

# Hand Therapy for the Non-Hand Therapist

■ Rachel Fraser, OTR/L CHT



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## Anatomy

- 27 Bones in the hand
- Carpal Bones, 8
  - Proximal Row
    - Scaphoid, Lunate, Triquetrium, Pisiform
  - Distal Row
    - Trapezium, Trapezoid, Capitate, and Hamate



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Mnemonic:

**She Looks Too Pretty, Try To Catch Her**  
 Scaphoid Lunate Triquetrium Pisiform Trapezium Trapezoid Capitate Hamate

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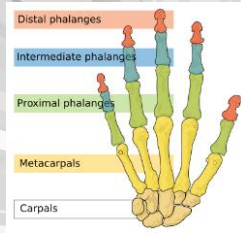
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## Anatomy Bones cont.

- Metacarpals- 5
- Proximal Phalanges- 5
- Middle Phalanges- 4
- Distal Phalanges- 5
- \*Thumb has a proximal and distal phalanx only




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## Joints

- Distal Radio-Ulnar Joint
- Radio-Carpal Joint
- Intercarpal Joint
- Carpometacarpal Joint
  - Thumb common site for OA




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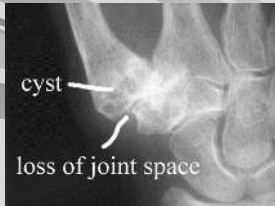
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## 1st CMC OA



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## Joint cont.

- Metacarpophalangeal (MCP) 1-5
- Proximal Interphalangeal (PIP) 2-5
  - Thumb, IP only
- Distal Interphalangeal (DIP) 2-5



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## Ligaments

- Collateral Ligaments
  - Provide Lateral Stability MCP C.L.
    - Slack Extension
    - Taut in Flexion
- PIP Collateral Ligaments
  - Slack in Flexion
  - Taut in Extension



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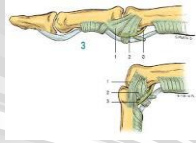
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## PIP Collateral Ligament

- Collateral Ligaments

- PIP Joint

- Slack in Flexion
- Taut in Extension



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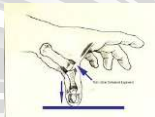
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## Ligaments cont.

- Thumb Ulnar collateral ligament

- Skier's Thumb
- Gamekeepers Thumb



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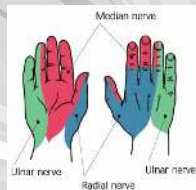
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## Nerves

- \*Think peripheral vs. Dermatomal

- Median
- Ulnar
- Radial



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## Tendons

- Extrinsic vs. Intrinsic
- Flexors
  - Flexor Digitorum Profundus FDP
  - Flexor Digitorum Superficialis FDS
  - Flexor Pollicis Longus FPL
  - Flexor Pollicis Brevis FPB (intrinsic)

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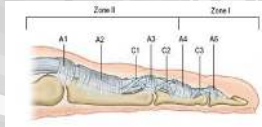
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## Tendons

- Pulley System
  - 5 Annular
  - 3 Cruciate



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## Landmarks

- CMC Joint, Thumb
- 1<sup>st</sup> Webspace
- Distal Palmar Crease, PIP and DIP Crease
- Radial and Ulnar Styloids
- Carpal Tunnel
- Anatomical Snuffbox



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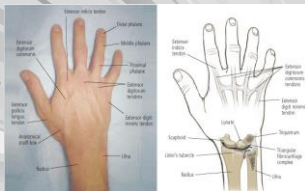
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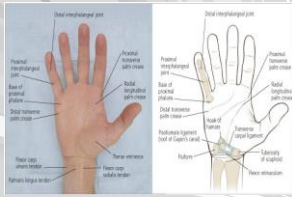
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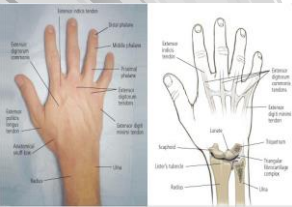
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## Movement

### • Wrist Extension



- 66% occurs between distal radius and carpus
- 34% occurs between proximal and distal carpal row

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## Movement



### • Wrist Flexion

- 40% occurs between distal radius and carpus
- 60% occurs between proximal and distal carpal row

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## Movement



### • Wrist radial deviation

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## Movement



### • Wrist ulnar deviation

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# Dart Throwers Motion

Wolfe, S.



