

# **Can this be fixed?**

## **Assessment and management of common hand/wrist/elbow conditions**

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**Outpatient Occupational Therapy**

# Learning Objectives

- Review physical examination of the upper-extremity, focusing on wrist/hand
- Understand common hand/wrist/elbow conditions: presentation and diagnostic pearls
  - Compression Neuropathies
  - Tendonitis + Tenosynovitis
  - Osteoarthritis
  - Inflammatory Arthritis
- Describe conservative treatment options and reasons for surgical referral



# Physical Examination

## Upper-Extremity Assessment



# Upper Extremity Physical Examination Components

- Observation
  - Alignment
  - Lumps, bumps and nodules
  - Atrophic changes
  - Behaviours: avoidance, neglect, protective
- ROM
  - General upper extremity scan
  - Objective measures using goniometry
- Edema
- Strength
  - Grip/pinch strength
  - Manual muscle testing
- Sensation
  - Protective vs. discriminative
- Occupational Performance Assessment
  - Self-care, productivity, leisure ADLs
  - Assistive devices/adaptations?

# Compression Neuropathies

## Carpal Tunnel Syndrome

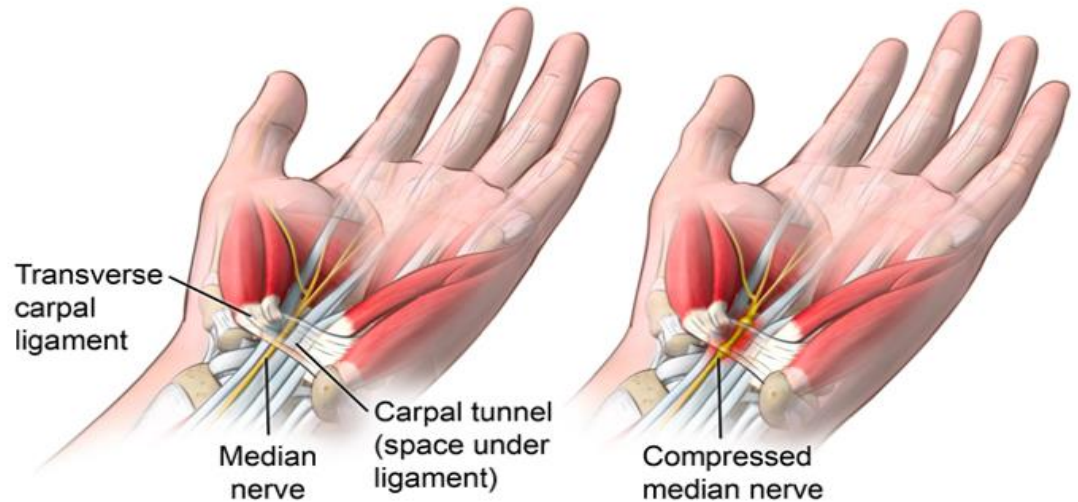


# Compressed Median Nerve

Tingling & Numbness  
Caused by Median Nerve Injury



- Sensory
  - 3.5 radial digits
- Motor
  - Recurrent branch
  - Thenar muscles



Normal carpal tunnel

Median nerve compressed  
in the carpal tunnel

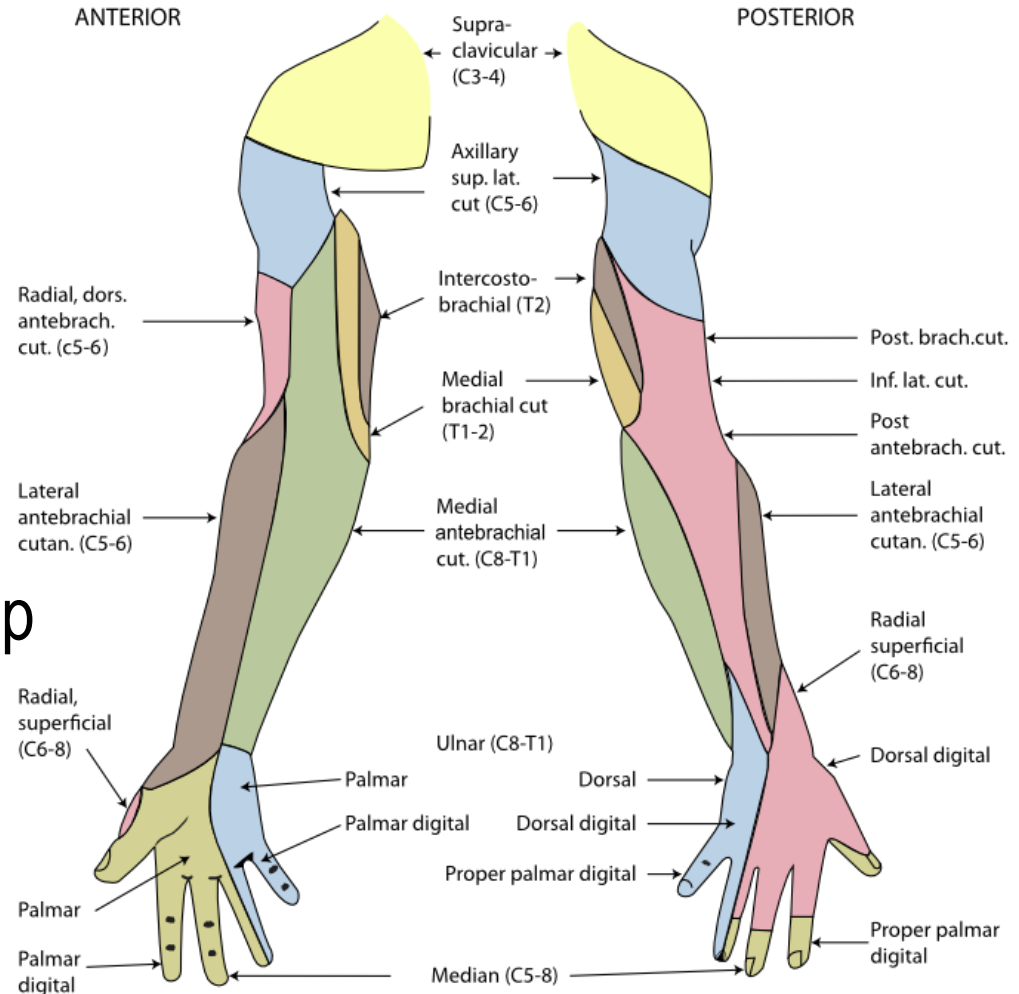
# Carpal Tunnel History

- Age
- Gender
  - Women > Men
- Smoking
- Diabetes
- Thyroid Disease
- Cervical disk disorders and thoracic outlet syndrome
- Rheumatoid Arthritis
- Obesity
- Renal Dialysis
- Repetitive Motion
- Pregnancy

# Carpal Tunnel History

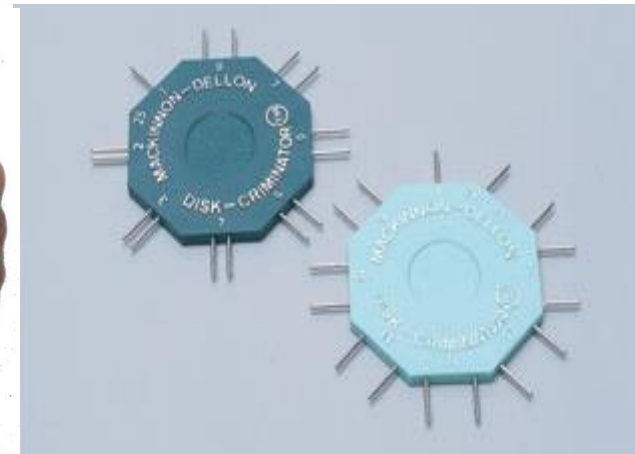
- Duration/Severity
- Intermittent or Constant Numbness
- Location of Numbness
- Night paresthesias
- Weakness of pinch or grip
- Pain

**Important information for referral to surgeon!**



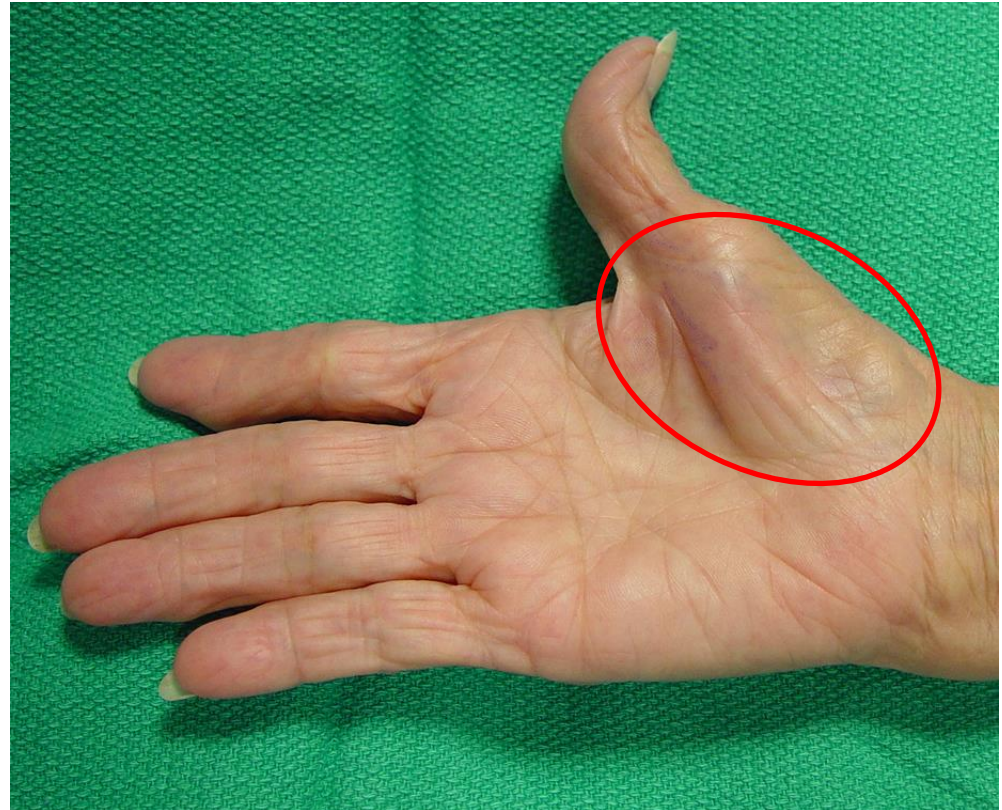
# Carpal Tunnel Clinical Exam

- COMPARE with the OPPOSITE hand or UNINVOLVED Digits
- Sensory:
  - Sensory radial 3.5 digits
  - Light touch
  - Static or Dynamic 2 point discrimination (4mm)
  - Sensation to base palm normal (palmar cutaneous branch unaffected)

