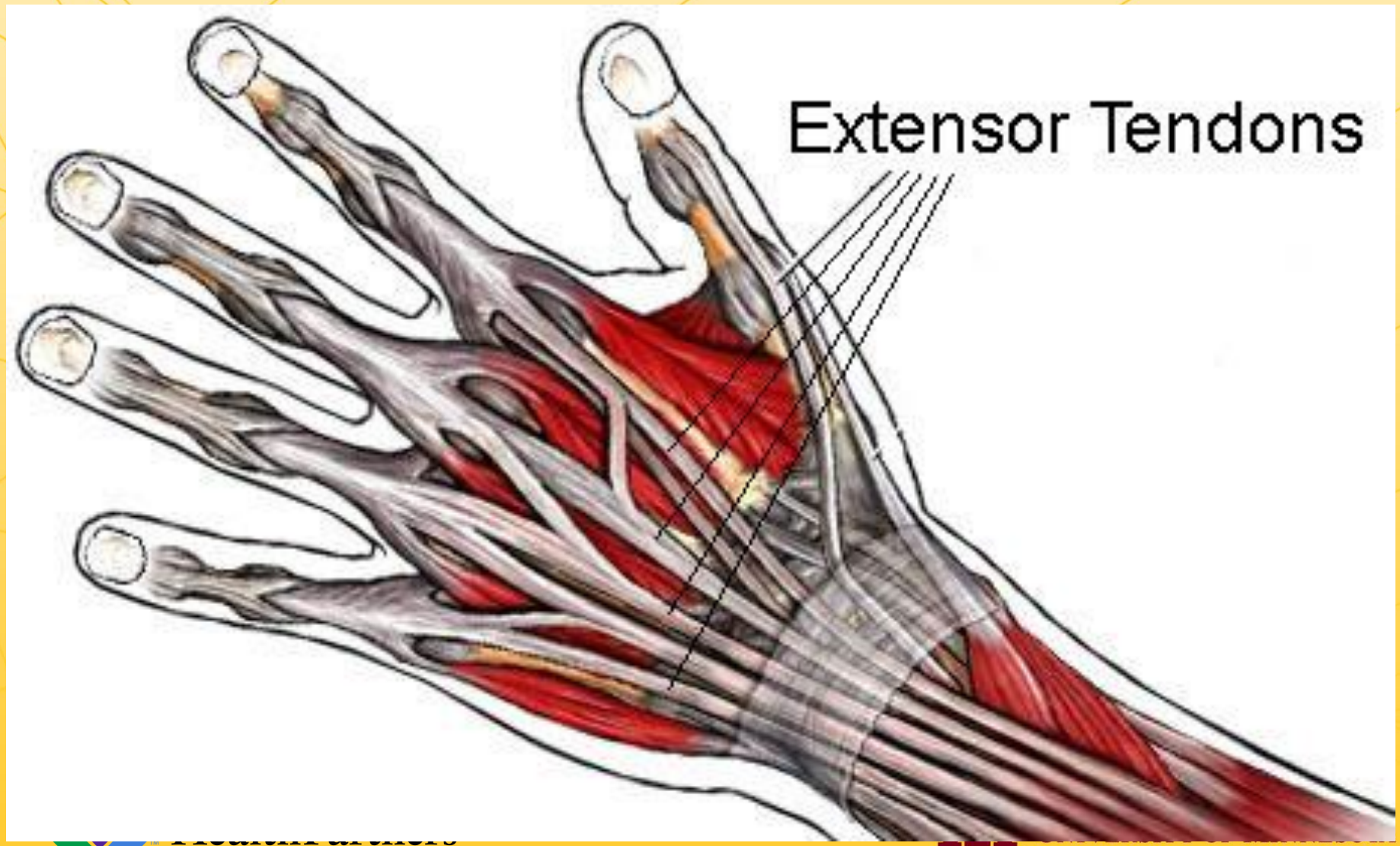
Redundancy of extensors



Initial care (dorsal hand)

- Antibiotics
- Tetanus
- **Splint wrist and fingers in extension**
- Primary wound closure
- Arrange follow up with hand surgeon
  - If you leave follow up to the patient, make sure they understand the importance of time to f/u