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# Thumb Motion



- Most Important Digit
- Allows for a wide variety of movements

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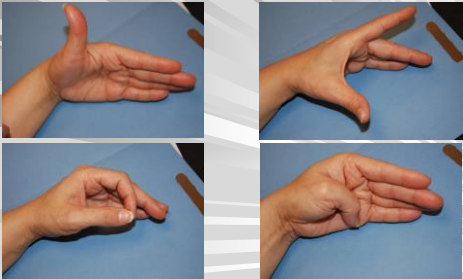
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# Thumb Motion

Most Important Digit - Permits wide variety of movement



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## Finger Motion



- Composite Flexion
- MP Flexion with IP Extension (Intrinsic Plus)
- MP Extension with IP Flexion (Intrinsic Minus or Claw)
- Full Extension
- MP Extension

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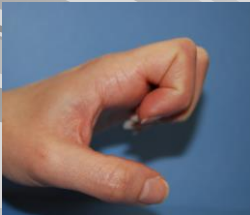
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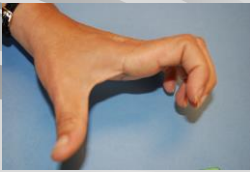
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## Finger Motion



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- Full Extension
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Complex and coordinated action between the **extrinsic flexors** and **intrinsic muscles** is what allows for a functional grasp.

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## Normal Grasp



Extrinsic flexors and  
intrinsic (lumbricals)  
work together to  
allow grasp of object



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## Abnormal Grasp

Loss of lumbrical  
muscles (flex MP and  
extend IP's) leads to  
claw grasp



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## Evaluation & Documentation

### Know Precautions Before Starting!

For some diagnoses, one small move could  
undo the surgical repair or healing tissue.

(mallet finger, PIP dislocation)

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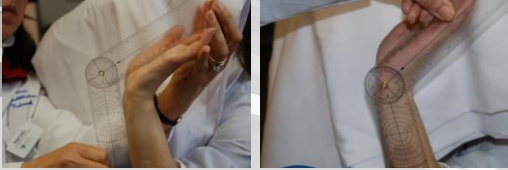
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Evaluation:  
Goniometry



Wrist Extension: Volar    Wrist Extension: Axial

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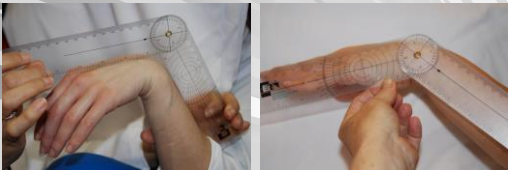
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Evaluation:  
Goniometry



Wrist Flexion: Dorsal    Wrist Flexion: Axial

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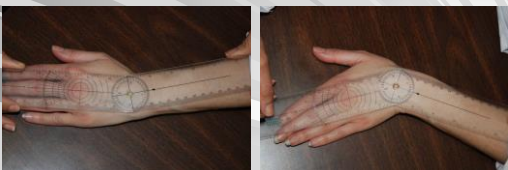
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Evaluation:  
Goniometry



Radial Deviation    Ulnar Deviation

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Evaluation:  
Goniometry



Supination: Watch for shoulder external rotation

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Evaluation:  
Goniometry



Pronation: Watch for shoulder internal rotation

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Evaluation:  
Goniometry

Documenting Finger  
Extension/Flexion

- MCP ext/flex
- PIP ext/flex
- DIP ext/flex

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Evaluation:  
Goniometry  
Documenting Finger  
Extension/Flexion



PIP lack of extension/flexion

55 / 120

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Evaluation:  
Goniometry



FT-DPC Measurement  
(Distal Palmar Crease)

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Evaluation of the Thumb

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## Evaluation Thumb - Video #1



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## Evaluation: Strength - Grip



2<sup>nd</sup> Setting  
Women



3<sup>rd</sup> Setting  
Men

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## Evaluation: Strength - Grip



### Dynamometer

- Elbow by side
- Elbow flexed 90°
- Forearm neutral
- Instruct
- Three trials/average

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## Evaluation: Strength - Grip



Poor Positioning

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## Evaluation: Strength - Pinch



Lateral (Key) Pinch



3-Jaw Pinch



Tip Pinch

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## Scar Tissue

- Can be very problematic
- More than just the incision/laceration line on skin
- Scar Tissue proliferation



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## Scar Tissue cont.