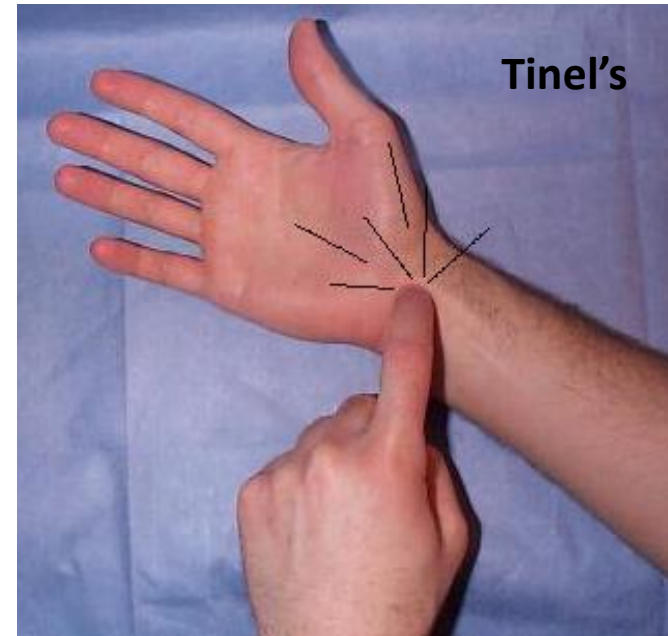


# Carpal Tunnel Clinical Exam

- COMPARE with the OPPOSITE hand or UNINVOLVED Digits
- Motor:
  - Thenar muscle atrophy
    - Abduct the thumb and palpate the thenar muscle
  - Thenar muscle strength
- Specific Tests for Compression:
  - Phalen's
  - Pressure Provocative Tests
  - Tinel's



# Carpal Tunnel Exam



- Hold for 1 minute

# Electrodiagnostic Studies

- WHY?
  - Diagnosis is uncertain
    - Cervical Arthritis
  - Cause is uncertain
    - Diabetic neuropathy
- WHAT?
  - Nerve Conduction Velocity
  - Focal Conduction Delays
- WHEN?
  - Axonal degeneration
  - If severe -> no sensory action potential recorded
- WHO?
  - 10-15% of patients with CTS have normal nerve conduction velocities

NCS does **not** change probability of diagnosing CTS to an extent that is clinically relevant

(Graham, B., 2008)

# **Non-Surgical Treatment**

# Prior to Plastic Surgery Referral

- Splinting for 3 months
  - Properly fitted, neutral wrist
- Avoid **or modify** activities that aggravate the CTS
  - Eg. Cycling, vibrating tools (hammer, sander, etc.)
- Anti-inflammatory
- REST
- Electrodiagnostic tests



# Splinting

- Wrist splint used at night in neutral position
- Caution wearing neutral splint for activity – incompatible!
- Commercially available vs. custom thermoplastic splints



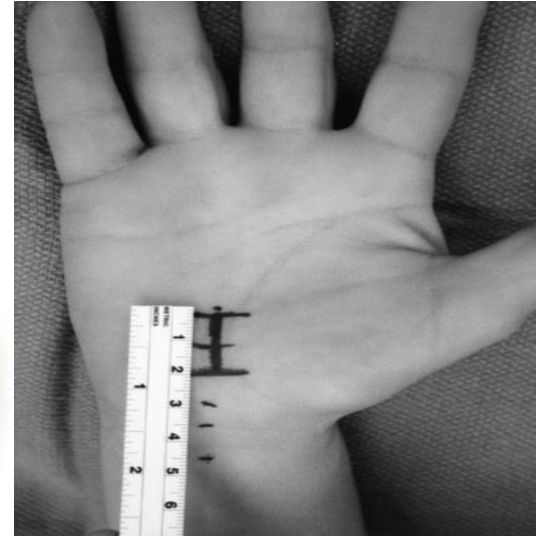
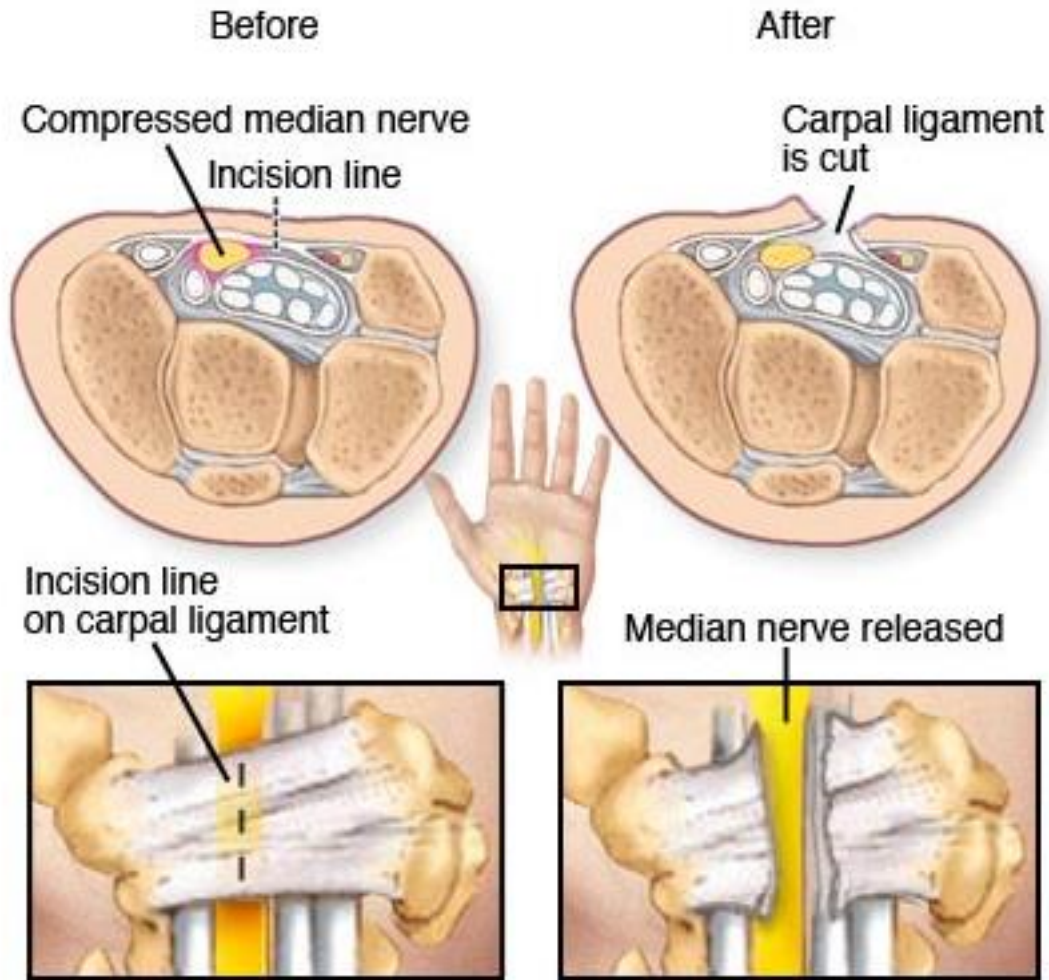
# Key splint features

- Neutral wrist
- Correct size (not too loose)
- Avoid compression at wrist
- Referral to Occupational Therapist/Hand Therapist if need customized thermoplastic splint



# **Surgical Treatment**

# Carpal Tunnel Release



# Compression Neuropathies

## Cubital Tunnel Syndrome

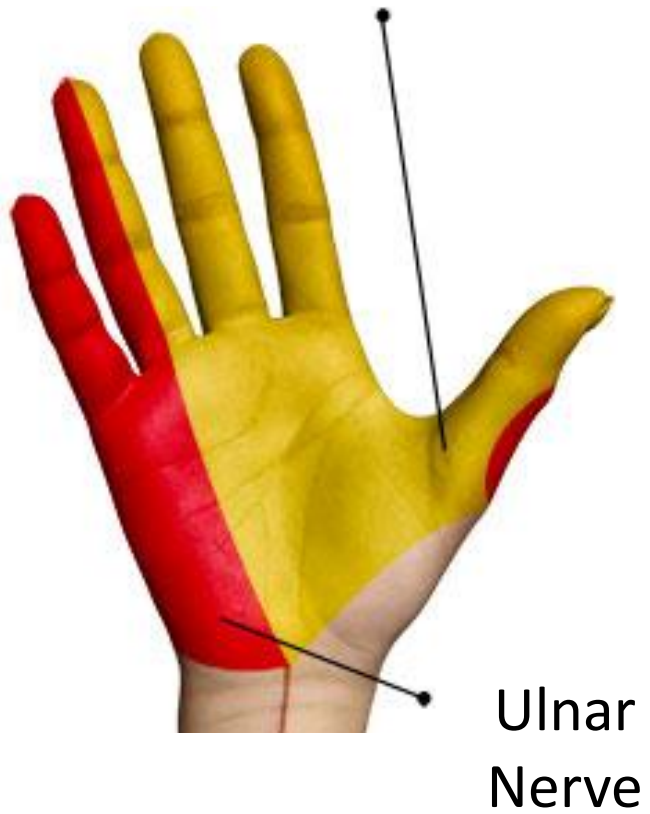


# Cubital Tunnel: History

- Sensory complaints
  - Ulnar side of forearm
  - Ulnar 1.5 digits
- Activities - prolonged elbow flexion
- Trauma - supracondylar fracture
- Tumour



