Triaging the Injured Worker

Hand Case Discussions

HAND to SHOULDER CENTER of wisconsin

1

4 hand cases

- Case AT
  - Ulnar Collateral Ligament Tear
- Case JL
  - PIP sprain/fx
- Case TH
  - Pain in arm
- Case YH
  - DeQuervains Tenosynovitis

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Case AT

- 47 yo female who jammed her thumb lifting a wooden object at work
- Outside facility
  - Physical
    - Pain over MCP
  - Differential diagnosis?
  - X-rays were negative
  - Plan
    - Started in PT for 6 weeks
    - Making no progress with PT
    - MRI

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Case AT

- Physical examination demonstrated valgus laxity at full thumb MCP extension and 30 degrees of flexion
- No endpoint noted

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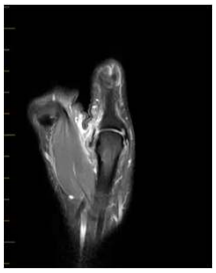
Case AT



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Case AT

- Taken to the OR
  - Thumb UCL repaired

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Case AT

- Post op course
  - Post op dressing 2 weeks
  - Brace 4 additional weeks
  - 6-12 weeks brace for heavy activities
  - 8 weeks strength
  - 3 month return to full duty
    - No permeant disability

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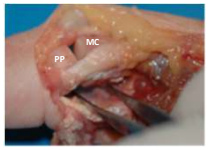
Anatomy



Carlson, et al JHS 2012

- The thumb MCP joint allows flexion, extension, abduction and adduction
- The UCL and RCL provide mediolateral stability as well as dorsal support
- The UCL is 4-8mm wide and 12-14mm in length
- Originates from the dorsal ulnar aspect of the MC head and travels in a distal and palmar direction to the medial tubercle of the PP

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Anatomy

Ritting, et al CJSM 2010

- With the thumb MCP in flexion, the proper collateral ligament (and dorsal capsule) is taut and the accessory collateral ligament (and palmar plate) is relaxed.
- When the joint is held in extension, the accessory collateral ligament (and the palmar plate) is taut and the proper collateral ligament (and dorsal capsule) is relaxed

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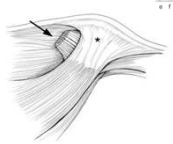
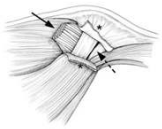
Injury

- Injury to the UCL is caused by abrupt and significant radial stress
- The UCL avulses from the proximal phalanx in approximately 90% of cases
- Midsbustance tears or MC avulsions are much less common
- A Stener lesion is evident when the distal end of the avulsed UCL is displaced proximal to the adductor aponeurosis and is blocked from re-approximation to its anatomic insertion





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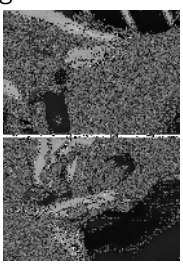
Diagnosis and Evaluation



Ritting, et al CJSM 2010

- Patients with acute thumb UCL injuries present with pain, swelling, ecchymosis and decreased motion
- Evaluation of stability is critical
  - **Grade 1**: sprain with no instability
  - **Grade 2**: incomplete tear with asymmetric laxity
  - **Grade 3:** complete tear with joint instability
- Stability is tested in MP joint flexion (proper) and extension (accessory)

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Diagnosis and Evaluation

- Radiographs are a routine part of evaluation
  - Avulsion fracture
  - Volar subluxation
  - Stress radiography
- Ultrasound can be useful for diagnosing complete tear
- MRI has 100% sensitivity and specificity

Ritting, et al CJSM 2010

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Management

- **Grade 1** and **Grade 2** injuries of the thumb UCL are typically managed with a cast or splint
- Immobilization is maintained for approximately 4-6 weeks
- ROM can be started either after immobilization or immediately if a removable splint is placed

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Management

- **Grade 3** injuries are often managed with surgery, particularly if a stener lesion is present
- Numerous described techniques for repair and/or reconstruction

http://ericksonhandsurgery.com

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Literature Review

Acute Repair for Thumb UCL Injury

- 6 studies have reported clinical outcomes after acute UCL repair
- Difficult to compare results, as numerous techniques reported:
  - Pullout suture over button +/- K-wire
  - Suture anchors
  - Soft tissue periosteal suture
  - Arthroscopic Stener reduction
- Better motion, strength with suture anchors over button or nonop
- Full or near-full strength was restored in all studies

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Case AT

- Learning points
  - Look at the images
  - PT cannot help with a complete ligament tear
- Questions?