- Evaluation of Scar
- Look
  - Is it flat? Bulky?
- Touch
  - Is it rigid or mobile?



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## Scar Tissue cont.

- Move
  - Push the skin around the scar
- Evaluate Muscles/Tendons
  - Dermoteneses
  - Gently pull scar in opposite direction of tendon glide
  - Does the patient report that it is more difficult to move?
  - Evaluation of tendon glide

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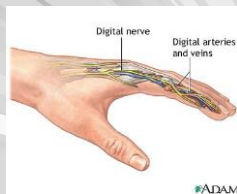
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## Sensation

- 3 Major nerves in the Hand
  - Median
  - Ulnar
  - Radial
- Digital Nerve



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## Sensory Evaluation

- Subjective
- Light Touch Screen
  - Compare left and right
  - Compare different nerve distribution same hand

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## Sensory Evaluation

- Observation
  - Sympathetic Nerve Function
  - Hyperhidrosis
  - Hypohidrosis
  - Wrinkles
  - Color
  - Hair Growth



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## Sensory Evaluation cont.

- Tinel's Sign
  - Distal to proximal
- Phalen's Sign
  - Positive, Strongly?
  - After how many seconds?



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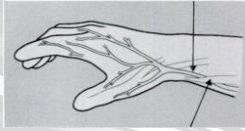
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## Sensory Evaluation cont.

### ■ Superficial Sensory Branch Radial Nerve

- Tight Splint Straps
- Tight Watchbands



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## Sensory Evaluation cont.

### • Semmes-Weinstein Monofilament Threshold Test



### • 2-point Discrimination Test Density Test



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## Video



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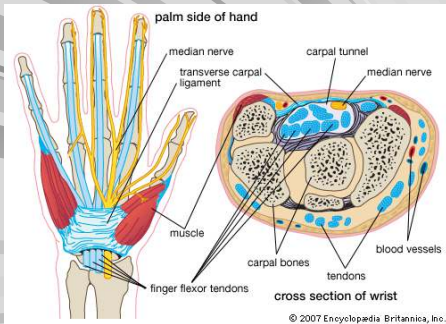
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## Carpal Tunnel Anatomy



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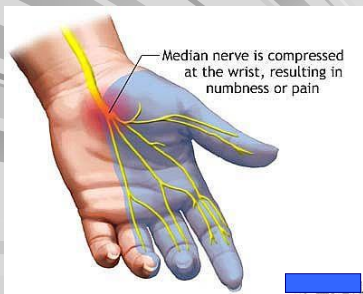
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## Carpal Tunnel Nerve Distribution



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## Carpal Tunnel Thenar Atrophy



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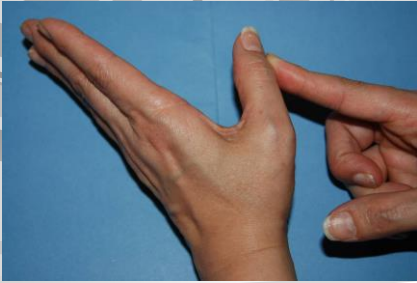
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### Carpal Tunnel Testing Palmar Abduction



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### Carpal Tunnel Etiology

- Sudden trauma
- Wrist fracture
- Crush injury
- Burn
- Constrictive Cast
- Hand Cuffs
- Repetitive and forceful grip
- Vibration

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### Carpal Tunnel Symptoms

- Tingling
- Numbness/Paresthesias
- Pain
- Achiness
- Cramping

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## Carpal Tunnel Symptoms



Driving



Sleeping

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## Carpal Tunnel Provocative Test



Phalens Test



Tinel

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## Carpal Tunnel Other Tests

- NCV/EMG
- Semmes-Weinstein Monofilament
- 2-point discrimination

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## Carpal Tunnel Treatment - Non Operative

