







Incidence of Hand Injury in Sports

- NFL Combine Review 1987-2000
 - Ankle Sprain 29.1% of all injuries
 - Next was **wrist/hand injuries** 17.7%

(Brophy et al., 2007)



High School Athletes

- Incidence of Dislocation Injuries from 2005-2009
 - most common Shoulder
 - Second most common **Wrist/Hand**

(Kerr et al., 2011)



Anatomy Review

- Wrist Joints
 - Distal Radioulnar Joint
 - Radiocarpal Joint
 - Intercarpal joints/Midcarpal joints



Anatomy Review



Hand Bony Anatomy

- Hand
 - Carpometacarpal joints (CMC)
 - Metacarpophalangeal joints (MCP)
 - Interphalangeal joints (PIP, DIP)



Anatomy Review



Ligament Complexes

- Wrist
 - Multiple volar, dorsal and collateral ligaments (too many to mention)
 - TFCC
 - Triangular Fibrocartilage Complex
 - Triangular shaped “disc” Ulnar wrist
 - Like meniscus in knee- stability



TFCC

- Provides shock absorption
- Adds stability to the wrist

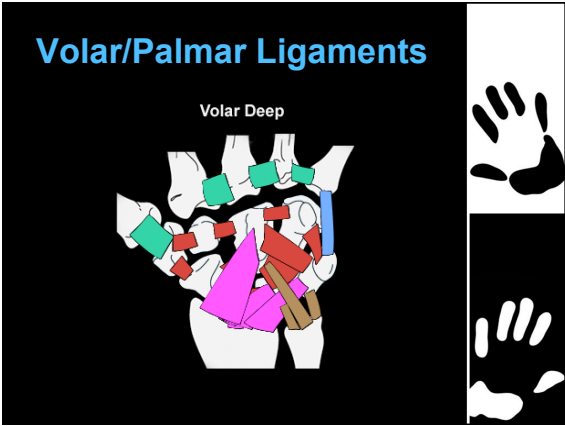


Wrist Ligaments- Dorsal

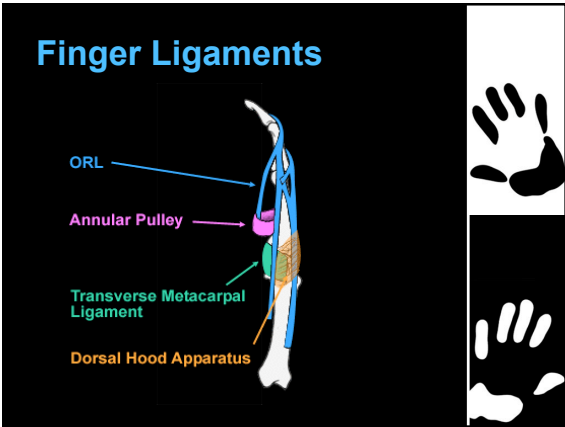
Dorsal Deep



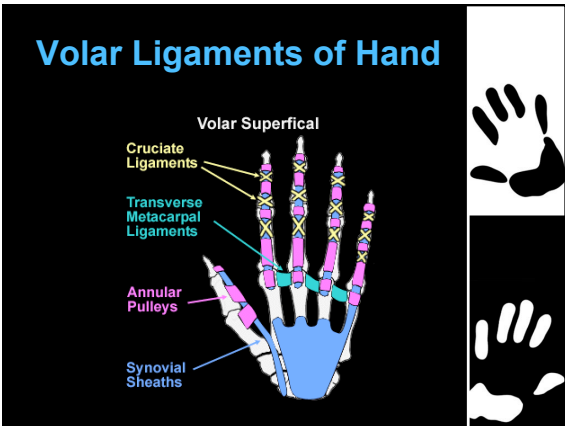
Volar/Palmar Ligaments

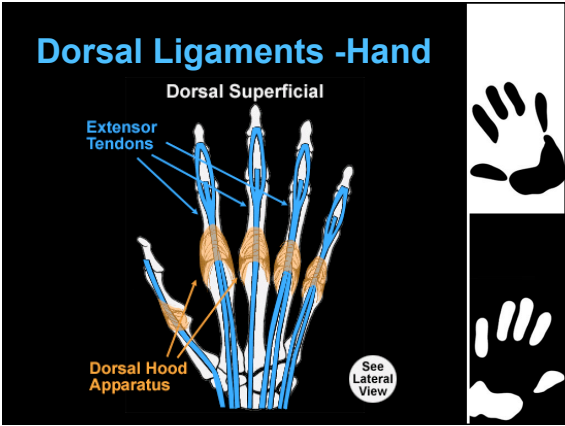


Finger Ligaments



Volar Ligaments of Hand





Forearm, Wrist, Hand

- Whole UE is Kinetic Chain
 - allows hand to be functional
 - Starts at thoracic spine
 - Involves scapulothoracic joint, shoulder, elbow and wrist/hand



Biomechanical Considerations- Kinetic Chain

- “Core strength” - Transverse Abdominus, Multifidus, Gluteals, Hip External Rotators
- Scapulothoracic Stability/Mobility
 - Rhomboids, Traps, Serratus Anterior
 - Thoracic spine/ribs
 - Posterior Capsule GH Joint



Weak Hip/Core Effect?