# Sensory Distribution

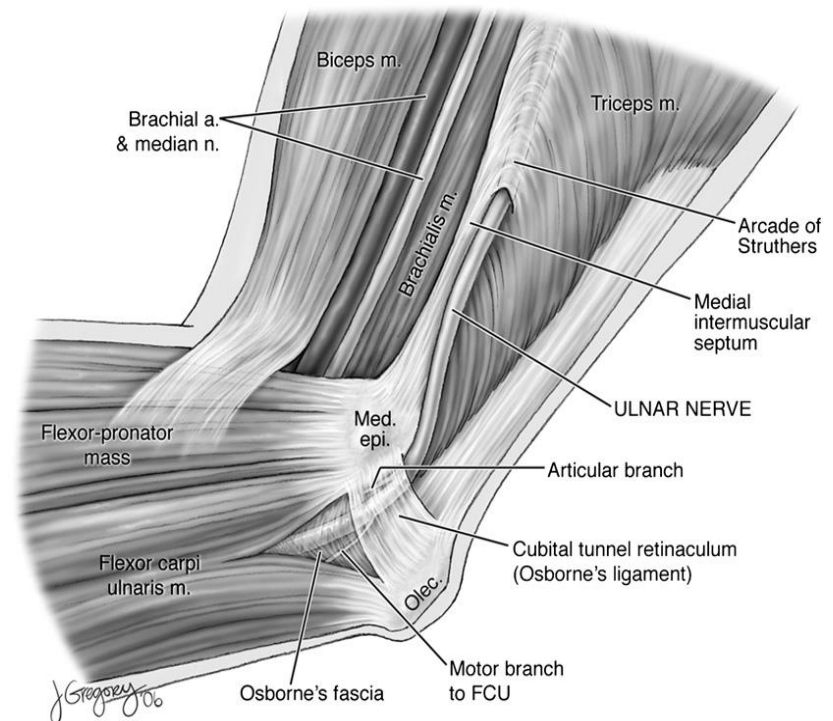


- Sensory
  - Ulnar side of forearm
  - Ulnar 1.5 digits



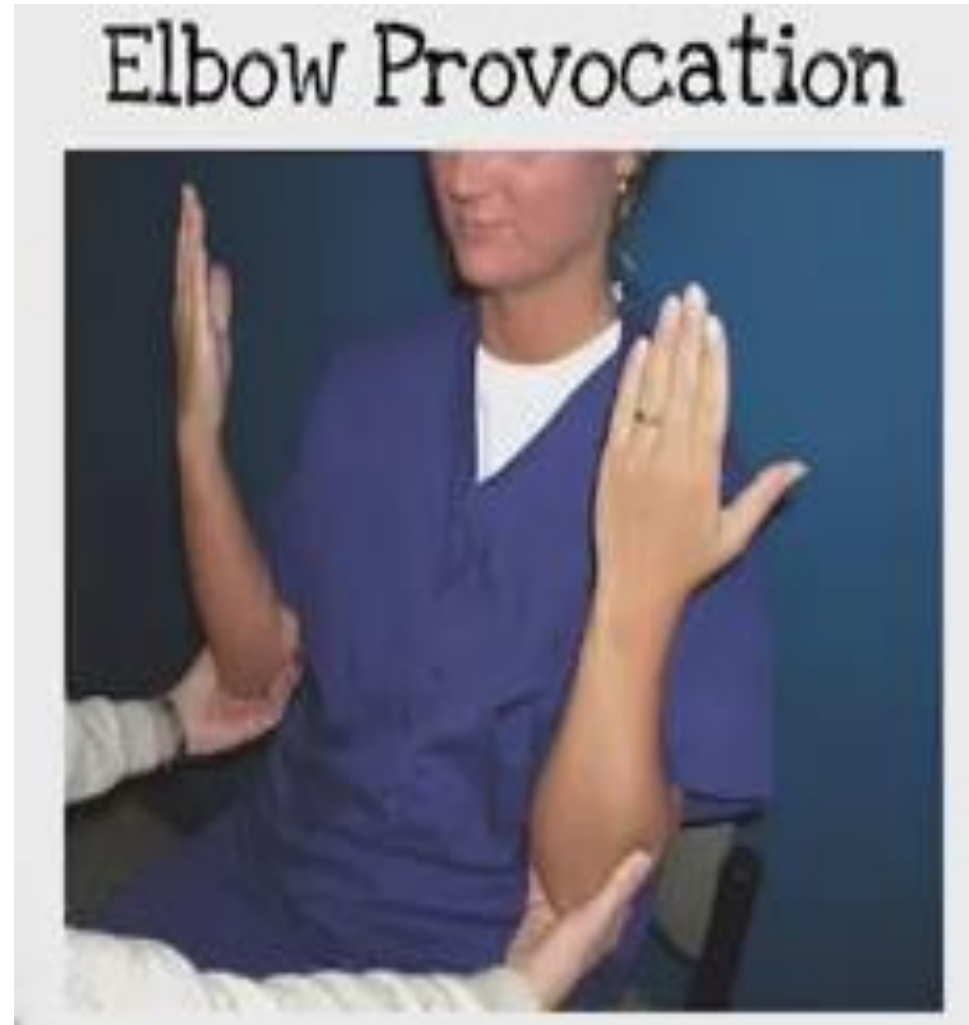
# Cubital Tunnel: Physical Exam

- Sensation
  - Altered sensation ulnar 1.5 (dorsal & palmar)
  - Positive Tinel's at elbow
- Palpation
  - Ulnar nerve subluxation with flexion



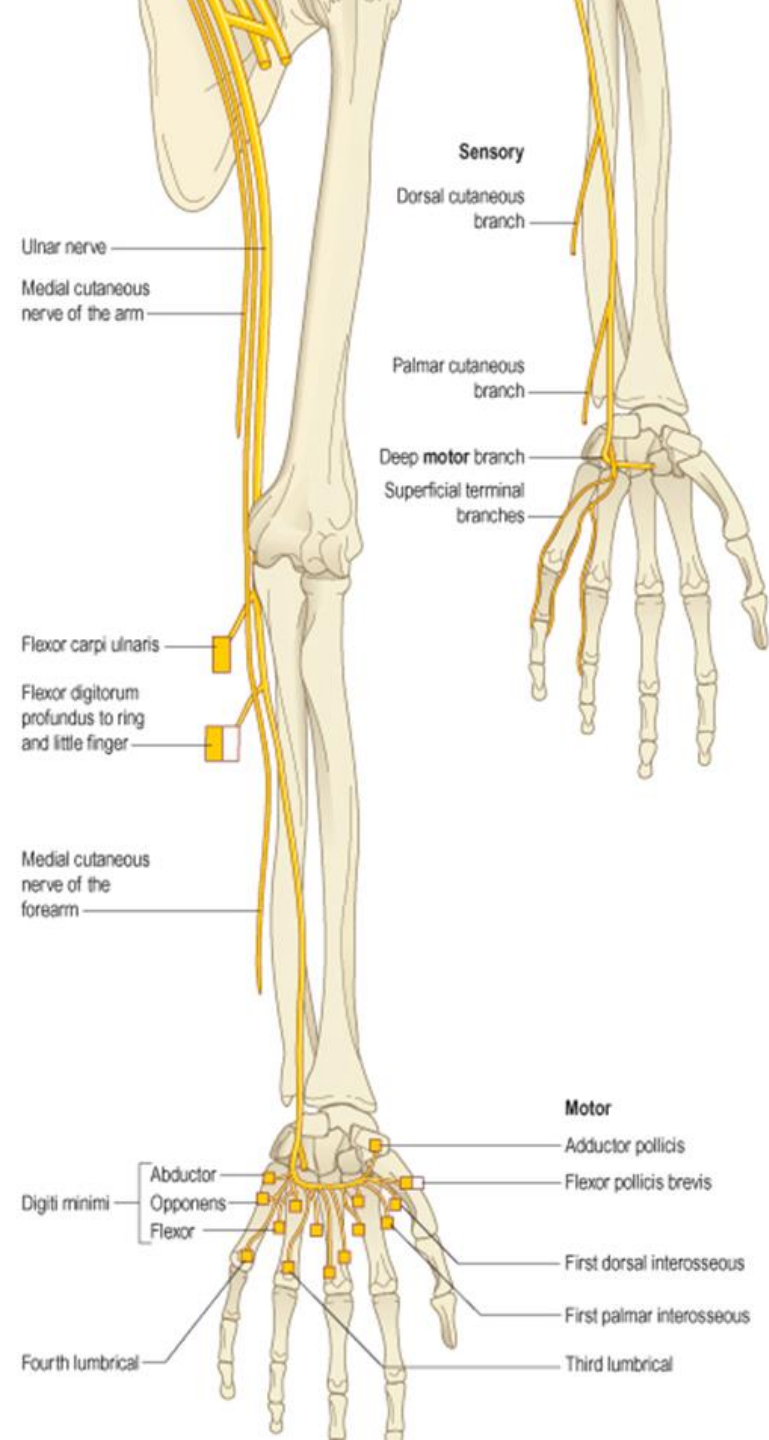
# Cubital Tunnel Provocative Test

- Increased numbness with elbow flexion, forearm supination (opposite of pronator/AIN syndrome) and wrist extension
  - 46% sensitivity
- Provocative - with digital pressure over ulnar nerve proximal to cubital tunnel
  - 75% sensitivity
  - Hold for 1 minute
- Two tests together = 98% sensitivity



# Physical Exam

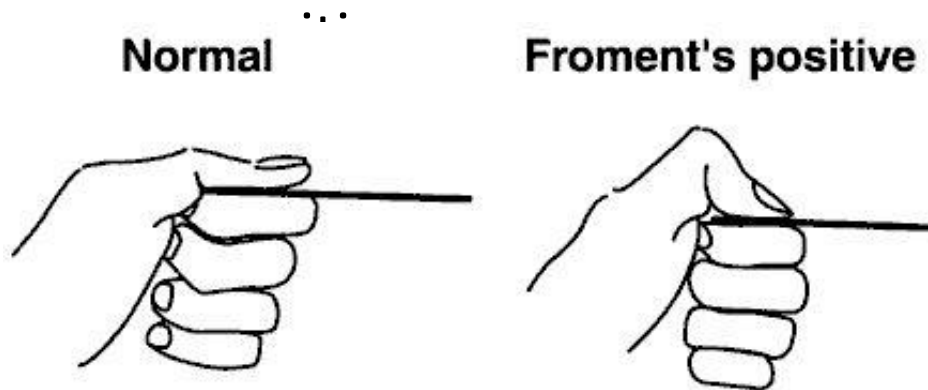
- At elbow, the sensory and intrinsic fibers are more superficial in the cubital tunnel
  - Explains the relative sparing of deeper FDP & FCU
- Interossei
  - Abduction and Adduction
  - Wasting in 1<sup>st</sup> Webspace
- Adduction Thumb
- Hypothenar muscles
  - Opposition
- FPB (deep head)
- FCU/ FDP 4<sup>th</sup> & 5<sup>th</sup> (rare)



# Cubital Tunnel: Physical Exam

- **Froment's Sign**

- IP flexion by FPL (AIN innervation; median nerve)
- FPL compensating for loss adductor pollicis
- Key pinch testing



- **Wartenberg Sign**

- Persistent small finger abduction and extension during attempted adduction (weakness 3<sup>rd</sup> palmar interossei and small finger lumbrical)



# Investigations

- **XR** – rule out elbow joint pathology/old fracture
- **NCS/EMG** may be helpful in complex cases/unclear dx
  - often negative
  - can help identify location of compression or rule out UMN disease or peripheral neuropathy
  - NCV <50m/s across elbow – diagnostic
  - Be cautious in making clinical inferences solely based on the changes in NCS (Graham, et al, 2007)
- **High resolution US** - enlarged/inflamed nerve at site

# Cubital Tunnel

	Degree of Ulnar Neuropathy	Treatment
<b>Grade I - Mild</b>	Mild lesions with paresthesia in the ulnar nerve distribution and a feeling of clumsiness in the affected hand; no wasting or weakness of the intrinsic muscles	Conservative or decompressive
<b>Grade II - Moderate</b>	Weak interossei and muscle wasting	Decompressive +/- transposition
<b>Grade III - Severe</b>	Paralysis of interossei and a marked weakness of the hand	Transposition

# **Non-Surgical Treatment**

# Conservative Management

- **90%** with mild/moderate or intermittent symptoms resolve with conservative treatment
- Splinting
- Lifestyle modification
  - Avoid prolonged/repeated elbow flexion, direct pressure/trauma to elbow
- Nerve gliding exercises

# Splinting

- Used for **sensory-only** complaints
- Blocks elbow flexion while sleeping
- Commercially available vs. customized splints