- Cortisone injection
- Splinting - night
- Pt ed. /ergonomics
- Median Nerve Glides
- Kinesiotaping



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Lowest pressure in Carpal Tunnel is with wrist in 2° of flexion and 1° of ulnar deviation

Weiss et al, 1995

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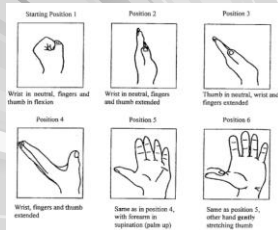
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## Kinesiotaping of Carpal Tunnel



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## Carpal Tunnel Treatment - Non Operative

Frequency of treatment:

Generally 2-4 visits

Twice first week and once/week for two weeks. Longer if stiffness, other factors involved

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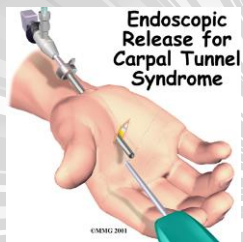
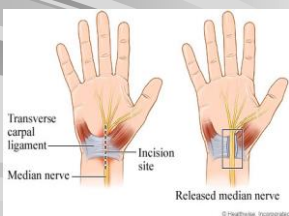
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## Carpal Tunnel Treatment - Post Operative

- OPEN RELEASE
- ENDOSCOPIC RELEASE



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## Carpal Tunnel Treatment - Post Operative

3 days post-op

- Remove bulky dressing
- Gentle AROM wrist and fingers
- Median Nerve Glides
- Edema control
- Pt education/precautions
- Use hand for light activities

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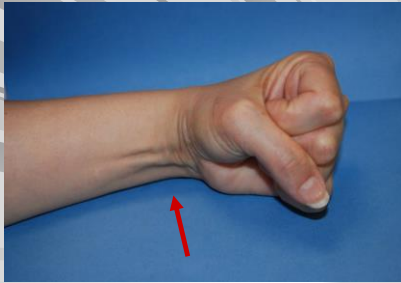
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Avoid wrist flexion with finger flexion



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## Carpal Tunnel Treatment - Post Operative

10 days post-op

- Sutures removed
- Scar massage/pressure pad
- Desensitization
- AROM - isolated tendon gliding 4x/day
- Median Nerve Glides
- Resume light ADL's



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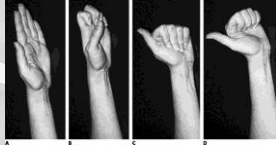
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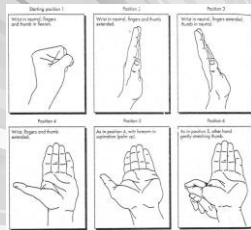
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## Carpal Tunnel Treatment - Post Operative

3 weeks post-op

- Gentle strengthening
  - Soft putty/Nerf ball
  - Wrist in extension
- TENS/E-stim typically not helpful. Aggravates nerve



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## Carpal Tunnel Treatment - Post Operative

4-6 weeks post-op

- Progressive strengthening
- Prepare for returning to work



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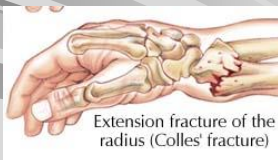
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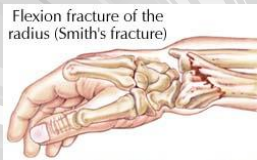
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## Wrist Fractures



Extension fracture of the radius (Colles' fracture)



Flexion fracture of the radius (Smith's fracture)

Colles Fracture

Smiths Fracture

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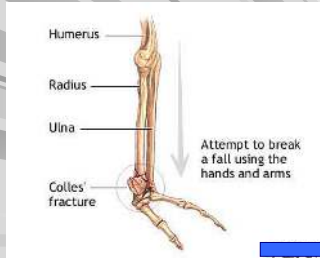
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## Distal Radius Fracture Colles Fracture



**FOOSH**

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## Dinner Fork Deformity



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## Ulnar Styloid Fracture



- 20% of distal radius fractures also involve an ulnar styloid fracture
- Usually not treated any differently
- Small fragments usually left to resorb

