General Concepts

Classification of Ligament Injuries

Pain with palpation of injured structure

- Grade I
  - Damage to individual fibers, no loss of stability or disruption of the ligament

- Grade II
  - Complete disruption of the ligament
  - Passively unstable
  - Actively stable through full ROM

Learning Objectives

- General Concepts
- Sprains and Dislocations of the MCP
- Sprains and Dislocations of the PIP
- Sprains and Dislocations of the Thumb
- Tendinopathies

General Evaluation

- Mechanism of Injury
- Presence of edema
- Visible deformity
- Palpation and tenderness
- Special testing
- From here let’s get more specific

Classification of Ligament Injuries

- Grade III
  - Complete disruption of the ligament
  - Actively and passively unstable
  - Avulsion fracture
  - Dislocation

http://int-prop.l2.cuni.cz/heart_sounds/ekg3/h5.jpg
Principles of Ligament Injury Management

- Prevent Lateral Stress to Joint
- Early Mobilization when possible
- Decrease pain
- Control edema RICE (rest, immobilization, compression, elevation)
- Never sacrifice stability for mobility
  - Need to know the severity of the injury, communicate with physician
- Control Complications
  - Pain, stiffness, and swelling from stiff joint may last months

Sprains and Dislocations of the MCP

Metacarpal dislocations

- Less common than PIP secondary to increased mobility
- 61% involved the thumb MP
- Long finger most common digit
- Stress testing of collaterals done with MCP flexed
- Always compare to unaffected extremity
- May see collateral ligament injuries with VP injuries

MCP Joint Soft Tissue Stabilizers

- Collateral Ligaments
  - Obliquely oriented from dorsal MCP to palmar aspect of Proximal Phalanx (P1)
    - Taught in flexion
    - Allows P1 to abduct and adduct in full MCP extension
- Volar Plate
  - Reinforces palmar capsule
  - Interconnected by deep transverse ligament binding MCP head together

MCP Joint Soft Tissue Stabilizers

- Sagittal Bands
  - Part of extensor retinacular system that extends from volar plate to Extensor Digitorum Communis (EDC)
  - Primary Stabilizer of the EDC tendon at the MCP joint and limits its excursion

MCP Joint Soft Tissue Stabilizers

- Sagittal Bands
  - Prevent tendon bowstringing during hyperextension
  - Prevents ulnar or radial subluxation of EDC
  - Injury – usually from forceful deviation of the digit against resistance with MCP extended
**Treatment MCP Dislocation**

- Hand-based static splint, adjacent finger included, IP’s free, MP’s in flexion (30-50 degrees)
- 3-4 weeks transition to buddy straps and AROM
- 6 weeks – PROM, strengthening
- Grade III Collateral lig injuries
  - May need buddy for 3 mo.
  - Athletes or active individuals may need surgical repair

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**Complex Dislocation Surgical Intervention**

- Unable to achieve closed reduction
- Post Operative Management
  - Dorsal blocking orthosis with MCP at 30-40 (4-6 weeks)
  - Week 2 protected AROM within orthosis
  - Week 3 – gentle MP flexion PROM
  - Week 6 – progressive strengthening

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**Surgical Intervention = Complete Collateral Lig Tears**

- Immobilization in hand based orthosis with MCP at 30-50
- At 3-4 weeks – AROM with buddy tapping
- At 6 weeks – PROM and dynamic splinting
- 6-8 weeks - strengthening

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**Sagittal Band (SB) Injury: Conservative Treatment**

- Reserved for minor SB injuries without extensor tendon instability or with extensor tendon subluxation
  - Buddy Taping for 3 weeks with AROM or hand based orthosis with MCP extended
Sagittal Band Injury: Post Operative Management

- Surgery performed for complete SB injuries with Extensor Tendon Dislocation
- Surgical Repair is centralization of EDC with Repair of SB
  - Hand based orthosis with MP in full extension
  - AROM at 3-4 weeks after surgery

Sagittal Band Repair: Complications

- Monitor MP joint for Extensor Lag throughout treatment
- Watch Radial SB injuries in the SF as an abduction deformity can develop due to ulnar subluxation of the abductor digiti minimi

Sprains and Dislocations of the PIP

- Can include:
  - RC/UC ligament sprain/rupture
  - Volar plate injuries
  - Central Slip