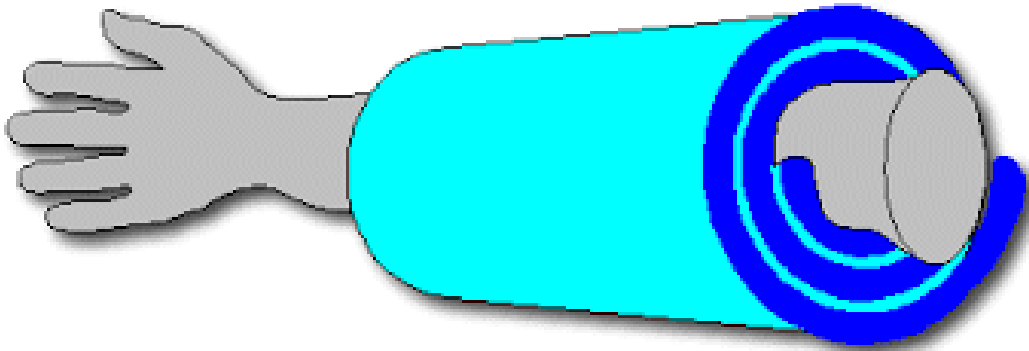
# Commercially Available Splints



# Custom Splint

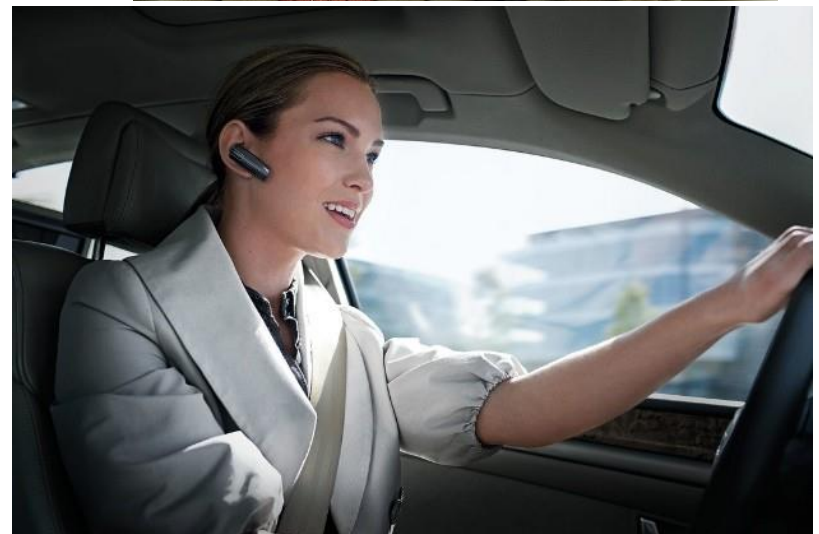


# Low Cost Splint Alternatives



# Life Style Modifications

- Lifestyle modifications – avoid bent elbow
- Phone – use headset or speaker phone
- Car – don't lean on the armrest
- Desk - don't lean head on hand with elbow on table
- Carry small cushion to protect nerve from being compressed.



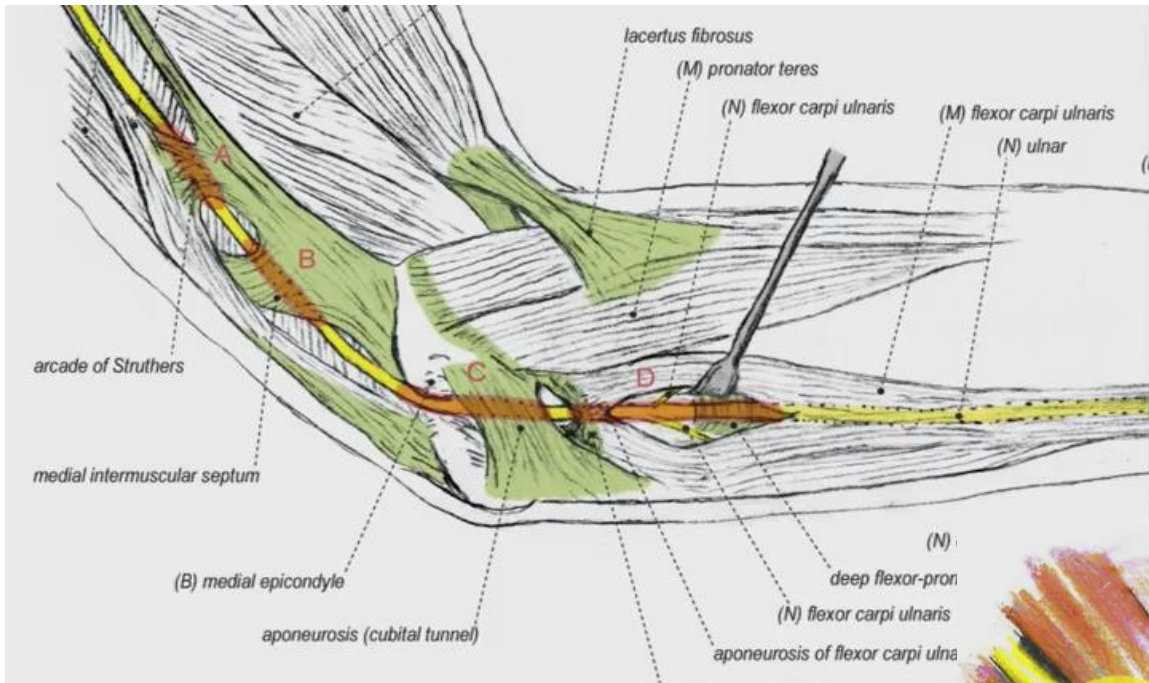
# **Surgical Treatment**

# Referral to Plastic Surgeon

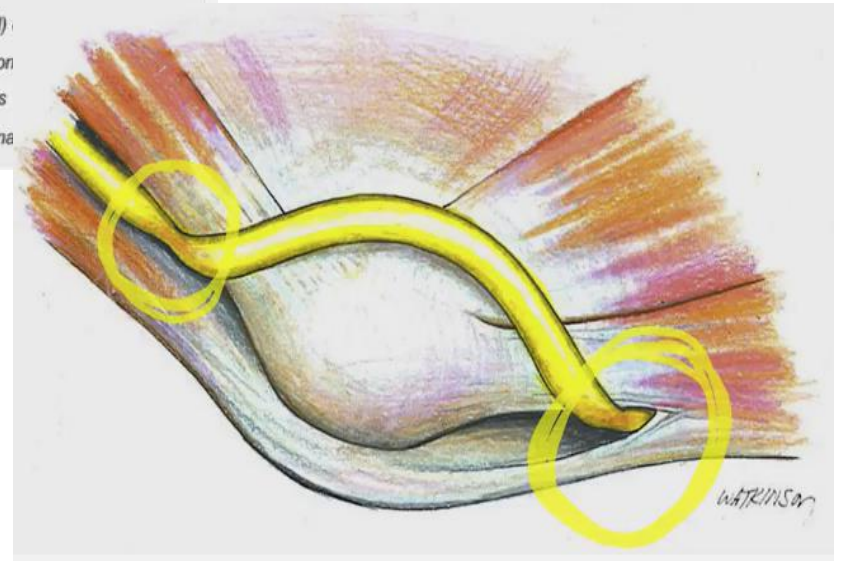
- **Sensory symptoms:**
  - Refer to Plastic Surgeon if not resolved with 3 months of conservative management
- **Motor Symptoms**
  - Electrodiagnostic tests
  - Immediate referral to Plastic Surgeon or Neurologist



# Surgery



**Direct Release**



**Transposition**

# Tendonitis

## Epicondylitis (a.k.a. Tennis + Golfer Elbow)



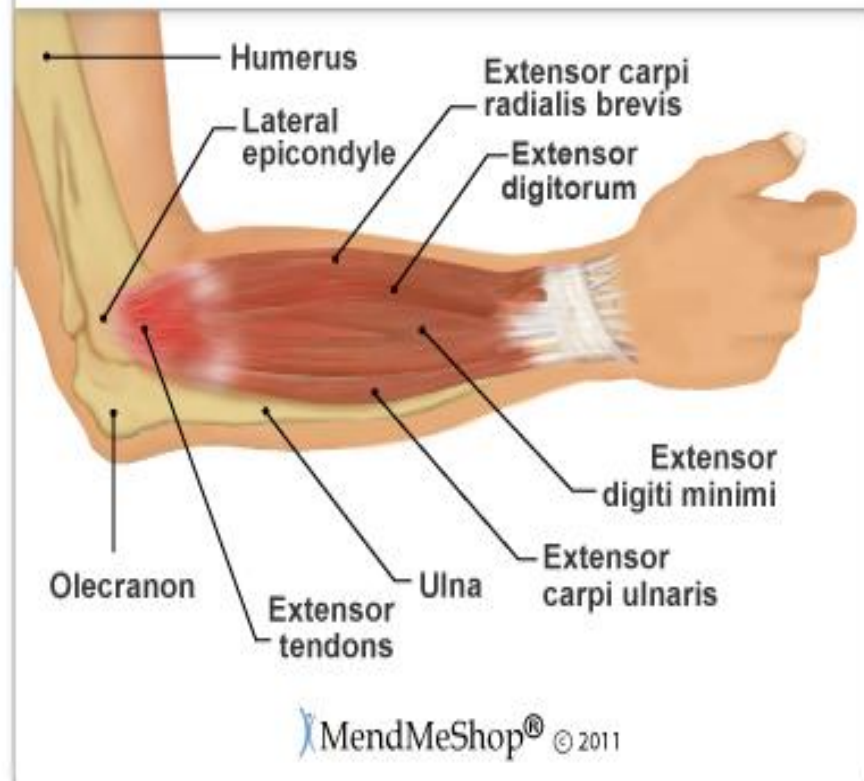
# Diagnosis

## Medial Epicondylitis (Golfer's Elbow)



<http://www.aidmytenniselbow.com/medial-epicondylitis/golfers-elbow-causes.php>

## Lateral Epicondylitis (Tennis Elbow)



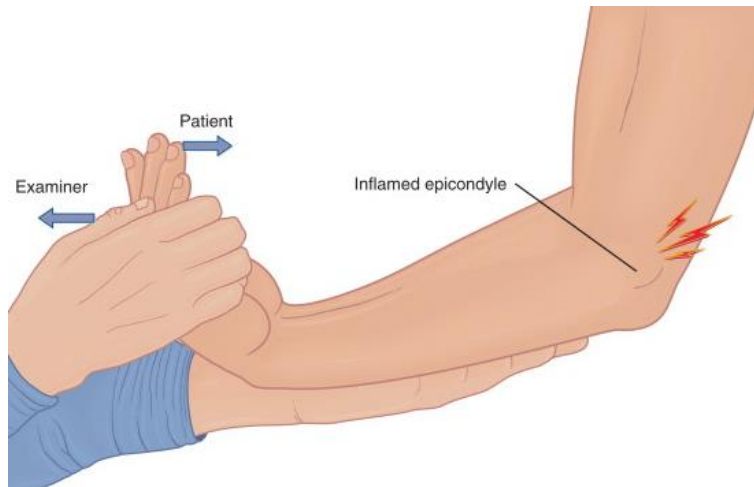
<http://www.aidmytenniselbow.com/lateral-epicondylitis/lateral-epicondylitis-information.php>

# Diagnosis

- Medial Epicondylitis  
(Golfer's Elbow)
  - Medial sided tenderness on inside of elbow; pain radiating down arm and wrist flexion
  - Weakness in hand/wrist
  - Due to overuse of flexors causing small tissue tear
- Lateral Epicondylitis  
(Tennis Elbow)
  - Lateral sided tenderness on outside of elbow; pain radiates down arm
  - Weakness with grip/twisting motion
  - Due to overuse of ECRL/ECRB/ECU, EDC/M causing small tissue tear
- If unable to heal, tissue can weaken until too thin and worn out

# Diagnosis

- Medial Epicondylitis  
(Golfer's Elbow)
  - Positive: resisted wrist flexion (reproduction of pain symptoms)



- Lateral Epicondylitis  
(Tennis Elbow)
  - Positive: resisted wrist extension (reproduction of pain symptoms)



# **Non-Surgical Treatment**

# Splinting



Step 1



Step 2



Step 3



Step 4



# Splinting

- Lateral Epicondylitis (Tennis Elbow)
  - Wrist cock-up splint to reduce load on extensor muscle bundle



# Activity Modification

- Rest
- Avoid provocative movements
  - Lateral epicondylitis: Avoid wrist extension against resistance
  - Medial epicondylitis: Avoid aggravating activities
  - Exercises/stretchers may irritate if performed too early
- Strengthening: start low and go slow!