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### Closed Reduction Distal Radius Fracture



- Long arm cast for 2 weeks to prevent supination/pronation



- Short arm cast for 4 additional weeks

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### Closed Reduction Distal Radius Fracture

#### GOALS - Early Phase 1-6 weeks post fx

- Edema reduction
- Full finger motion: passive and active
- Maintain proximal motion
- Gentle sup/pro 1/2 range when in short arm cast

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### Closed Reduction Distal Radius Fracture

#### GOALS - Middle Phase 6-8 weeks post fx

- Reduce edema
- Full finger motion: passive and active
- Maintain proximal motion
- Regain A/PROM to all wrist and forearm ranges
- Wean off removable splint by 8 weeks (if directed by MD)

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## Closed Reduction Distal Radius Fracture

### Edema control

- Coban wrap fingers
- Isotoner glove
- Elevation – review day and night positions
- Retrograde massage



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## Closed Reduction Distal Radius Fracture

### Edema control

- Coban wrap fingers
- Isotoner glove
- Elevation – review day and night positions
- Retrograde massage



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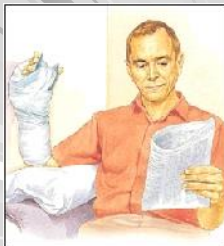
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## Closed Reduction Distal Radius Fracture

### Edema control

- Coban wrap fingers
- Isotoner glove
- Elevation – review day and night positions
- Retrograde massage



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## Closed Reduction Distal Radius Fracture

### Edema control

- Coban wrap fingers
- Isotoner glove
- Elevation – review day and night positions
- Retrograde massage



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## Closed Reduction Distal Radius Fracture

### A/PROM

- Joint blocking
- Individual tendon gliding
- Gentle passive stretch to extrinsic flexors and extensors
- Functional hand activities



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## Closed Reduction Distal Radius Fracture

### A/PROM

- Joint blocking
- Individual tendon gliding
- Gentle passive stretch to extrinsic flexors and extensors
- Functional hand activities



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## Closed Reduction Distal Radius Fracture

A/PROM

- Joint blocking
- Individual tendon gliding
- Gentle passive stretch to extrinsic flexors and extensors
- Functional hand activities



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## Closed Reduction Distal Radius Fracture

A/PROM

- Joint blocking
- Individual tendon gliding
- Gentle passive stretch to extrinsic flexors and extensors
- Functional hand activities



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## Closed Reduction Distal Radius Fracture

A/PROM

- Gentle sustained passive stretch
- IP flexion straps



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## Closed Reduction Distal Radius Fracture

A/PROM

- Gentle sustained passive stretch
- IP flexion straps



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## Video



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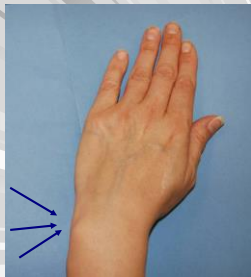
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## Closed Reduction Distal Radius Fracture

Patients c/o pain ulnar wrist upon rotation

Typical- even if no fracture to ulnar styloid



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## Closed Reduction Distal Radius Fracture

GOALS - Late Phase 8-12 weeks post fx

- Maximize wrist A/PROM
- Strengthen wrist
- Strengthen grip/pinch
- Ready for return to work/activity

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■ Correlation between hand strength and amount of wrist extension

- Prayer stretch
- 30 sec. 3-4x/session



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## Closed Reduction Distal Radius Fracture

Late Phase 8-12 weeks post fx

Begin Dynamic Wrist Extension or Flexion Splinting



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Closed Reduction Distal Radius Fracture  
Late Phase 8-12 weeks post fx

Begin Dynamic Forearm  
Supination or  
Pronation Splinting



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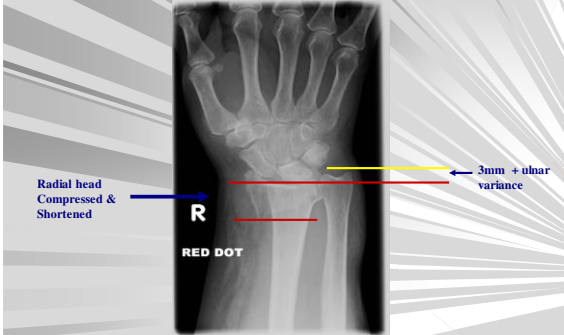
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Open Reduction- Internal Fixation  
Distal Radius Fracture