A word about fight bites …

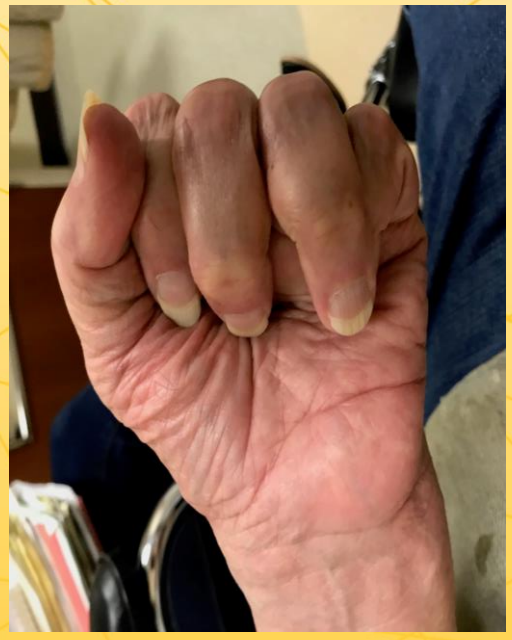
- Small lac over dorsal MP joint from punching someone's mouth
- Extensor tendon typically fully functional
- Needs xrays, good irrigation and debridement, as well as antibiotics

- Volar hand
  - Flexor tendons
  - Median and ulnar nerves, digital nerves
  - Radial and ulnar arteries
- Dorsal hand
  - Nailbed
  - Extensor tendons
  - Fight bite
- If you are uncertain, splint and refer for prompt repeat exam

Proximal and Middle Phalanx Fractures

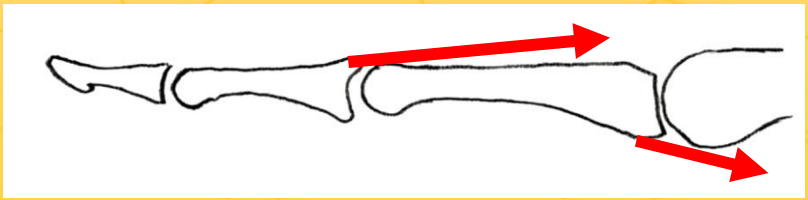
- Challenging to treat
  - Closely applied tendons
  - Requires near full ROM for normal function
  - Malalignment readily visible and impairs function
- Goal: Restore alignment and function

Get off to a good start . . .



Phalangeal base fractures

- Metaphyseal bone
- Often deform into extension (apex volar angulation)
- In older patients more common to have multiple fingers involved



Closed reduction and splinting

- Closed reduction often works well, can be difficult to maintain reduction

- Lucerne cast
  - MP's flexed
  - Allows IP flexion
  - Buddy straps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MS


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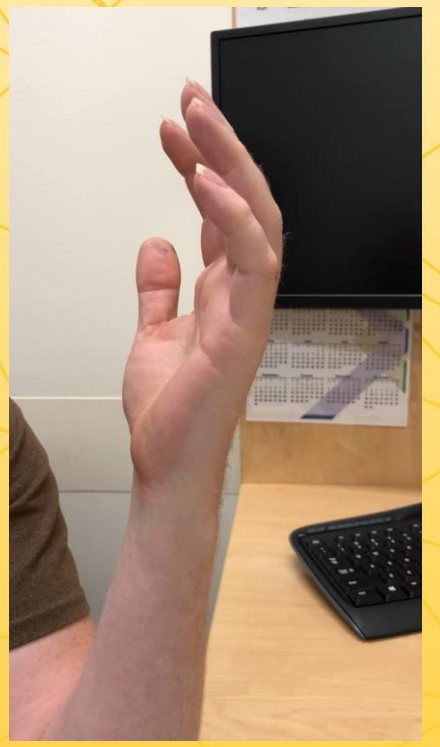
21 days postop, prior to K wire removal