Collateral Ligament Injuries

**Importance**

- PIP joint = 100-120 degrees of motion
- Accounts for 85% of motion in grasping
- Collateral ligament injury is most common ligament injury in the hand
- RCL/UCL, 5:1

Figure 1. Anatomy of the PIP joint.
Management of PIP RCL/UCL Injuries

Grade I:
- Buddy tape
- Immediate ROM
- Night extension orthosis

Grade II:
- Immobilize extension orthosis
- 2-4 weeks with early protected motion

Grade III
- If not treated surgically, immobilize up to six weeks but initiate protected early AROM at 3-4 weeks with buddy strapping to avoid lateral stress.
  - Complication = development of flexion contracture

Volar Plate Sprains/Dorsal Dislocations

- 85% of the dislocations at PIP
- Eaton Classification:
  - Type I: disruption of central attachment of volar plate, critical corners intact
  - Type II: volar plate avulsion with tear between accessory and proper collaterals
  - Type III: Dorsal dislocation, volar and lateral instability, volar plate rupture

Treatment

- Dorsal blocking gutter orthosis at 20-30
  - Protected early AROM into flexion for first 3 weeks
- Buddy tape 3-6 weeks
  - Extension exercises may begin
- At 6 weeks gradually add
  - Strength
  - Monitor for flexion contracture
  - Dynamic splinting into extension

Surgical Intervention: Volar Plate Arthroplasty

- POD 10-14: K-wire is removed
  - Dorsal blocking orthosis at 30 degrees of flexion
  - A/PROM into flexion initiated
- POW #4
  - AROM out of dorsal blocking orthosis
- POW #5
  - Passive extension
  - Dynamic Extension orthosing
- POW #6
  - Strength

- Emphasis on joint blocking to prevent tendon adhesions
- Complications
  - Tendon Adhesions
  - Flexion contractures

Surgical Intervention: Volar Plate Arthroplasty

- K-wire placement during volar plate Arthroplasty
Surgical Intervention = External Fixation

• POD #3-5
  – Initiate AROM
• POW #6
  – Ex-fix removed
  – A/PROM unrestricted
• POW #8
  – Strengthening
• Our Goal is Functional ROM

Volar Dislocations

• Rare and usually occurs when an extended digit is forcibly flexed at the PIP joint (sliding into home plate)

Volar dislocations

• Associated with central slip rupture (Boutonniere deformity)
• Unable to actively extend at PIP joint
• Often missed diagnosed as “finger sprain”

Conservative Treatment = Volar Dislocation

• Immobilization in PIP extension splint with DIP free for 6 weeks
• At 6 weeks – AROM PIP
• At 7 weeks – PROM and dynamic flexion orthosis; strengthening
• More details on this diagnosis in the extensor tendon presentation

Sprains and dislocations of the thumb

• Gamekeeper’s injury
• Stener’s lesion
• UCL>RCL 10:1
• Volar Plate injuries
Thumb MCP UCL Injuries: Gamekeeper’s or Skier’s thumb

- Injury to UCL when forced into radial deviation
- Orthosis for mild cases, longer with more moderate cases, surgery for Stener’s lesion.

Thumb MCP UCL Injury: Stener’s lesion

Hyperabduction force results in complete rupture of the UCL at its distal insertion with displacement proximally. The adductor aponeurosis blocks the ligament from returning to its insertion site.

Thumb MCP UCL Injury

- Grade I & II
  - Hand Based or forearm based thumb spica orthosis
  - Can start mobilizing joint between 3-4 weeks dependent on pain levels
  - PROM at week 5
  - Heavy use not until 8 weeks (particularly tip pinch)
  - Remember stability over mobility

Thumb MCP UCL Injury – Surgical Intervention

- Surgical Fixation and Post Op Management
  - Surgical fixation can be varied and in combination – suture anchor, k-wires, screw
  - Immobilized with a thumb spica cast or orthosis full time until POW 4-6
  - Start mobilizing joint between POW #4-6

Thumb UCL Injury – Surgical Intervention

- Post Operative Management
  - PROM and dynamic orthosing 6-8 weeks after repair
  - Strengthening at POW #8-10
  - Full use generally not until POW #12
Thumb UCL Injury - Complications
• Immediate IP mobilization is necessary to prevent adhesions of the extensor mechanism
• Goal of rehabilitation is a stable pain free joint – be cautious with over aggressive treatment