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Case JL

- 45 yo female fell at work and "jammed finger"
- X-ray taken
  - Volar plate avulsion fracture
  - Splint
    - Do not remove
    - Follow up in 2-3 weeks

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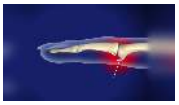
Case JL

- Seen at Hand to Shoulder
  - 2.5 weeks later
  - 15 Degrees of motion at PIP
  - Also stiff at MCP and DIP
- 6 weeks of therapy to resolve stiffness



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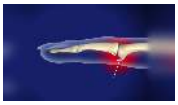
Case JL

- Immediate motion
- Ok to take off for hygiene
- Follow up in 2-3 weeks if WC depending on job duties



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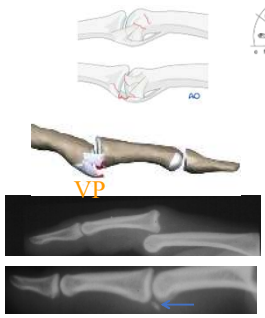
PIP Joint Dislocations

- Dorsal
  - Most common
  - Volar plate rupture
  - Collaterals injured
  - Easily reduced
  - Buddy tape, ROM
  - Dorsal extension block splint if unstable
  - Avulsion fracture – flexion contracture



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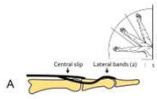
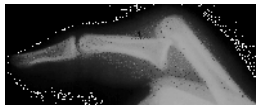
PIP Joint Dislocations

- Volar
  - Less common, central slip disruption
  - If unstable after reduction – pin for 3 weeks
  - Treat to prevent *Boutonniere* – 6 weeks PIP extension splint





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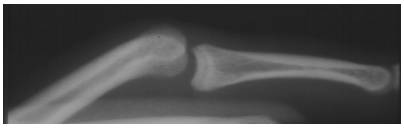
PIP Joint Dislocations

- Rotatory
  - Central slip intact
  - P1 condyle buttonholed between central slip and lateral band
  - Often irreducible by closed means, operative intervention



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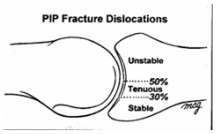
PIP Dorsal Fracture-Dislocations

- Challenging to treat
- "Jammed finger"
- Involvement of P2 articular surface:
  - Type 1 (Stable) < 30%
  - Type 2 (Tenuous) = 30% - 50%
  - Type 3 (Unstable) = > 50%



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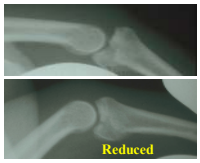
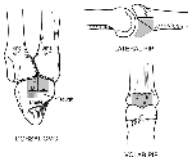
PIP Dorsal Fracture-Dislocations

- Treatment –
  - Dorsal Extension Block Splint if PIP can be reduced in flexion (Type 1 or 2) – decrease flexion every week
  - Type 3 – ORIF, volar plate arthroplasty, hemi-hamate graft
  - Chronic – PIP arthrodesis if not already autofused





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Pilon Fractures

- Even more challenging
- Treat with Dynamic Traction
  - Ligamentotaxis
  - Allow early ROM
  - Expect relatively poor outcome

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Case JL

- Leaning points
  - "Jammed finger" is variable
  - Need to get a good x-ray
- Questions?