# Steroid Injection



# **Surgical Treatment**

# Operative Treatment

- Open Procedure:
  - Multiple techniques according to surgeon preference
    - Post-operative care will vary
  - Responsible tendons influence procedure
  - May involve resection affected tissue, surgically moving origin more distally



Damaged tissue  
removed

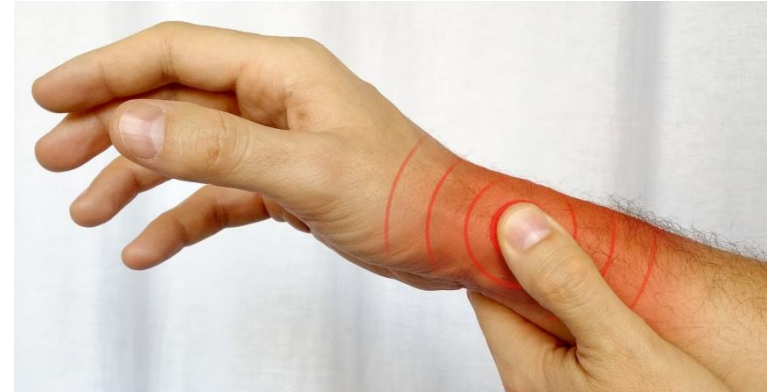
# Tenosynovitis

## De Quervain's Tenosynovitis



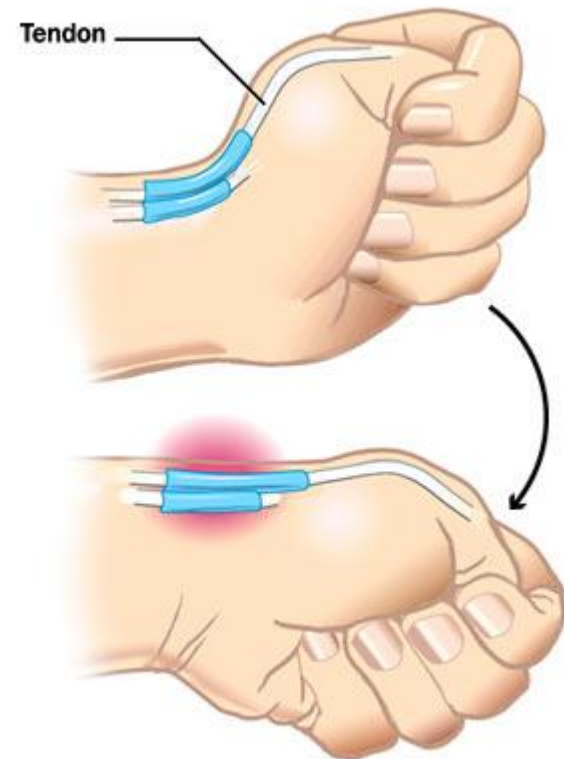
# Diagnosis

- Tender at Base of thumb;  
Extensor compartment 1
- ROM thumb aggravates symptoms
  - Key pinch or grasp
- Chronic overuse
- Women/new parent
  - Pregnancy
  - Postpartum/lifting children



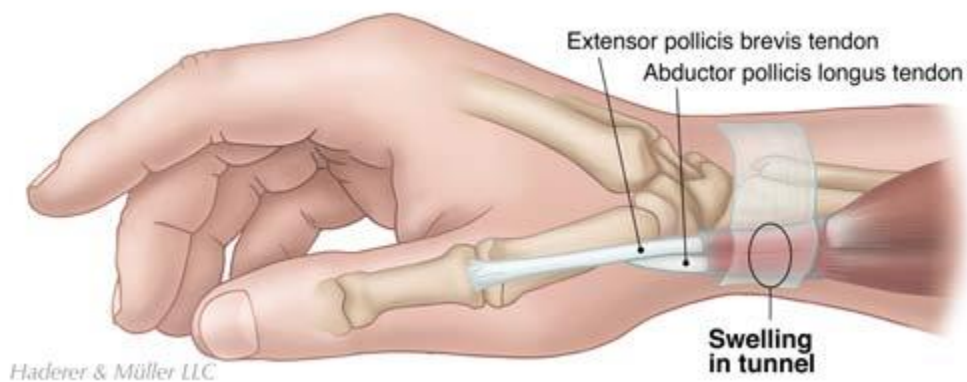
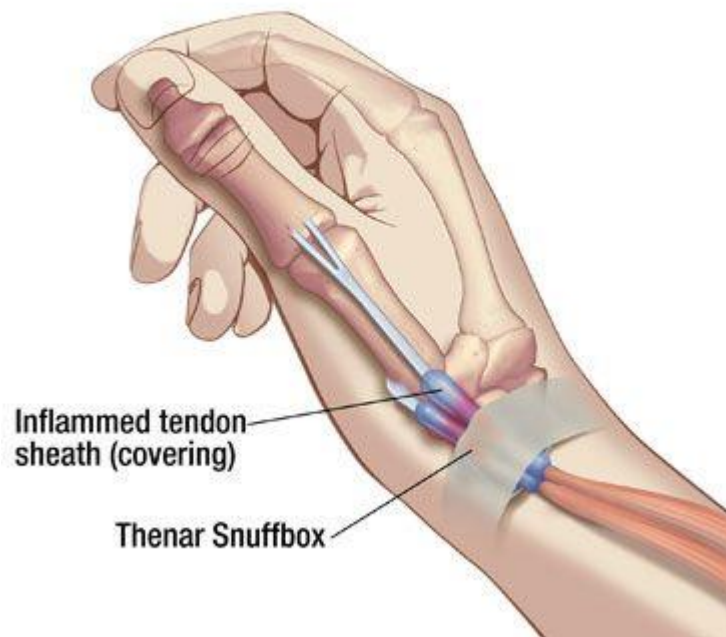
# Diagnosis

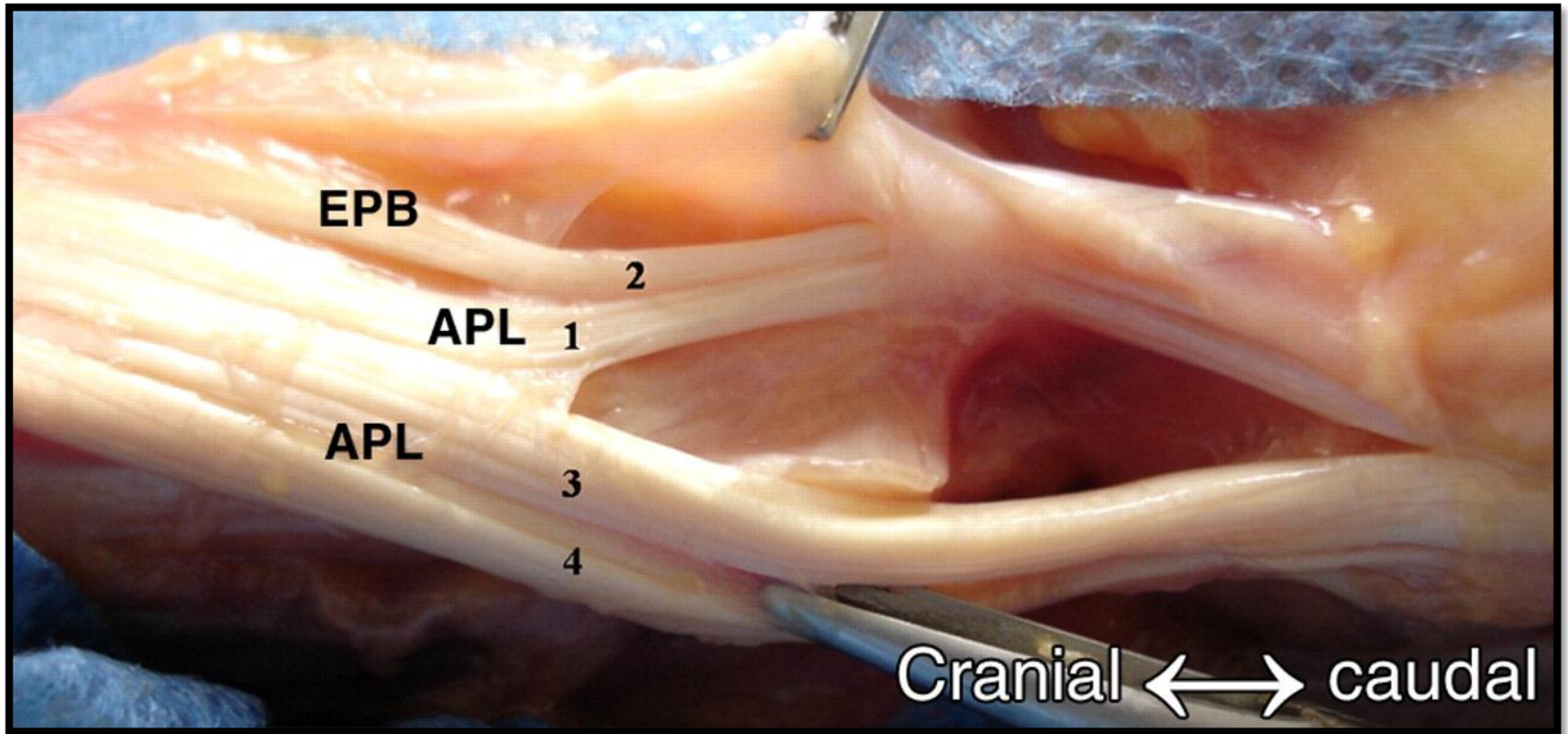
- Tender at Base of thumb
- Extensor compartment 1:  
EPB, AbPL
- ROM thumb aggravates  
symptoms
  - Key pinch or grasp
- Positive Finkelstein's Test:  
passive test



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## De Quervain's Tenosynovitis





## Extensor Compartment Number One

EPB and APL

*Jean-Denis Laredo; Caroline Parlier-Cuau; Radiology* **2010**, 257, 427-433.  
*Radiology*, <http://pubs.rsna.org/doi/abs/10.1148/radiol.10092265>

# Differential Diagnosis

- DeQuervain's

- Radial wrist pain
- +’ve Finkelstein’s test
- -’ve grind test
- No changes on X-ray
- Pain on resisted thumb extension
- Pregnancy, repetitive work tasks
- Wide age range

- CMC OA

- Pain at base of 1<sup>st</sup> MC (volar)
- -’ve Finkelstein’s test
- +’ve grind test
- OA changes on X-ray
- Squaring of CMC joint/subluxation
- Women > Men, most common OA in hand
- 50+ yo

# **Non-Surgical Treatment**

# Splinting

- Thumb spica/long opponens splint
- RESTING SPLINT (not working splint)
- Worn at night and during painful activities
- Commercially available vs. custom thermoplastic splints



# Activity Modification

- Avoid repetitive activity
  - Ulnar deviation
  - Pinching
- Lift with your arm and not your thumb
- Adjuncts to baby carrying
- Change the activity or change the work tool