Thumb MCP RCL Injury
• Injured with adduction or rotational force
• Graded similarly to UCL
• Treatment similar to UCL
  – Differences =
  • Orthosis in slight flexion and radial deviation at MCP to take strain off RCL
  • Key pinch is delayed as this increases stress to RCL

Thumb MCP Volar Plate Injuries
• Rare
• Volar plate can become interposed between MC and P1. Causing dorsal dislocation to be irreducible.
• Immobilized in a thumb spica orthosis for 3 weeks in slight flexion (20-30)
  – At 3 weeks AROM of entire thumb with focus on regaining strength and function

TENDINOPATHIES

Tedinopathies
• Generalities
• Dequervain’s
• Intersection Syndrome
• ECU Tendonitis/Subluxation
• Flexor Tendonopathy at Carpal Tunnel
• FCR Tendonopathy
• FCU Tendonopathy
• Trigger Digit

Tedinopathies Generalities
• Many tendonitis’ in the UE are now found to be Tendinoses
• What does this mean?
  – Degenerative condition not inflammatory
  – No inflammatory cells
  – Hyperplasia of fibroblasts and endothelial cells
  – Neovascularization
  – Disorganization of collagen
  – Infiltrates found in tendon: mucoid, fatty, calcified
Tendinopathies Generalities

• Diseases associated with:
  – DM
  – RA
  – Psoriatic OA
  – Hypothyroidism
  – Gout
  – Deposition Diseases (amyloidosis)
  – Sarcoidosis

Tendinopathies Generalities

• Assessment
  – Where is the pain
  – What causes “the” pain
  – Medical history
  – Triggering
  – Crepitus
  – Provocative tests

Tendinopathies Generalities

• Treatment
  – Initially rest the affected tendon
    • Gradual tapering of immobilization in response to improving symptoms
  – NSAIDS
  – Corticosteroids
  – Physical Agent = MH, ice, US, ioni, stim
  – Stretching
  – Strengthening
  – Return to use

DeQuervain’s

• Stenosing tenosynovial inflammation of the 1st DC
• Common in women 30-50
• Racquet sports, idiopathic, overuse, posttraumatic, postpartum

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DeQuervain’s Tenosynovitis

  – Prospective randomized study, N = 67
  – Measures VAS for pain and Quick DASH
  – Found that corticosteroid injection in conjunction with thumb spica immobilization (93% success rate) more beneficial than without (69% success rate)

Positive Finkelstein’s Test
DeQuervain’s Conservative Treatment

- Thumb Spica Orthosis with 15 degrees of extension
- Anti-inflammatories
- Injection
- Ice
- Avoidance of symptom inciting activities

DeQuervain’s Surgical Treatment

- Release of 1st dorsal compartment
  - Ensure EPB sub-compartment released
  - Protect Radial Sensory Nerve
- Post Op Therapy
  - Thumb Spica Orthosis for 2-3 weeks
  - AROM initiated within first week post operatively
  - Gentle strength can start POW 2

Dequervain’s Tenosynovitis

  - Randomized prospective trial N=52; endoscopic=27, open=25
  - At 12 weeks post op DASH and pain significantly significant improvements in endoscopic group as compared to open
  - Less instances of Transient Radial Sensory Nerve Injury in endoscopic group than in open group (3 versus 9)

Intersection Syndrome Oarsman’s Wrist

- Common in weightlifters and rowing
- Pain and tenderness in distal forearm with localized swelling about 4cm proximal to the wrist
- Severe=redness and crepitus
- ECRL/ECRB crossing over the EPB/APL tendons with or without peritendinous bursal inflammation

Intersection Syndrome Conservative Treatment

- Thumb Spica Orthosis or wrist orthosis
- Anti-inflammatories
- Injection
- Ice
- Avoidance of symptom inciting activities
- Taping

Intersection Syndrome Conservative Treatment

- Kaneko, S. & Takasaki, H. Forearm pain, diagnosed as intersection syndrome, managed by taping; a case series.
  - Taping in elastic at starting at intersection of EPB/APL and ECRL/ECRB – applied in ulnar direction for 3 weeks
  - Showed resolution of crepitus and inflammation and improved DASH score (disability/symptom subscale) in all 5 cases in series with application of tape
Intersection Syndrome Surgical Intervention