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Case TH

- 26 yo security office got her arm caught in a door while dealing with a pysch patient at hospital
  - Oct 2023
- Seen at OSH
  - ER diagnosis contusion
    - X-ray forearm 10/17– Normal
  - Followed up with outside provider
    - Minimal physical exam
    - Treated for 4 months with multiple imaging studies and PT
    - Not working
    - Physical therapist nervous to hurt arm so doing minimal

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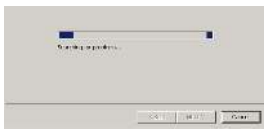
Case TH

- Studies Ordered
  - X-ray forearm 10/17– Normal
  - MRI elbow – 10/20 Normal
  - X-ray wrist 11/14– Normal
  - CT elbow – 11/17 Normal
  - MRI wrist – 11/14 – Possible TCFF perforation
  - EMG – 12/7 Normal
  - US right arm 12/7– Subluxing ulnar nerve



- Only order a study if you are going to do something different

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Good Physical Exam

- Know the anatomy
- Perfusion
- Innervation
- Bones/Joints
- Tendons
- Infection

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Perfusion

- Color
- Turgor
- Temperature
- Capillary Refill
- Doppler

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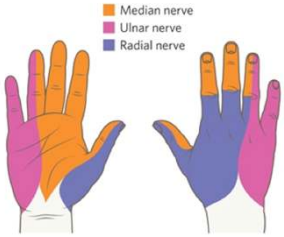
Sensory Nerve Distribution



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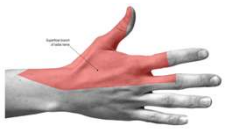
Radial Nerve

- Upper Arm
  - Triceps, Brachioradialis, Anconeus, Extensor Carpi Radialis Longus
- Branches at supinator muscle into
  - Posterior Interosseous Nerve (Motor*)
  - Superficial Radial Nerve (Sensory)



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Posterior Interosseous Nerve

- Abductor Pollicis Longus
- Extensor Pollicis Brevis
- Extensor Pollicis Longus
- Extensor Digitorum Communis
- Extensor Indicis Proprius
- Extensor Digiti Minimi
- Extensor Carpi Ulnaris
- (Extensor Carpi Radialis Brevis*)
- (Supinator*)

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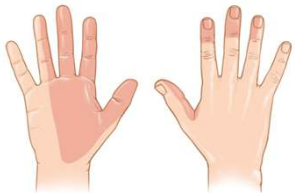
Median Nerve

- Branches at pronator teres
  - Anterior Interosseous Nerve (Motor)
  - Continuation of Median Nerve (Motor + Sensory)



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Median Nerve Proper

- Forearm (no muscles in brachium)
  - Pronator Teres
  - Flexor Carpi Radialis
  - Palmaris Longus
  - Flexor Digitorum Superficialis
- Hand
  - Lumbricals (index and long)
  - Thenar muscles except Adductor Pollicis, ½ flexor pollicis brevis

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Anterior Interosseous Nerve

- Flexor Pollicis Longus
- Flexor Digitorum Profundus (index and long)
- Pronator Quadratus

FIGURE 21-6 Inability to make OK sign in AIN palsy. (Picture courtesy of Ghazi Rayan MD).

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Ulnar Nerve

- Motor and Sensory
  - No Motor Branches in brachium
  - Forearm
    - Flexor Carpi Ulnaris
    - Flexor Digitorum Profundus (ring, small)
  - Hand
    - Hypothenar muscles
    - Lumbricals (ring, small)
    - Adductor Pollicis
    - ½ Flexor Pollicis Brevis
    - Palmaris Brevis

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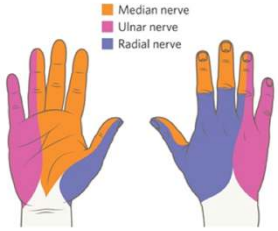
Ulnar Nerve

- Sensory



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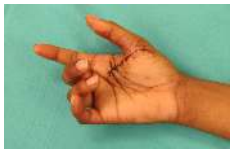
Tendons

- Digital Flexor
- Digital Extensor
- Wrist Flexors/Extensors
- Look at digital cascade