# Steroid Injection



- Referral to Plastic Surgeon/Rheumatologist for steroid injection

# **Surgical Treatment**

# Operative Treatment

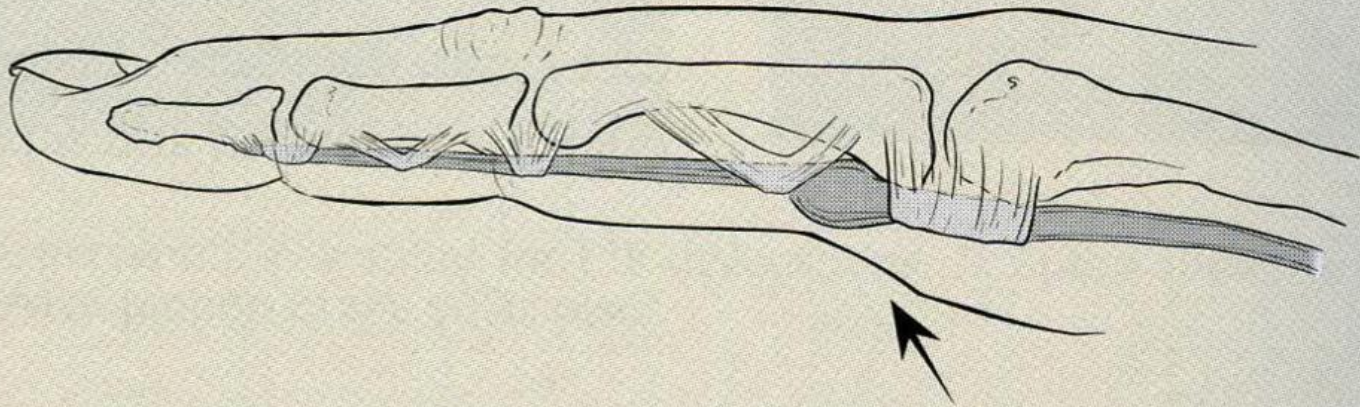
- Surgical option if no success with conservative management
- Release of APL/EPB tunnel



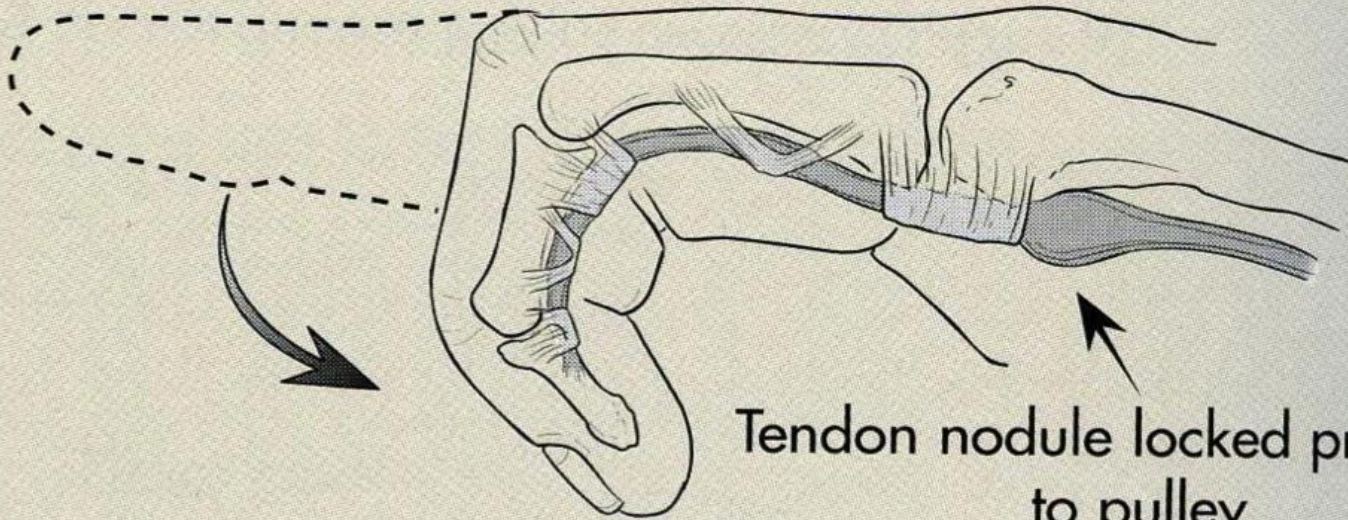
# Tenosynovitis

## Stenosing Tenosynovitis (a.k.a. Trigger Finger)





Nodule distal to pulley with  
finger in extension



Tendon nodule locked proximal  
to pulley

# Differential Diagnosis



- Dupuytren's Contracture
  - Thickening in the palmar fascia & finger
  - Flexed posture **CANNOT** be overcome
  - Painful & progressive
  - Thickening of palmar fascia
  - Hand and feet
  - Age > 50, Men (5:1), family history
  - Northern European

# **Non-Surgical Treatment**

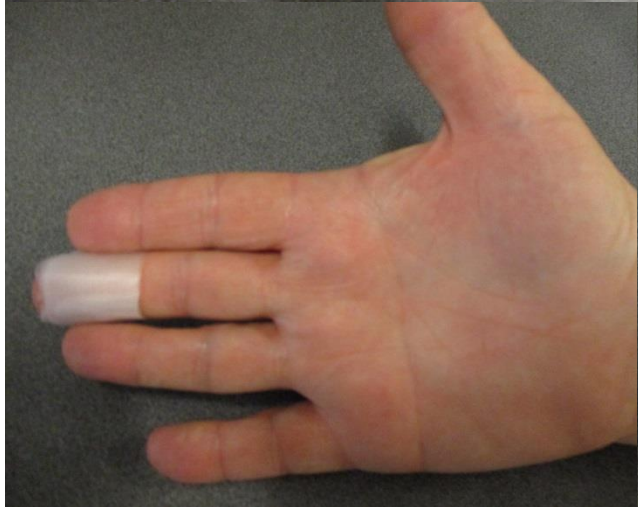


Start with the DIP

Move proximally and block MCPJ



# Low Cost Alternatives



# Trigger Thumb – IPJ blocking



# Multiple Fingers



# Not a Party Trick!



# **Surgical Treatment**

# Steroids vs. Surgery

## Steroids

- Complications:
  - Tendon rupture
  - Skin pigmentation changes
  - Nerve injury
- Healing Time:
  - Can do ROM immediately
  - Massage



## Surgery

- Complications:
  - Tendon rupture/laceration-rare case studies only
  - Nerve injury-rare case studies only
  - Painful scar – uncommon
- Healing Time:
  - 2 weeks for skin
  - ROM immediately

# Osteoarthritis

## Carpometacarpal (CMC) Arthritis



# CMC Joint Arthritis

- 50-70 yo female
- Radial sided wrist or base of thumb pain
- Insidious onset
- Intermittent
- Stiffness (AM)
- Exacerbated with ROM
  - Turning doorknobs or jars
  - Handwriting
  - Needlepoint
- Relieved with rest + analgesics



# Physical Exam

- Inspection
  - Swelling
  - Dorsoradial prominence of thumb MC base (squaring)
  - Adduction contracture (web space contracture)
  - Hyperextension MPJ
- Palpation
  - Focal tenderness TM joint
  - ST joint
- ROM
  - Active & passive
  - Laxity at TM joint
- Provocative Maneuvers
  - Grind test (axial loading + MC rotation)



# Differential Diagnosis

- CMC OA

- Pain at base of 1<sup>st</sup> MC (volar)
- -'ve Finkelstein's test
- +'ve Grind test
- OA changes on X-ray
- Squaring of CMC joint/subluxation
- Women > men, most common OA of hand
- 50+ yo

- DeQuervain's

- Radial wrist pain
- +'ve Finkelstein's test
- -'ve Grind test
- No changes on X-ray
- Pain on resisted thumb extension
- Pregnancy, repetitive tasks
- Wide age range

# **Non-Surgical Treatment**

# Non-Operative Treatment

- Education
- Activity Modification
  - Less forceful pinching
  - Alternate hand use
  - Switching to larger diameter instruments
  - Reading stand to hold books
- Strengthening exercises: intrinsic & extrinsic
- NSAIDs
- Intra-articular Steroid Injections
- Splinting

# Splinting

- Decreases pain
- Does not decrease the eventual need for surgery
- Decreases subluxation on pinch for Stage I and II CMCJ
- Long Opponens vs. Short Opponens
  - No clear indications
  - Type of activity performed
  - Patient preference
- Well-fitted custom splint
- Dosage
  - Day time
  - Night time
  - Heavy activities

# Commercially Available



Early stage CMCI pain

# Custom Thermoplastic Splints



# **Surgical Treatment**

# Operative Treatment

- Offered for:
  - Significant loss of function and pain
  - Unsuccessful conservative management
  - Rate of progression
- Surgeon's preference + judgement
- Surgical options:
  - Trapeziectomy
  - Ligament Reconstruction Tendon Interposition (LRTI)
  - Suspensionplasty
  - MC Osteotomy
  - CMC Arthrodesis

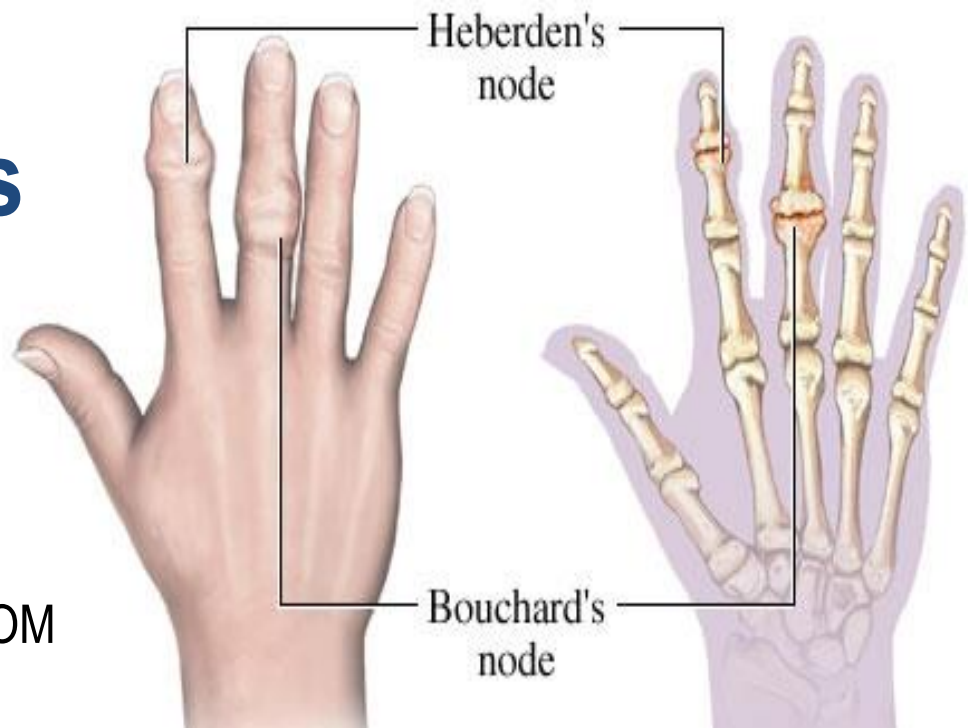
# Osteoarthritis

## Distal Interphalangeal (DIP) Arthritis



# DIP Joint Arthritis

- Most common location in body for OA
  - 58% of individuals 60+ years
- Symptomatology:
  - Joint pain – exacerbated with ROM
  - Change in joint size
  - Radial/ulnar deviations
  - Extension lag
- Osteophyte developed on top or side of joint
  - Heberden's vs. Bouchard's node
- Functionally limiting
  - Opening containers, manipulating small objects/tools