- Release of second dorsal compartment and removal of inflamed bursa
- Wrist orthosis for 1-2 weeks
- Start with gentle ROM POW 1

ECU subluxation

- Secondary to attenuation and rupture of ECU subsheath in the 6th dorsal compartment
- Subsheath is critical to ECU stability
- Subluxes in volar and ulnar direction
- Can lead to tendinitis
- Painful with extension, UD and sup/pro
- Need to rule out other sources of ulnar sided pain/instability

ECU Tendinopathy/Subluxation

- Diffuse ulnar sided wrist pain
- Palpate ECU coming out of the ulnar groove when moving form sup-pro
- ECU Synergy Test – Tester holds thumb and MF with one hand and palpates ECU with other; then patient radially abducts thumb
  - Positive with pain

ECU Tendinopathy/Subluxation

- Conservative treatment includes wrist orthosis/ulnar gutter
- NSAID’s, ice, and injection

ECU Tendinopathy Surgical Intervention

- Release of 6th dorsal compartment (radial side)
  - Rare
- Post Operative care
  - Wrist orthosis for 1-2 weeks
  - Start ROM POW 1-2
    - Begin with isolated planes of motion movements
    - Then move on to combined motion
ECU Subluxation Surgical Interventions

- Repair of ECU Subsheath
- Post Operative Rehabilitation
  - Immobilization muenster type orthosis avoid rotation – 6 weeks
  - Be cautious of extreme supination and wrist flexion when first starting ROM

Flexor Tendinopathy at CT

- Hypertrophy of flexor synovium increases pressure on median nerve in carpal canal
- Treatment =
  - Wrist orthosis (neutral)
  - Tendon gliding
  - Nerve gliding
- Surgical Intervention =
  - CTR
  - Tenosynovectomy

FCR Tendinopathy

- May see in conjunction with STT OA
- Pain near scaphoid tubercle
- Pain with resisted wrist flexion/RD
- Conservative Treatment
  - Wrist orthosis (slight flexion)
  - NSAIDS
- Surgical Intervention
  - Atypically needed
  - May need surgery for other local conditions (ganglion, CMC/STT arthritis, osteophytes)

FCU Tendinopathy

- Most common flexor tendinopathy
- May be seen with Pisotriquetral arthritis
- Pain at insertion of FCU?
- Pain with resisted wrist flexion/UD
- Conservative Treatment
  - Wrist orthosis (slight wrist flexion)
  - NSAID’s
- Surgical Intervention
  - Rare
  - Sub periosteal Pisiform excision

Trigger Digit

- Pain, tenderness, and triggering at A1 pulley
- Triggering can occur also at proximal end of A2 and at A3-infrequent finding
- Finger “locking” and/or clicking
- Finger gets stuck down at night and they have to pull it open

Flexor Tendon Pulley System

- Fibrous bands that overlay the synovial sheath in segmental fashion
- Function
  - Prevent bowstringing with active finger flexion
  - Consists of annular pulleys and cruciate ligaments
- Critical pulleys: A2 and A4

Trigger Digit

- Correlation between absence of vinculi and triggering
- Affects women more than men
- Thumb, Ring, and Middle most often affected
- More common in diabetics

Trigger Digit

- Conservative Treatment
  - Decreased success in patients with co morbidities
- NSAIDS, injection
- Orthosis with Exercise
  - Orthoses: MP extension orthosis for digits and IP extension orthosis for thumb
  - Repetitive composite fisting should be avoided as long as symptoms continue

- 87% success rate with use of orthosis for trigger digit at one year

Surgical Intervention:
- Can be open or percutaneous
- Complete release of A1 pulley
- If triggering continues look for adhesions between tendons or hypertrophic tenosynovium
  - Sublimis resection (full/partial) or reduction profundus tenoplasty

Post Operative Therapy
- Not always necessary
- Patient can begin moving day of procedure
- Instances when therapy is appropriate:
  - Contracture
  - Hypersensitivity
  - Hypertrophic scarring
  - Limited motion

Learning Objectives

- General Evaluation
- Sprains and Dislocations of the MCP
- Sprains and Dislocations of the PIP
- Sprains and Dislocations of the Thumb
- Tendinosis
References