Common Wrist Injuries

- Fractures
- Ligament Sprains
- Tendonitis
- Nerve Injury
- Cartilage Injury



Wrist Fractures- Scaphoid

- Mechanism- fall on outstretched hand
- Symptoms
 - Swelling over snuffbox
 - Snuffbox tenderness
 - Limited ROM
 - Pain with axial compression of thumb towards radius



Scaphoid Fracture

- X-ray may be negative until 2-3 wks after injury
- MRI/Bone scan definitive diagnosis early
- When it doubt, Immobilize in thumb spica splint until confirmation



Treatment- Scaphoid Fx

- Stable Fracture
 - Immobilized in Scaphoid cast for up to 8weeks
- Unstable Fractures
 - Percutaneous fixation
 - ORIF
 - Rehab starts sooner than cast only



Rehabilitation:

- Initial stage (0-3wks post cast)
 - ROM exercise
 - Pain and edema reduction
 - Wear thumb spica splint
- Stage 2 (3-5wks)
 - Begin strengthening, splint
- Stage 3 (5-12+wks)
 - Continued strength, wean from splint
 - Work with MD on return to sport



Radius/Ulna Fractures

- Similar mechanism of Injury to Scaphoid Fractures
- Symptoms
 - Deformity noted with injury
 - Pain, swelling, loss of motion



Radius/Ulna Fractures



Radius/Ulna Fractures

- Cast immobilization
- ORIF



Radius/Ulna Fracture

- Rehabilitation after Casting
 - Stage 1 (wks 1-2)
 - ROM, edema reduction, tendon gliding
 - Stage 2 (wks 2-4)
 - Continue ROM, add light strengthening
 - Stage 3 (>4wks)
 - Gripping, lifting, gaining end ROM
 - Sports Specific training
- Special note- finger exercise can start IN cast

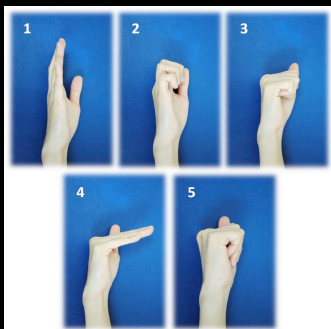


Tendon Gliding Exercise

- Functional motions of Hand/Digits
 - Edema management
 - ROM
 - Functional Grip improvement



Tendon Gliding Exercises



Ligament Sprains

- Special Issues
 - Scapholunate Dissociation
 - After a “sprain” with falling on outstretched hand, continues to have pain and limited function
 - Feels clicking sensation in wrist
 - May be little or no swelling with these
 - Scapholunate joint tender dorsally to palpation



Scapholunate Instability

- Diagnosis
 - Stress x-ray to measure gap between scaphoid and lunate
 - Watson Scaphoid Test
 - Sensitivity 69%, Specificity 66%
 - Stress x-ray is definitive here



Watson Scaphoid Test

- Pts arm in pronated position
- Grab wrist from radial side with thumb on scaphoid tubercle
- Move wrist from ulnar deviation and extension to radial deviation and flexion
- If present, will feel a “thunk” as the scaphoid moves back in place



Treatment

- Current review of Evidence-based Medicine recommends

- Surgical fixation for active patients
- No information regarding prolonged conservative care vs surgery in regards to arthritis, function

(Kalaninov & Cohen, 2009)



DeQuervain's Tenosynovitis

- Synovial inflammation
 - APL
 - EPB
 - At level of Radial Styloid
- Repetitive use injury
 - Racket Sports
 - Rowers, Canoeists
 - Bowlers



DeQuervain's Diagnosis

- Palpation
 - Finkelstein's test
 - Sensitivity 81% (good to rule it out)
 - Specificity 50% (not so specific-other pathologies may be present with a positive test)
 - but it's all we've got, so use it!
- (Alexander et al, 2002)



Finkelstein's Test



OurHealthNetwork.com



DeQuervain's Treatment

- Splinting
 - Thumb Spica
 - May need custom splinting with a prominent Radial styloid, or with significant edema
- Local Modalities
 - Conflicting evidence on efficacy of physical modalities in the literature
- Manual therapy- friction massage