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Open Reduction- Internal Fixation  
Distal Radius Fracture



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## Open Reduction- Internal Fixation Distal Radius Fracture

### Primary difference between ORIF vs. closed

- Removable splint at 4 weeks
- Begin gentle AROM of the wrist sooner (only at direction of surgeon)
- Expectation of good recovery of wrist AROM
- Strengthening and dynamic splinting same schedule as closed

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## ORIF – Distal Radius Fractures

### Therapy Considerations

Adherence of Flexors in Developing Scar, including the FPL

Assess for adherence and start scar mobilizations and tendon gliding exercises

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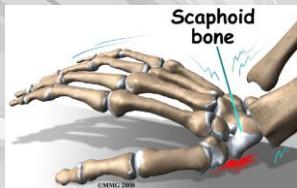
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## Scaphoid Fractures

- Old term: Navicular
- High Energy Fall
- Typically in teens and young adults
- Fx may not be seen on x-ray until 2 weeks post fx
- Poor circulation
- High non-union rate



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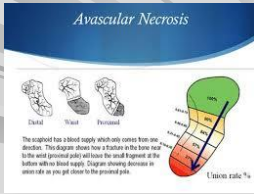
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## Blood Supply to Scaphoid




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## Scaphoid Fractures

- Circulation enter bone distal to proximal
- Blood supply often torn to proximal fragment
- Non-union
- Avascular Necrosis




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## Scaphoid Fractures



- Pain in the anatomical snuff box
- Often fx not diagnosed. Referred to therapy for sprained wrist

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## Scaphoid Fractures



ORIF

fixation with  
cannulated screw

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## Scaphoid Fractures Immobilization Comparison

### Closed

- 0-6 wks thumb spica cast above elbow
- 6-12 wks short arm thumb spica splint
- 12-18 wks removable thumb spica splint

### ORIF

- 0-4wks thumb spica cast above elbow
- 4-8 wks short arm thumb spica cast
- 8-10 wks removable thumb spica splint

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## Scaphoid Fractures

- Goals similar to radius fracture, different time frame
- Expect less stiffness in wrist post immob primarily because of age group
- Injury often occurs in young athletes and you may be pressured by parents to progress faster than recommended.
- No weight bearing on wrists until cleared by MD.
- Follow Doctors Instructions!

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## Scaphoid Fractures

- Expect stiffness of thumb, address with ROM exercises including coordination activities
- Don't start resistance until MD OK's

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## Scaphoid Fractures

Recommend alternative push-ups for all patients with wrist sprains/fractures (for life)



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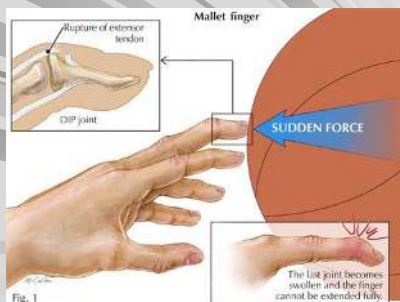
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## Mallet Finger



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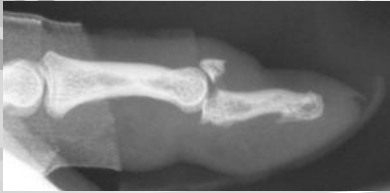
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## Mallet Finger

Tendon injury with occasional bone fragment



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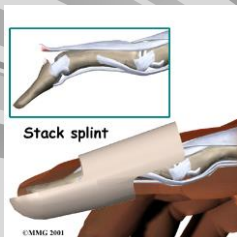
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## Mallet Finger



- Most common treatment is Stack Splint
- May be referred for custom splint
- Immobilized 6-10 weeks - continuous wear

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## Mallet Finger



- Goals:
- 0-8 weeks of immob
  - Maintain uninterrupted splinting of DIP in 10°-15° hyperextension
  - Assure skin maceration dorsal DIP does not occur
  - Full ROM uninvolved digits
  - Ensure compliance with precautions

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## Mallet Finger

### Important

At NO point during the healing process is the DIP joint allowed to drop into flexion. If it does, the splinting time line will start over from day one.