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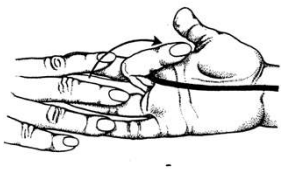
Digital Flexor Tendon Exam

- Flexor Digitorum Superficialis



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Digital Flexor Tendon Exam

- Flexor Digitiorum Profundus

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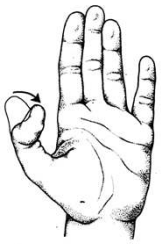
Digital Flexor Tendon Exam

- Flexor Pollicis Longus



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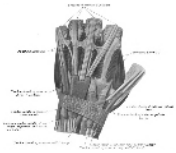
Digital Extensor Tendon Exam



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Extensor Tendon Zones

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Tenodesis Effect

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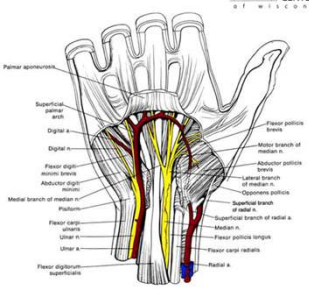
Wrist Flexors

- Weakness in wrist flexion
- Beware of Proximity to other structures



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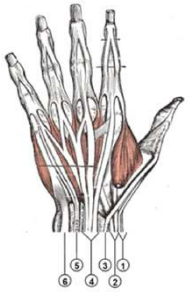
Extensor Tendon Compartments



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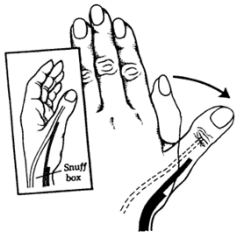
First Extensor Compartment



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Second Extensor Compartment

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Third Extensor Compartment

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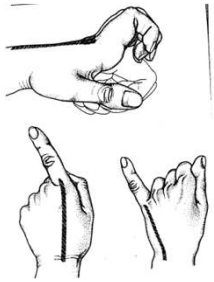
Fourth/Fifth Extensor Compartments



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Sixth Extensor Compartment

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Case TH

Easy

- Care transferred to Hand to Shoulder
  - Told needed nerve fixed along with TFCC perforation
  - 4 months out from injury (chronic pain)
- Intake paperwork
  - Pain in arm, elbow, wrist, hand, index finger, middle finger, ring finger, and small finger
  - Hx of six neck surgeries for pain
- Physical Exam
  - Unable to shake hands
  - Pain throughout whole arm
  - Unable to move arm
- Pt requesting surgery to fix subluxing ulnar nerve and TFCC

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Case TH

- Pt requesting surgery to fix ulnar nerve subluxation and TFCC
  - 15 - 30 % of asymptotic patients have ulnar nerves that sublux
  - 27 % of asymptotic patients under age 30 have TFCC
- Home inspection

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Case TH

- What is pain and where does it live?
  - Rachel Zoffness and Lorimer Moseley
    - Pain psychologist
  - Pain
    - Exists to keep you alive
    - Danger detector
      - Broken leg -> running
    - Found in all parts of the brain
    - All pain is real
  - Biopsychosocial
    - Biological – Tissue damage, genes, diet, exercise
    - Psychological – Thoughts, emotions (crying), behaviors (avoidant behaviors amplify), trauma
    - Social – Family, social environment, religion, access to care
  - Modern Medicine
    - Biological focus

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Case TH

- Is pain all in our body?
  - Phantom limb syndrome
    - If only in the body pain should be gone
  - Congenital insensitivity to pain and anhidrosis (CIPA)
    - Cannot feel pain or sweat
    - Don't live past 25
  - 100 percent of pain is filtered in the brain

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Case TH

- Chronic pain does not solely live in the part that hurts
- Pain is never truly physical
  - Thoughts
  - Beliefs
  - Perceptions
  - Emotions
  - Past experiences
  - Context and input from your body all affect your experience of pain