DeQuervain's Considerations

- Proximal stability/strength
 - Overuse of distal muscles for compensation
 - Look at periscapular muscles, rotator cuff
- Grip size vs grips with racket sports
- Eccentric strengthening



Carpal Tunnel Syndrome

- Median Nerve Compression in Carpal Tunnel
- Symptoms
 - Nocturnal burning, paresthesia
 - Pain may radiate to forearm, shoulder
 - Mm atrophy with prolonged compression



Diagnosis of Carpal Tunnel Syndrome

- History is Key- listen to the athlete
 - NCV/EMG
 - Physical Tests
 - Not great for specificity/sensitivity- mixed reports in literature
 - Phalen's
 - Tinel's
- Best diagnosis based on symptoms



Phalen's Test



Tinel's Test (Carpal Tunnel)



Treatment Carpal Tunnel Syndrome

- NSAIDS
- Splinting with wrist neutral
 - Most over the counter splints at 20 degrees wrist extension, actually increase pressures in carpal tunnel
 - Custom neutral splint for night wear
- Nerve gliding exercises, local modalities



TFCC Injuries

- The Wrist Meniscus- ulnar side of wrist
- Can occur with
 - Sprains/strains
 - Fractures
 - Wrist instabilities
 - As a repetitive injury in compressive loading of the wrist



TFCC Injuries

- Who gets this?
 - Gymnasts
 - Divers
 - Golf and other racket sports athletes



TFCC Symptoms

- Pain with Ulnar deviation and extension of the wrist
- Pain with compression and weight bearing activities
- Pain and clicking with loaded supination/pronation
- Reduced grip strength



TFCC Treatment

- NSAIDS
- Local modalities
- Wrist stabilization training
 - Strengthening while avoiding symptoms
 - Wrist taping/splinting for activities
 - Wrist Widget



Wrist Widget



Wristwidget.com




Common Hand Injuries

- Tendon Injuries
- Ligament /Pulley Injuries
- Fractures/Dislocations



Tendon Injuries

- Jersey Finger
- Mallet Finger
- Boxer' s Knuckle
- Boutonniere Deformity



Jersey Finger

- Mechanism of injury
 - Occurs when grabbing a jersey
 - Profundus tendon ruptures
 - Ring finger affected 75% of time



Jersey Finger

- Symptoms
 - Cannot flex the DIP actively
 - Will present with swelling, pain
 - Swelling may camouflage the injury



Jersey Finger Diagnosis

- Clinical Exam
 - Unable to flex DIP
 - DIP with less resistance into passive extension (not always)
- Ultrasound evaluation
- MRI



Treatment of Jersey Finger

- Important to identify this within 7-10 days
- Surgical reconstruction of tendon
- If untreated, result in DIP instability which can lead to problems with PIP and further disability
- Grip strength following surgery approaches normal, expect 10-15 degree extension loss



ReturnTo Play

- Depends on Physician Protocol
 - May return with splinting/casting earlier than expected
 - Takes 8-10 weeks to rehabilitate post surgery
 - Goals to restore normal DIP mechanics and strength



Mallet Finger

- Mechanism of Injury
 - Direct blow to the tip of the extended finger
 - Distal phalanx is forced into flexion
 - Disruption of the extensor mechanism over the dorsum of the DIP joint



Mallet Finger

- Symptoms
 - Swelling on dorsum of DIP
 - Inability to extend DIP
 - “Drop Finger”



Diagnosis

- Based on clinical exam
- Bony Avulsions may be seen on Radiographs




Treatment of Mallet Finger

- Continuous Splinting of DIP in extension or slight hyperextension for 6 weeks (at least)
- Then additional night splinting for 2 to 4 more weeks
- Athlete can usually participate in their sport unless baseball pitcher or quarterback




Boxer's Knuckle


- Mechanism
 - Subluxation or dislocation of extensor tendons from direct blow
 - Mostly in middle finger
 - Happens on Ulnar side more than radial



Boxer's Knuckle




Sagittal Band Rupture allows extensor tendon to sublux



Boxer's Knuckle Treatment

- Conservative treatment
 - Splint MCP joint in extension for 4-6wks
- Surgery to repair sagittal band
 - MCPs immobilized 3-4wks
 - Start active motion at MCP in dynamic extension splint next 2-3 wks
 - Discontinue splint at 6wks
 - Return to sport with full ROM/Strength



Boutonniere Deformity

- Mechanism
 - Occurs as a result of central slip injury
 - Head of proximal phalanx goes through the extensor mechanism
 - Occurs with Palmar dislocation of PIP joint
 - If left untreated, disabling deformity can result
 - Missed at times when dislocations are reduced on the field