# Physical Exam

- Inspection
  - Swelling
  - Observation
    - Heberden's nodes
    - Radial/ulnar deviation
- Palpation
  - Focal tenderness DIP joint
- ROM
  - Active & passive
- Strength
  - Pain with gripping

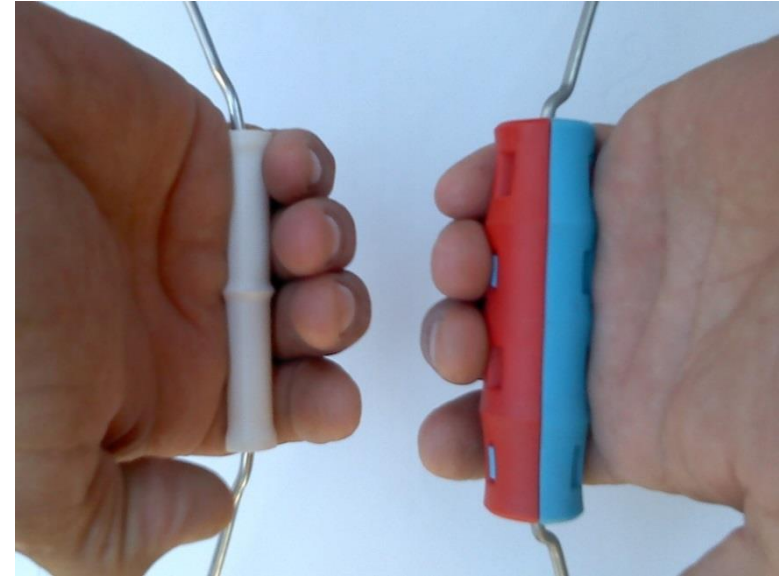


# **Non-Surgical Treatment**

# Non-Operative Treatment

Similar to CMC joint OA treatment...

- Education re: joint protection
- Activity Modification
  - Less forceful gripping
  - Alternate hand use
  - Switching to larger diameter instruments
- Gentle active ROM
- NSAIDS
- Intra-articular steroid injections
- Splinting



# Splinting

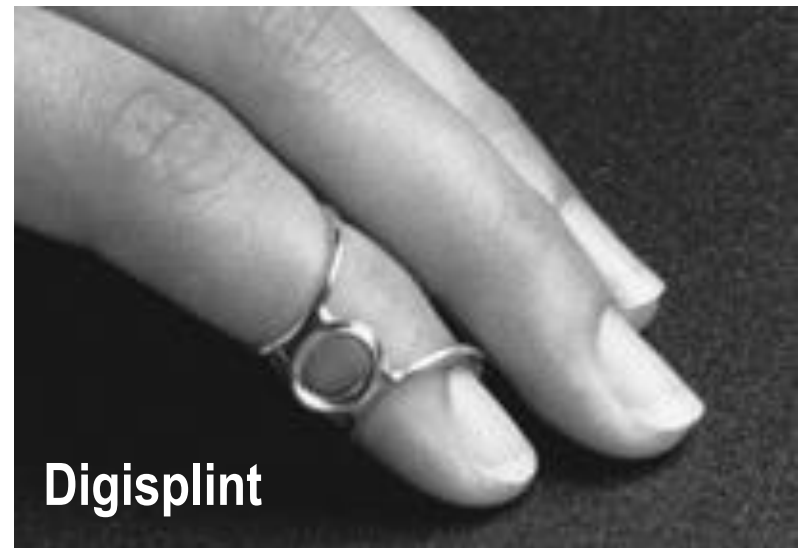


- Decreases pain
  - 66% improvement in pain symptoms with splinting during activity for DIPJ OA (Ikeda, et al., 2010)
  - Use of a splint during sleep decreased pain and improved DIP OA deformity in 3 months (Watt, et al., 2014)
- Potential prevention of deformity progression
- Position to promote finger functioning

Ikeda M, Ishii T, Kobayashi Y, Mochida J, Saito I, Oka Y. (2010) Custom-made splint treatment for osteoarthritis of the distal interphalangeal joints. *J Hand Surg Am* 35:589–93.

Watt, F.E., Kennedy, D.L., Carlisle, K.E., Freidin, A.J., Szydlo, R.M., Honeyfield, L., Satchithananda, K., & Vincent, T.L. (2014). Night-time immobilization of distal interphalangeal joint reduces pain and extension deformity in hand osteoarthritis. *Rheumatology (Oxford)*, 53(6): 1142-1149

# Splinting



# Splinting Alternatives

- Tape, coban, thickened bandage
- Advantages:
  - Compression
  - Increased access and affordability
- Disadvantages:
  - Hygiene



# **Surgical Treatment**

# Operative Treatment

- Offered for:
  - Significant pain
  - Rate of Progression
- Surgical option:
  - Arthrodesis



# Inflammatory Arthritis

## IA Hand Deformities



# Conservative Management

- Education:
  - Joint protection
  - Energy conservation
- Assistive devices/ADL adaptations
- Splinting
  - Rest
  - Correct deformity
  - Functional

# Resting Hand Splints

- Immobilizes thumb, digits and wrist
- Resting splint worn at night or when joints are painful

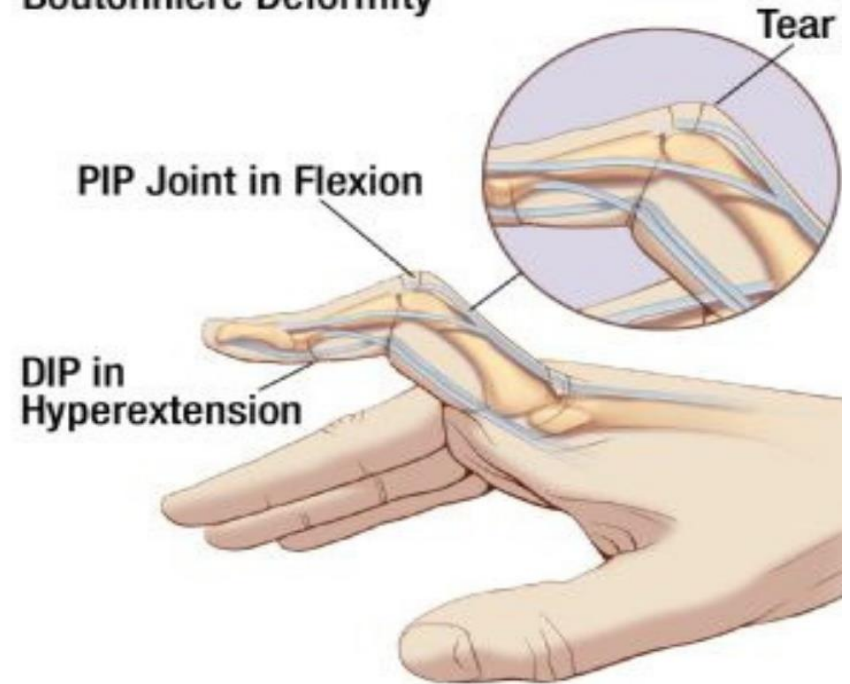


# Swan Neck vs. Boutonniere Deformities

Swan Neck Deformity

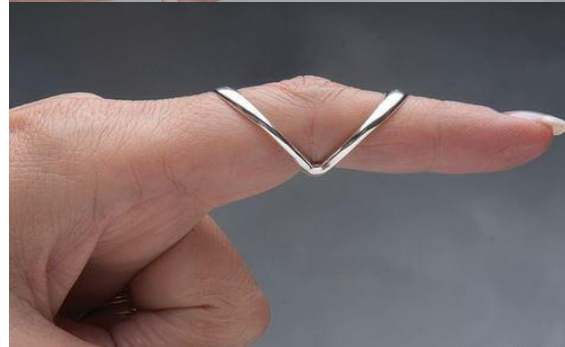
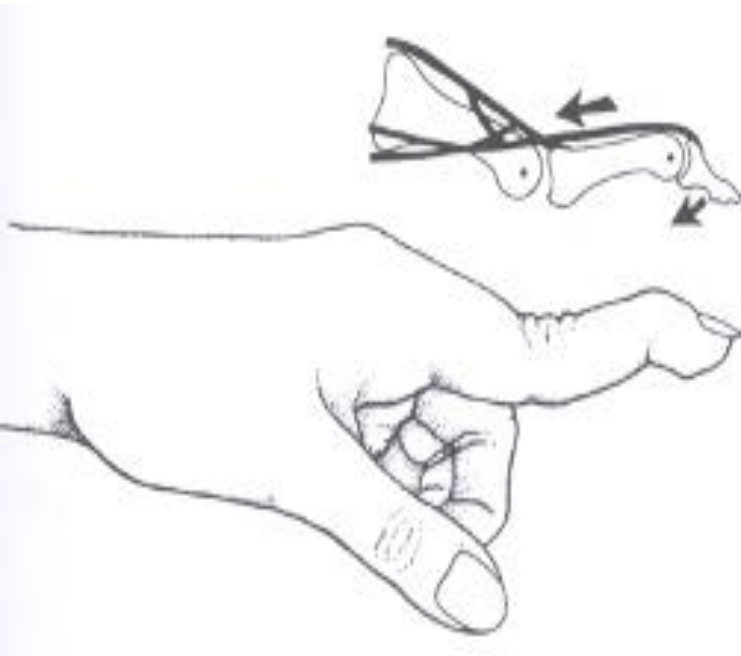


Boutonniere Deformity



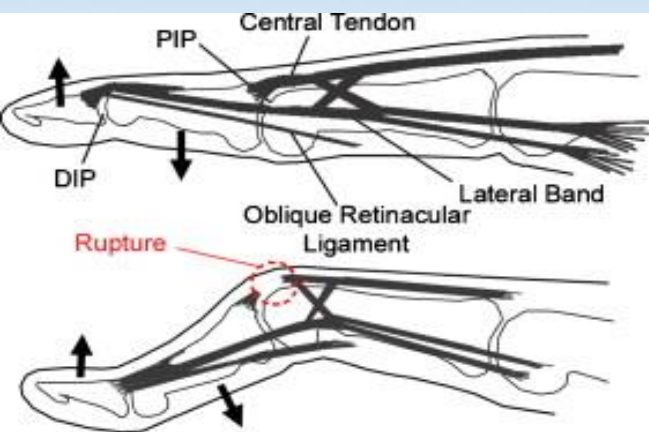
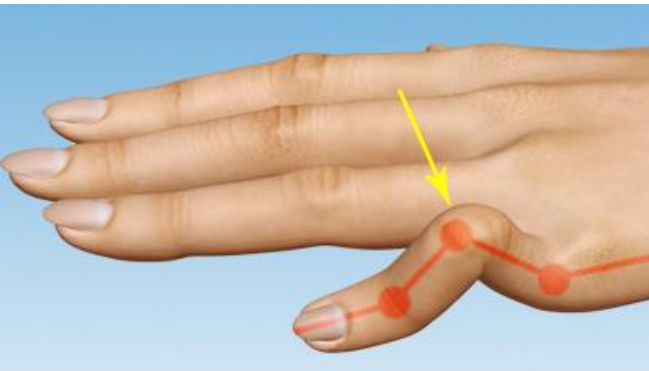
# Anti-Swan Neck Deformity Splints