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A tale of two nails

- Case Study 1
  - 1995 British Medical Journal
    - 29 yo male construction worker jumps and lands on nail
      - 7 inch nails goes through his shoe
    - Coworkers rush him to the hospital
    - In terrible pain he is taken to the ER and given opioids
    - In the ER his shoe is removed, and the nail went between his toes
  - No tissue damage
    - Brain
      - Work environment
      - Five senses
      - Emotions
      - Perceived pain so made pain to protect him

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Case TH

- Case Study 2
  - (Psychosom Med, 2007)
  - Construction worker using a nail gun
    - Gun accidently discharges and hits him in the face
    - He sees a nail hit the wall and has a toothache
  - Six days later continues to have a slight toothache
    - Goes to Dentist
      - X-rays show a nail imbedded in his face
  - Contextual, emotional cues failed to trip alarm

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Case TH

- What does this say about pain?
  - Pain = physical + emotional
  - Pain = sensory input (body/brain) + contextual input (environment)
  - Pain is not an accurate indicator of tissue damage
    - Amount of pain not proportional to degree of tissue damage

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Case TH

- Pain is a guesstimate
  - Your brains best guess as to whether your body requires protection and how much (Moseley and Butler)
  - Sum total of all available information from your internal and external environments, is critically important to pain processing, and always informs your experience of pain
  - Pain is never purely biological, due exclusively to issues like tissue damage and anatomical dysfunction. It is also emotional, social and cognitive, constantly influenced by thoughts, perceptions, emotions, and context (Bushnell et al, 2013)

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Case TH

- "Pain Dial" in CNS

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Case TH

- "Pain Dial" in CNS
  - 3 things change pain volume
    - Stress
    - Mood
    - Attention
  - Dial up:
    - High stress/anxiety, negative thoughts, low mood, attention on pain -> poor coping, avoidance, decrease sports activities - > dial UP -> pain worse, lasts longer
  - Dial down:
    - Appropriate coping skills -> decreased avoidance, increase activities, improved mood, decreased stress/anxiety - > dial DOWN - > pain less, shorter duration

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Case TH

- Hurt vs Harm
  - Used interchangeable
  - Hurt – Is the physical pain which can and cannot involve harm
  - Harm – Is actual physical bodily damage

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Case TH

- Discussed findings with the patient
  - Recommended trauma/pain psychology provider
    - Pain coach
    - CBT therapy
  - Pain education
    - Emotions are physical (crying, butterflies)
    - Biopsychosocial model
    - Scared and avoidance
  - Physical therapy with new provider
  - Pt requested a second option because she needed surgery

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Case TH

- Learning points
  - Hurt vs Harm
    - Start with a good physical exam
    - Limit testing
  - Return to work early
  - Transfer to arm surgeon early
- Questions?

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Case YH

- 43 yo factory worker with radial sided wrist pain
  - 2 months of symptoms
- PE:
  - Pain over 1st dorsal compartment
  - Positive Finkelstein's test
  - Differential diagnosis (trigger finger/CMC arthritis)
- Dx:
  - Right wrist De Quervains

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De Quervain's Diagnosis

- Tenosynovitis of 1st extensor compartment
- Racket sport athletes, golfers, new mothers
- Dorsal-radial wrist pain and swelling
- Crepitus, fullness, may be associated ganglion cyst
- Weakness with lifting

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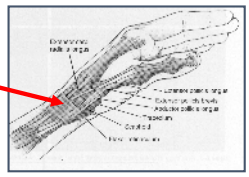
De Quervain's Treatment

- Thumb spica
- NSAID
- Activity mod.
- Injection
- Release if Sx persist
  - Multiple slips of APL
  - Separate EPB compartment
  - Radial nerve irritation / injury common



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Case YH

- Treated at outside facility
  - 6 weeks of OT/PT
  - Thumb spica
- Failed treatment so sent to Hand to Shoulder
  - Confirmed diagnosis
  - Injection – 4 weeks of relief
  - Symptoms returned
  - Taken to the OR for first dorsal compartment release

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Case YH

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Case YH

- Post op
  - Soft dressing
  - No PT/OT
  - Return to full duty at 1 month
  - No PPD

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Case YH

- Questions?

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Thank You

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