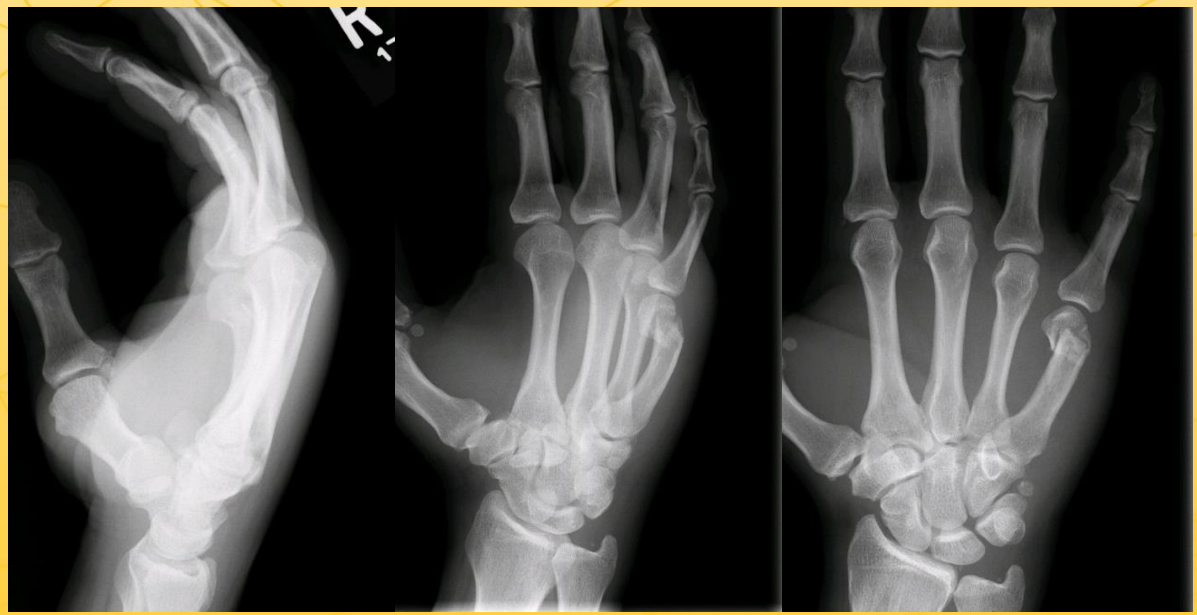


Metacarpal fractures

- **Boxers fractures**
- Spiral oblique fractures
- Transverse fractures
- CMC fx/dislocations

Boxers Fractures

- Most common fracture
- Most often males 15-40 yo



If you don't bother the boxers fracture…

- Closed reduction doesn't help (Pace et al, JHS 2015)
  - Even in kids (if <50 deg, Lee et al HAND 2022)
- Angulation doesn't matter (Ozturk et al, Injury 2008)
- Type of immobilization doesn't matter (unless its making them stiff…)
- Surgery is more expensive (Hooper et al PRS 2020)
  - $2400-3000 for OR, $560 for closed reduction, $261 no intervention

…the boxers fracture won't bother you

Table 2

Outcomes of Fracture Treatment

Study	ROM		Strength		Other Outcome Score	
	Measurement	Treatment Favored	Measurement	Treatment Favore		Treatment avored
Hansen and Hansen[19]	MCPJ	Wrap	NR	NR		Equiv Equiv
Kuokkanen et al[20]	MCPJ	Wrap	Grip	Wrap		Equiv
McMahon et al[18]	MCPJ	Wrap	NR	NR		Wrap Wrap
Braakman et al[16]	Flexion deficit Extension deficient	Wrap Wrap	Pull Torque Pronation Supination	Wrap Wrap Wrap Wrap		NR
Statius Muller et al[17]	MCPJ	Equiv	NR	NR		Equiv Equiv Equiv

Abbreviations: Equiv, equivalent; MCPJ, metacarpophalangeal joint; NR, not recorded; PIPJ, proxi e of motion.

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30's M, fall on ice, desk job

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Metacarpal fractures

- Boxers fractures
- **Spiral oblique fractures**
- Transverse fractures
- CMC fx/dislocations

Table 1. Comparison of Common Operative Fixation Techniques

Technique	Advantages	Disadvantages
Percutaneous pinning	Flexibility in technique and stabilization patterns; minimizes soft-tissue trauma; less expensive materials	Inherently less stable than rigid fixation; achieving reduction can be more challenging than open treatment; pin-site care needed if not buried; infection/pin migration risk
Plate fixation	More rigid and stable construct; open approach may allow better anatomical reduction	Soft-tissue stripping/dissection necessary; more expensive than Kirschner wires; extensor tendon adhesions/attrition; requires adequate soft-tissue envelope
Lag or interfragmentary screws	Rigid fixation with less soft-tissue stripping than plate fixation; less prominent and irritating to extensor tendons	Requires soft-tissue dissection; only ideal for specific fracture patterns (long oblique orientation); not as rigid as plate fixation
Intramedullary fixation	More rigid fixation with minimal soft-tissue dissection; anterograde or retrograde approaches feasible	Rotational control may be difficult; hardware removal may be difficult in the setting of infection or refracture
External fixation	Allows soft-tissue injuries to heal while stabilizing fracture; can span segments of bone loss; provides distraction of joint if needed for reduction (e.g., thumb metacarpal base fractures)	Commercial devices expensive; risk of pin-site infections; pin sites may impede tendon gliding and cause adhesions; prominence of hardware is difficult for activities of daily living