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## Mallet Finger

### Bad Splinting



- PIP hyperextended
- Important not to immobilize PIP in splint
- Mobilizing PIP helps rebalance intrinsic mechanism of finger

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## Mallet Finger



### Poor Splint Positioning

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## Mallet Finger



### Goals:

8-12 weeks

- If no extensor lag may begin gentle DIP flexion out of splint
- Start with 20 degrees DIP flexion
- If no lag develops, increase 10 degrees each week

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## Mallet Exercises

- Blocking exercises and fists encouraging DIP flexion
- 10-15 reps 4-5x/day



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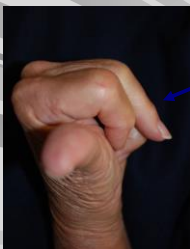
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## Mallet Finger



### Goals:

8-12 weeks

- Slowly wean off splint during day
- Wear splint at night through 12 weeks
- Achieve functional fist with no lag

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## Mallet Finger

- Closely monitor extensor lag and resume splinting if it occurs
- Patient education of utmost importance
- See weekly early on to check splint and skin condition

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## Metacarpal Fractures

- Most common hand fracture, 30-50% of all hand fracture
- Can be managed closed or with ORIF

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## Metacarpal Fracture/ORIF

- Deceptively Difficult
- Especially in the little finger



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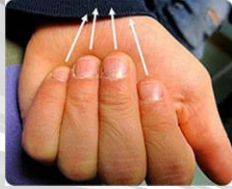
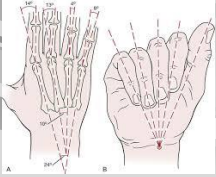
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## Normal Finger Cascade



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## Rotational Deformity



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## Boxers Fracture

- Fracture through the neck of a metacarpal
- Generally occurs when a fistful hand strikes an immovable object



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## Metacarpal Fracture/ORIF cont.

- Why so difficult?
  - Scar tissue/lack of soft tissue
  - Adherence of extensor in scar tissue
  - Extensor lag
    - Definition:  
Passive extension > Active extension



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## Evaluation Metacarpal Fracture

- 1) Scar Tissue
  - Look, Touch
- 2) AROM- all fingers
  - Adjacent digit often affected
- 3) PROM
  - Is there an extensor lag present?
- 4) Do not check grip unless healed



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## Treatment- Metacarpal Fracture

- Thermal Modalities
  - Ice, heat when appropriate
- Tendon gliding exercises (TGE)
  - To improve glide of extensor tendon through scar
  - Helps to hold MCP passively flexed
  - TGE with traction on scar

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## Video



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## Avoid Lumbrical Override During Extensor Gliding Exercises



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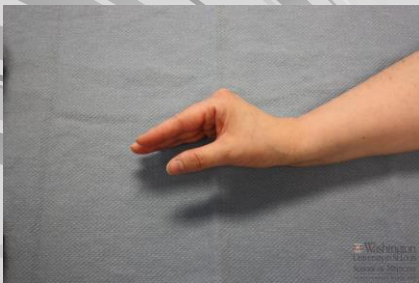
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## Avoid Lumbrical Override During Extensor Gliding Exercises



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## Treatment- Metacarpal Fractures

- AROM
- PROM
  - Careful not to stretch out tendon distal to scar adherence (coban)
  - Watch for PIP flexion contractures
  - Watch for MCP extension contractures
- Scar Massage
- HOME PROGRAM
- Monitor, Monitor, Monitor ROM

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## DeQuervains Tendonitis

- Tendons of 1<sup>st</sup> extensor compartment
  - Abductor pollicis longus
  - Extensor pollicis brevis
- Run under ligamentous tunnel- Extensor Retinaculum



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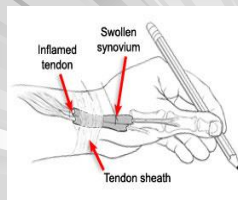
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## DeQuervains Tendonitis cont.