- Worn for function + rest to correct deformity
- Blocks PIP hyper-extension

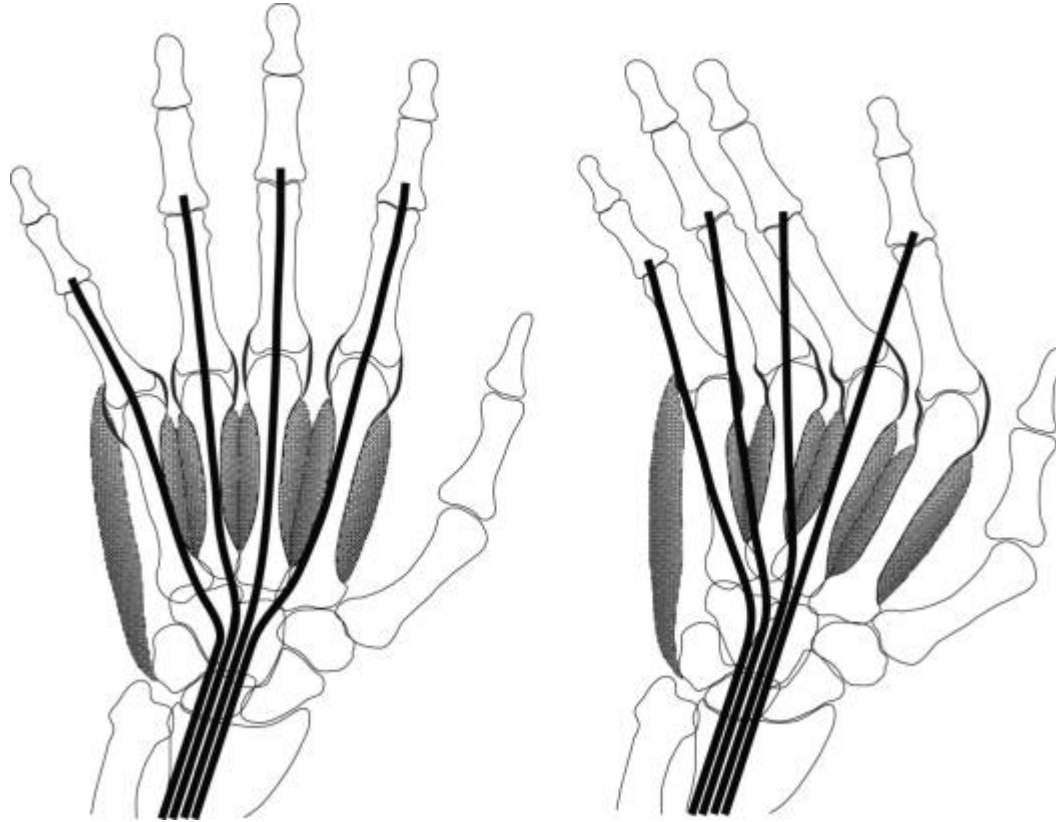


# Anti-Boutonniere Deformity Splints

- Worn during day for functional activities to correct deformity
- Applies force to extend PIP, while allowing DIP free to flex

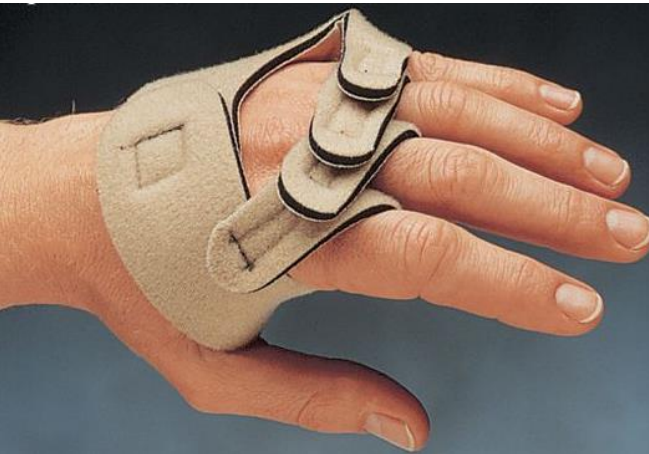


# Ulnar Drift



# Anti Ulnar Drift Splints

- Applies gentle medial deviation to prevent MCP ulnar drift
- Worn for function or at rest



# Wrist Splints

- For painful wrist joint at rest or with activity
- If worn to supports wrist in functional position: wrist extension
- If worn to support wrist for rest: wrist neutral



# Wrist Pathologies

## Special Tests



# Watson's (Scaphoid Shift) Test

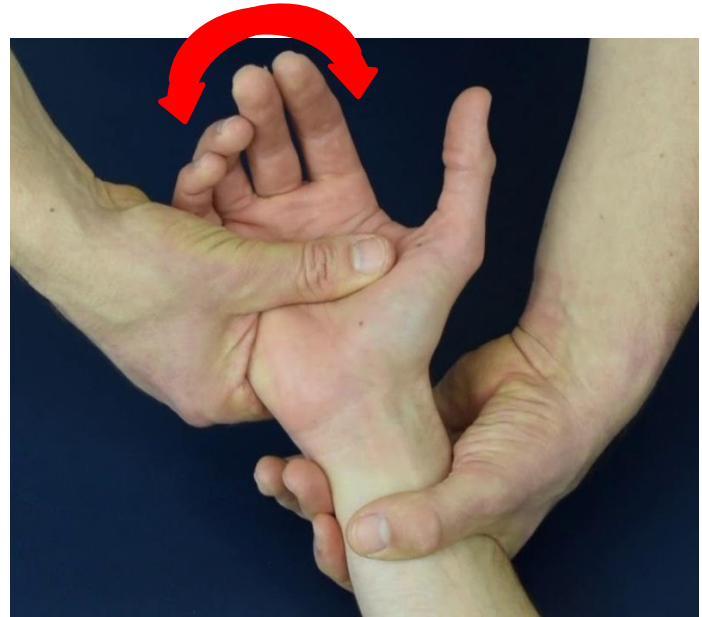
- Tests for scapholunate ligament tear/instability
- Examiner places thumb on volar scaphoid tubercle and applies constant pressure as the wrist is moved from ulnar to radial deviation
- Positive test: dorsal wrist pain, apprehension or “clunk”



[https://www.youtube.com/watch?v=mMlva\\_QibxE](https://www.youtube.com/watch?v=mMlva_QibxE)

# Test for Mid-Carpal Instability

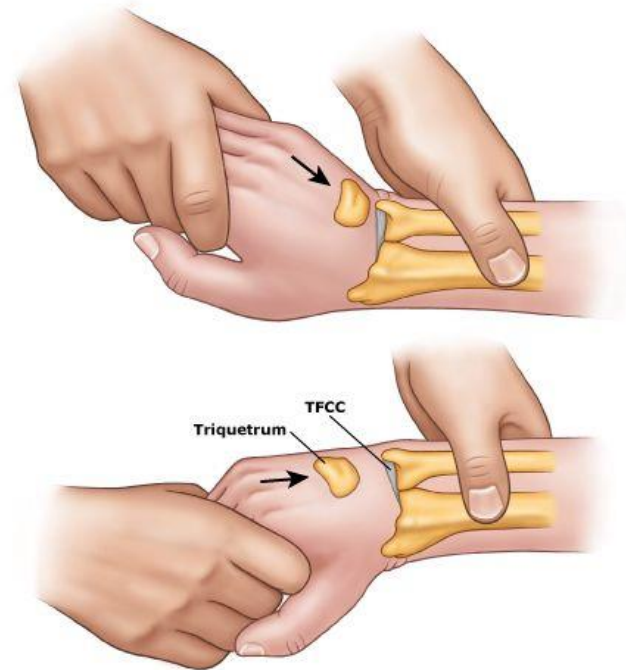
- Examiner stabilizes distal radius/ulna with one hand, and grasps palm with other hand.
- Move wrist from ulnar/radial deviation while applying axial load.
- Positive test: pain, “clunk” or laxity of capitate



<https://www.youtube.com/watch?v=FCvBEupSlus>

# Test for Ulnar Sided Wrist Pain

- Tests for TFCC tear or ulnar-capral impingement
- Ulnar stress test/TFCC load:
  - Ulnar deviation of pronated wrist while axially loading, flexing/extending wrist
  - Positive test: pain
- Fovea test:
  - Palpation of ulnar wrist between styloid and FCU tendon
  - Positive test: pain



<https://www.youtube.com/watch?v=uJ863xruFnU>

# **Wrist Pathology: Orthotic Interventions**

# Guidelines for Orthotic Use

- Purposes of splint wear:
  - Rest
  - Immobilization with activity use
  - Correction of position during activity
- For activity wear, cannot use splints if require extensive wrist mobility
- Patient education is key – “don’t fight the splint”
- Activity modification may be better suited
- Consider motion vs. immobilization to avoid stiffness

# Long Opponens

- Potential uses:
  - DeQuervain's Tenosynovitis
  - Wrist/CMC OA pain
  - Scaphoid pathology
- Used for **REST** only (not a functional splint)
  - For sleep
  - For rest during day (protection)



# Wrist Splint

- Potential uses:
  - Neutral:
    - CTS
    - Wrist articular damage
  - Extension:
    - Extensor tenosynovitis
    - Post cast removal
    - Radial nerve palsy
    - Lateral epicondylitis
- Consider rest vs. activity



# Wrist Widget<sup>®</sup>/Bullseye<sup>®</sup>

- Potential uses:
  - Ulnar sided wrist pain
  - TFCC
  - DRUJ instability/injury
- For activity wear
- To assess:
  - weight-bearing/load test with/without splint



# Take Home Message

- REST
- STOP Offending Activity
- Preserving mobility



“PNUT -  
Finger tutting”

<https://youtu.be/gQVxE0NF8xc?t=27s>

# Contact Information

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# Resources

- The Arthritis Society: <https://arthritis.ca/>
- Eaton Hand: <http://www.eatonhand.com/>
  - Education for clinicians and patients
- Ortho Bullets:  
<https://www.orthobullets.com/hand/6008/physical-exam-of-the-hand>
  - Wrist special tests
- Adaptive Equipment
  - Performance Health <https://www.performancehealth.com>
  - Shopper's Home Health Care  
<https://www.shoppershomehealthcare.ca/>
  - Starkman's Health Care Depot <https://www.starkmans.com/>



# Things to bring to TWH

- Splints:
- Custom: CTS, DeQ/long thumb spica, MCP blocking, short opponens, anti swan neck, wrist/CTS,
- Prefab: Wrist, elbow sleeve, towel?, epicondylitis strap?, stax, thermoform?, PUSH, Oval -8, finger trough, Resting hand, anti-ulnar drift LMB, wrist widget/bullseye
- 
- Equipment: 2 point discriminator, large handle/rubazote, Coban,
- ADL equipment? : Scissors, OXO knife, peeler, jar openers, nail clipper,
- Bring Dycem samples for the group?