Higgins et al PRS 2017

Spiral Oblique Metacarpal Fractures

- Shortening and rotation is limited by the transverse metacarpal ligament
- Good results with nonoperative treatment in most cases
  - Al Qattan JHS Eur 2008
    - Extensor lag resolves over time
  - Lalonde et al Plast Surg 2014
  - Neumister Clinics in Plastic Surgery 2014
  - Khan and Giddins, JHS Eur 2014

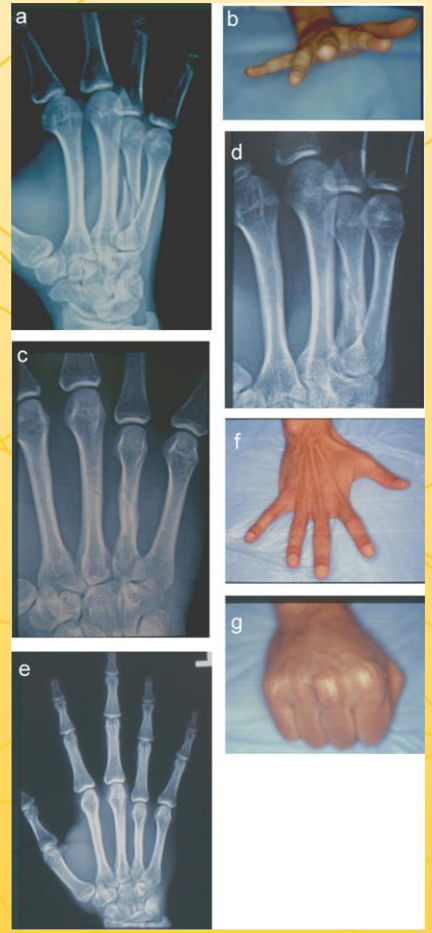

Fig 2 A case with a single metacarpal fracture and minimal shortening: (a) X-ray at the time of presentation; (b) extension lag of the ring finger at 2 weeks (following the removal of the splint); (c, d) X-rays at 6 months; (e) X-ray at 1 year; (f, g) full range of motion of the fingers but the ring finger knuckle is slightly depressed.

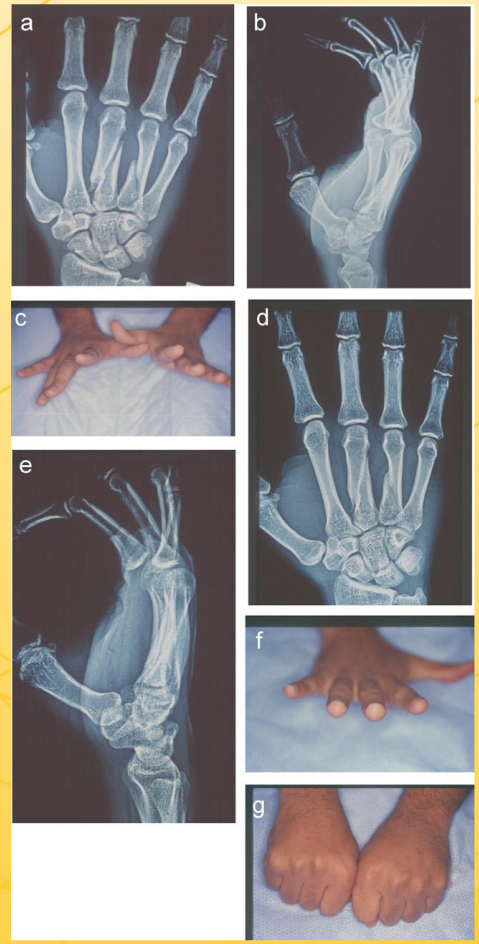

Fig 3 A case with multiple metacarpal fractures and a more pronounced shortening: (a, b) X-rays at the time of presentation. Note that there is no significant angulation. The extension lag at 2 weeks. (d, e) X-rays at 9 months. (f, g) Full range of motion of the fingers but the knuckles of the injured fingers are slightly depressed.