- APL and EPB are wrapped in synovial lining
- Helps the tendons glide through this tunnel easier
- Inflammation of the synovium from shearing force



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## DeQuervains- Causes

- Overuse
- Thumb Abduction/Extension lifting baby/carton juice
- Pinch/Ulnar deviation
- Rotational Twisting



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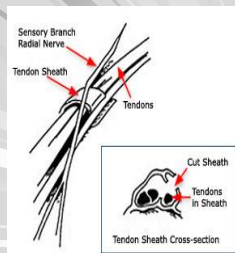
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## DeQuervains- Symptoms

- Pain, especially over radial styloid with provocative movements
- Swelling
- Possible crepitation with tendon glide
- Possible paresthesias; sensory branch radial nerve



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## DeQuervains- Evaluation

- History
- Locate Tenderness
- AROM thumb and wrist
- Finkelstein's Test
  - thumb flexion and ulnar deviation.
- Feel For crepitation along snuffbox area



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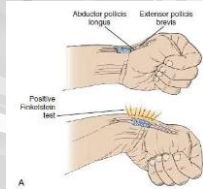
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## DeQuervains - Evaluation

- **Finkelsteins Test**
  - Stretch placed on thickened synovial sheath



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## DeQuervains- Conservative Treatment

- Splints
  - Must include thumb
- Patient education
- Ice
- Ultrasound
- Kinesiotaping



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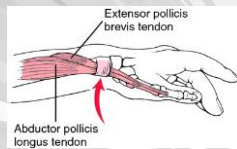
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## Post Operative DeQuervains



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## DeQuervains Post-Op Treatment

- Bulky dressing removed 3-4 days post op and placed in forearm based thumb spica splint
- AROM started at 2 weeks post op. Gentle ROM wrist and thumb with specific tendon gliding exercises for APL and EPB.
- Scar Management techniques
- Grip and Pinch strengthening at 3-4 weeks
- Return to full activity by 6 weeks post op

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## DeQuervains Post-Op Treatment



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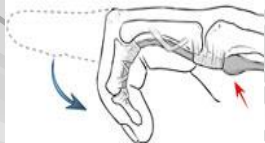
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## Trigger Finger

- Stenosing Tenosynovitis (STS)
- Nodule-like swelling of Flexor synovium
- Catches in pulleys as tendon glides



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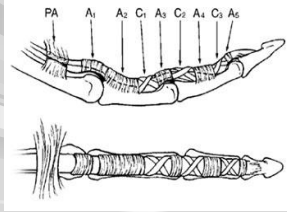
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## Trigger Finger

- Momentarily gets stuck, causing a "pop"
- Generally at A1 pulley



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## Trigger Finger- Causes

- Overuse; repetitive gripping
- Diabetes, Rheumatoid Arthritis
- Sometimes unknown
- Often bilateral or in multiple digits

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## Trigger Finger- Symptoms

- Can be painful or painless
- Can palpate lump or nodule around Metacarpal joint
- Nodule glides with flexor tendon
- Patient feels symptoms mid-finger

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## Trigger Finger- Symptoms

- Symptoms are often worse after activity or 1<sup>st</sup> thing in morning
- Night Splinting



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## Trigger Finger; Non-Operative Treatment

- Tell patient not to test
- Rest, splint
- PROM, gentle AROM
- Ultrasound
- Massage
- Patient Education

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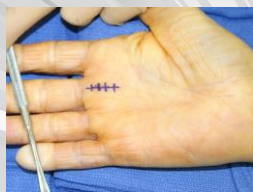
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## Treatment; Post-Surgical Trigger Finger Release

- Scar management
  - ultrasound
  - scar massage
- AROM
  - tendon gliding exercises
- PROM as needed
- Splinting of digit in extension if flexion contracture develops



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## Trigger Finger Release Potential Complications

- Scarring and PIP flexion contractures
- Sensitivity



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## Trigger Finger Potential Complications

- Decreased glide of the flexor tendon



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## Exercises to Regain Flexion



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## Overview

### ■ Clinical Pearls

- Understand diagnosis and surgical procedure
- Understand relevant precautions
- Monitor ROM frequently
- Don't forget about digital extension

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Thank You



[rfraser@charter.net](mailto:rfraser@charter.net)

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