Boutonniere Deformity

Diagnosis

- May present as a “jammed finger”
- A rupture of the central slip must be considered in these cases
- Study (Leddy & Coyle, 1989)
 - 16 athletes had “simple” PIP dislocations reduced on the field
 - 6 of these athletes had undetected central slip injuries (38%)



Treatment

- Recommend conservative treatment
 - Extension splinting at PIP joint as early as possible post injury
 - 5 weeks of continuous splinting with DIP free for motion
 - At 5 weeks, start AROM/PROM
 - 2 additional weeks of nighttime splinting
 - Chronic injuries require surgery



Ligament/Pulley Injuries

- Skier's Thumb
- Pulley Injuries



Skier's Thumb

- Mechanism
 - Forced abduction and hyperextension of the MP joint
 - Sprain of the UCL of the thumb



Skier's Thumb

- Symptoms
 - Swelling and tenderness over the ulnar aspect of 1st MP joint
 - Pain Ulnar MP joint



Skier's Thumb

- Stress Test

Skier's Thumb Treatment

- Grade I – painful and stable
- Grade II- painful with some laxity, possible fracture
- Grade III- it's over, the ligament is gone, probable avulsion fracture

Skier's Thumb Treatment

- Grade I
 - Tape, Splint, ROM exercises, Ice, protect. Have some commercially available splints. (6wks)
- Grade II
 - Same as above, unless bony fracture involved (6-8wks)
- Grade III
 - Usually require surgical intervention then (6-8wks)

Pulley Injuries

- Rock Climbing mechanism
 - A2 pulley of ring finger most often
 - Happen with falls in the “crimp grip” position



Pulley Injuries

- Symptoms
 - Pain localized
 - Swelling
 - Difficulty moving finger, gripping
 - Unable to crimp grip



Pulley Injuries

- Crimp Grip



Pulley Injuries

- A2 pulleys
 - Volar Superficial
 - Cruciate Ligaments
 - Transverse Metacarpal Ligaments
 - Annular Pulleys
 - Synovial Sheaths

Pulley Injury Treatment

- Most Pulley Injuries
 - Immobilize for 1wk
 - Start ROM exercises
 - Strengthening (isometric), avoid crimping for up to 6wks until painfree
- If do not respond to conservative treatment- Surgery

Fractures/Dislocations

- Symptoms
 - Traumatic, deformity usually noted, not always in the case of fracture
 - Pain
 - Swelling within the hour

Fractures/Dislocations

- Types
 - PIP joint (middle joint) most common
 - DIP joint
 - MCP joint- most severe, usually high impact
- Many dislocations have associated fractures...How do you know?



Fracture or No Fracture?



Fracture or No Fracture?



X-Ray for Definitive DX



Common Fractures

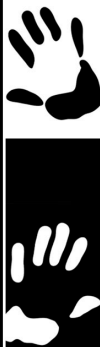
- Boxer's Fracture
 - Fracture of 5th metacarpal
 - Hand vs object usual cause



Metacarpal Fractures

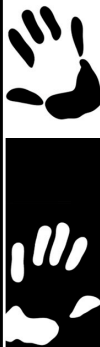


Phalanx Fractures



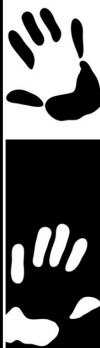
Treatment

- Timeline is generally 4-6 weeks for bony healing
- Many of these can be immobilized, buddy taped and return to play per MD guidelines earlier



Treatment/Rehab

- **Restore ROM**
 - Timeline based on healing
 - Fracture line into joint will be harder recovery
- **Strengthening**
 - Putty, clothes pins, etc.
- **Return to play**- buddy taping, splinting for protection



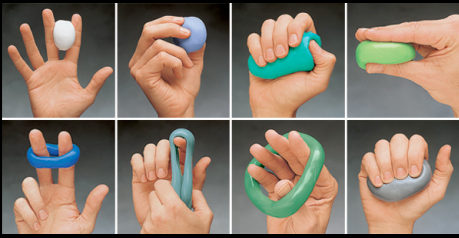
Ideas for Strengthening

- Putty resistance
 - Varying degrees of resistance
- Digiflex/grip strengthening devices
- Therabar
- Theraband
- Rice, beans, sand for resistance



Putty Exercises

- Gripping, Pinching, etc.
- Sammons Preston, Alimed, others



Strength Options



Theraband



Remember, strengthen the **entire** UE,
and Core, not just the hand!



Buddy Taping Options



In Review...

- The Hand is Complicated...but...
 - Same goals of return ROM, strength and function as in other joints of body
 - Smaller graded forces with manual therapy
 - Specific exercise protocols based on physician



Return to Play-Protect

- Tape
- Splinting
- Casting
- Athlete Education *****
- Communicate with Physician, PT/OT in regards to healing status



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Thanks for Listening!



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References/Credits

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