Al-Qattan
2008

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Nonoperative Versus Operative Treatment for Displaced Finger Metacarpal Shaft Fractures

A Prospective, Noninferiority, Randomized Controlled Trial

Fredrik Peyronson, MD, Cecilia Stalberg Ostwald, MD, Nils P. Hailer, MD, Grey Giddins, FRCS(Orth), Torbjörn Vedung, MD, PhD, and Daniel Muder, MD, PhD

JBJS 2023

TABLE III Outcome at the Time of Follow-up*

Outcome	Nonoperative (N = 22)	Operative (N = 20)	P Value
Mean grip strength as a percentage of contralateral hand (95% CI)†	104% (89%-120%)	96% (89%-103%)	0.34
Mean grip strength (95% CI)† *(kg)*	35 (29-42)	43 (37-49)	0.07
No. with grip strength ≥85% of contralateral hand† *(no. [%])*	19 (86)	17 (85)	1
No. with rotational deformity‡	1	3	0.33
Mean radiographic shortening at 6 weeks (95% CI) *(mm)*	5.3 (4.2-6.4); 2 missing values	2.3 (0.8-3.9); 5 missing values	0.004
No. with flexion deficit§	0	1	0.48
No. with extension deficit§	1	1	1
Mean TAM (95% CI)# *(%)*	100.2 (96.8-103.6)	99.1 (95.1-103.1)	0.75
Mean overall satisfaction on NRS, 1-10, 1 = best (95% CI)	1.2 (1.0-1.5)	1.7 (1.3-2.0)	0.08
Mean pain under load on NRS, 1-10, 1 = best (95% CI)	1.2 (1.0-1.5)	1.3 (1.0-1.6)	0.68
Mean cosmetic appearance on NRS, 1-10, 1 = best (95% CI)	1.5 (1.1-1.9)	1.7 (1.3-2.2)	0.41
Mean DASH score, 0-100 (95% CI)	1.6 (0.8-2.6)	2.6 (0.9-5.3)	0.89
No. with revision surgery	0	3	
Mean sick leave duration (95% CI) *(days)*	12 (5-21)	35 (20-54)	0.008

50’s M, injured doing tree work, desk job

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Metacarpal fractures

- Boxers fractures
- Spiral oblique fractures
- **Transverse fractures**
- CMC fx/dislocations

Late teens, ejected from MVA, polytrauma
with B LE injuries, ipsilateral ulna fracture

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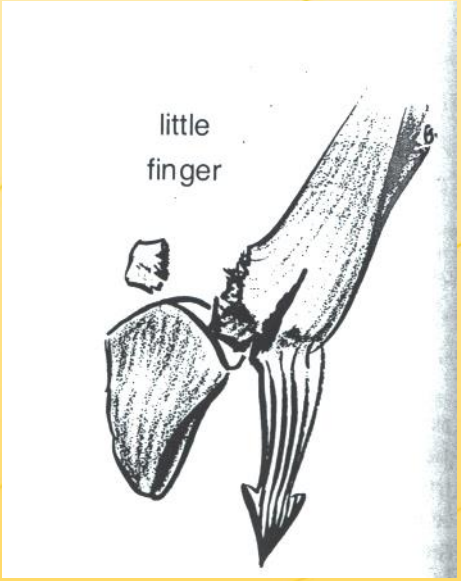
30's F, wedding in two weeks

Metacarpal fractures

- Boxers fractures
- Spiral oblique fractures
- Transverse fractures
- **CMC fx/dislocations**
  - Can be subtle on xray
  - Can involve multiple digits
  - Sometimes reducible and stable closed



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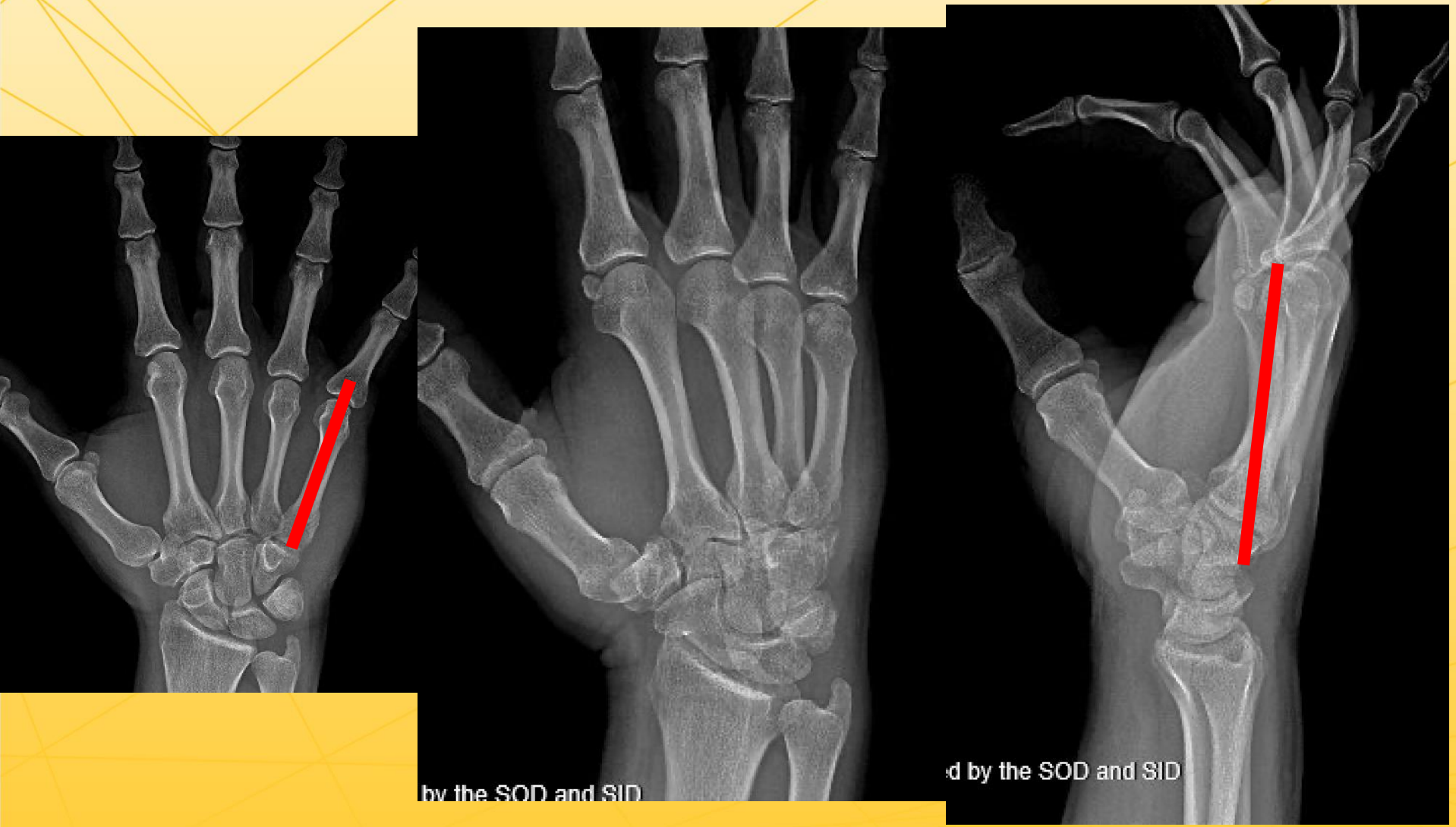

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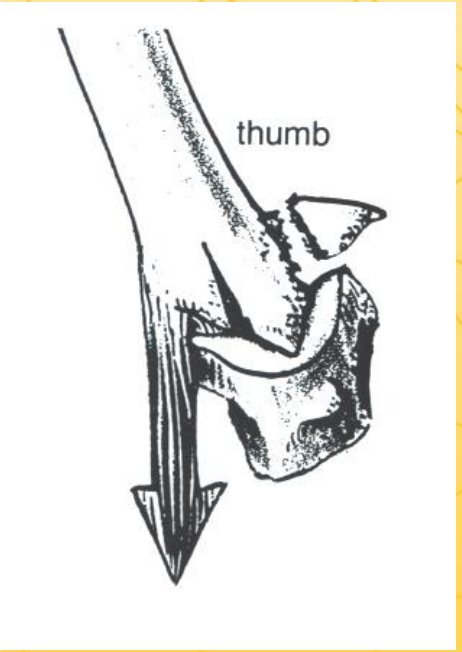
- 19yo male punched brick wall x 2, presented 20 days after injury.

Bennett's fracture



- >2 mm stepoff associated with radiographic arthritis (? Symptoms ?)
- CRPP associated with fewer complications (Langridge et al J Hand Microsurg 2021)

Conclusion

- Don’t forget about nonoperative treatment… oftentimes, less is more
- Motion and function >>> xray appearance
- Maximize early motion when possible

THANK YOU!

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