Hand Injury Rehab Concepts and Return to Play

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Presentation Overview

- Discuss common hand and finger injuries/rehabilitation in baseball
  - UCL of the Thumb Tear
    - Rehab comparisons based on surgical technique
  - Hook of the Hamate Fracture
    - Case Study: Acute proximal phalangeal metaphyseal fracture

Introduction

- Commonly injured structure of the MCP joint
  - Opposable thumb provides up to 40% of hand function (Posner et al. 1992)
  - Injury to supporting structures of MCP leads to a loss of 22% of bodily function (Stener et al. 1962)
  - UCL - primary restraint to valgus force

- Mechanism of Injury
  - Hyper-extension or hyper-abduction of the MCP joint
    - Sliding into a base: FOOSH

- Treatment decisions
  - Favorable outcomes with primary repair
    - Limited with what initially due to immob.
Injury Videos

- MOI: Acute tear while batting

Injury Videos

- MOI: Fall on the outstretched hand

Injury Breakdown
ATC/MD Examination

• ATC Evaluation (DOI)
  – Positive Ulnar Gapping
  – 2/5 Strength Ulnar Deviation
  – Pain with MMT

• MD Examination (Day 1 post-injury)
  – X-Rays: (-) for fracture
  – MRI: (+) UCL tear
    • (+) Stener Lesion: displacement of the UCL superficial to the adductor aponeurosis

Surgical Technique
**Strengthening (Day 14)**
- Ball drops
- Rice Bucket
- Thera-Web
- Incorporate grip strengthening with arm care exercises
  - PVC Pipe...Cheap and easy to increase difficulty

**Objective Measures**
- Bilateral comparison of ROM
- Strength assessment
  - Grip
  - Pinch

**Return to Sport**
- Began baseball activities at 3 weeks post-op
- Throwing Progression
- Hitting Progression
  - Dry Swings
  - Tee
  - Trees
  - Cage and Field B.P.
  - Live At-Bat/Hitting off Machine
- Defensive Drills
- Conditioning
Hitting Progression – Toss (27 days P/O)

- Protective Padding - Batting
  - Pro-Hitter
  - Easton Pro Slot Batting Gloves

Protective Equipment - Sliding
- Neoprene material
- Protective shell (plastic) for thumb
- Volar and dorsal aluminum stay
**Post-Operative Comparison**

<table>
<thead>
<tr>
<th>Primary UCL-R</th>
<th>UCL-R with Internal Bracing</th>
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<tbody>
<tr>
<td>0-6 weeks: Splint</td>
<td>0-3 days: Post-op splint</td>
</tr>
<tr>
<td>6 weeks: Begin physical therapy</td>
<td>3 days: Begin ROM</td>
</tr>
<tr>
<td>10 weeks: Begin baseball activity</td>
<td>14 days: Begin strengthening</td>
</tr>
<tr>
<td>12 weeks: Game</td>
<td>21 days: Begin baseball activity</td>
</tr>
<tr>
<td></td>
<td>35 days: Game</td>
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**Take Home Points**

- Surgical repair with internal bracing allows for accelerated rehab and return to sport
- Clinical Experience
  - Smooth rehab process
  - No surgical complications
- Subjective reporting
  - “I only had soreness the first 3 days”
  - “No issues since the surgery”

**Hook of the Hamate Fractures**
Introduction

- Fractures of hook of hamate represent 2-4% of all carpal fractures (Rettig '03)
- Volar and radially projecting hook at risk in sports with gripping (Bishop et al '88)
  - Baseball, golf, racquet sports
- Anatomical Considerations
  - Proximity of ulnar nerve, small finger flexor tendons
- Treatment approach
  - Surgical vs. Non-Operative
  - Surgical Procedure
    - Excision vs. ORIF

Introduction

- Baseball Mechanism of Injury
  - Impingement of the bat against hook of the hamate (Parker et al '86)
  - Acute fracture or chronic stress
- Pain description
  - Deep, ill-defined ulnar-sided wrist pain
  - Ulnar paresthesias
- Weakened Grip
- Routine radiographs may miss fracture (Bachoura et al '13)
  - MRI
  - CT Scan

Post-Surgical Rehabilitation

- Week 0-1
  - Remain in post-op splint
  - Keep incison clean/dry
  - Finger AROM
  - Remove sutures at 1 week post-op
- Week 1-3
  - Regain hand/wrist ROM
  - Incision
  - Grip strengthening
- Week 3+
  - Strengthening
  - Return to sport progression
Post-Surgical Complications

- Carlan et al '17
- 81 patients treated surgically with HoH excision
- 25% of cohort experience post-op complications
  - Transient ulnar nerve symptoms
  - Transient motor weakness
  - Scar Related Pain
  - Abnormal sensation in another cutaneous n.
  - Ulnar-sided wrist pain
- Increased rate of complication
  - Longer interval between onset and surgery
- Minimal difference in RTP time

Functional Rehab Progression

- Principles of Progression
  - Monitor volume of overall activity
  - Hitting, Throwing, Weight Training
  - Avoid progressing multiple areas in the same day
  - Incorporate off/download days
  - Collect objective measures throughout progression
    - Range of motion, strength
  - Modify program based on subjective reporting

Functional Rehab Progression

- Accelerated Rehab Progression
  - Begin baseball activity at 3 weeks
  - Goal of return to game at 6 weeks
  - Hitting Progression
    - Dry Swings w/ Fungo/Bat
    - Swings off the Tee
    - Front Toss
    - Cage BP
    - Field BP
  - Hitting off machine/Live At-Bats
  - Appropriate throwing, defensive drills, and conditioning to ensure athlete prepared for return
Case Study:
Proximal Phalangeal Metaphyseal Fracture

Injury Video

Injury Video
Post-injury Radiographs

Surgical Procedure

- Closed reduction, percutaneous pin fixation, proximal phalanx of index finger
- 1 week post-op: Remove post-op dressing
  - ROM for DIP and MP Joints
- 3 weeks post-op: Removal of pins
  - Continue to wear finger immobilizer

Post-Surgical Radiographs – 12wks
Anatomy of the PIP Joint

• Structures surrounding the PIP joint
  – Extensor Mechanism
  – Dorsal Capsule
  – Collateral Ligaments
  – Volar Plate
  – Flexor Digitorum Superficialis
  – Flexor Digitorum Profundus

Preventing Hand Stiffness

• Some degree of stiffness inevitable following substantial injury
  – How do we prevent excessive stiffness?!
• Early reduction of edema
  – Increased volume of fluid encourages contractures of capsuloligamentous structures
• PIP joint poses its own difficulties
  – Relative weakness of extensors
  – Intrinsic tightness?
  – Extensor tendon, capsuloligamentous tightness?

Inflammation

• Aggressive edema management vs. "aggressive" ROM
• Monitor frequently
  – Circumferential measurement
  – Appearance
• Techniques utilized
  – Soft tissue massage
  – Compression Wraps
    – Coban
    – Silicon
  – Kinesiology
Treatment Session

- Collect Objective Measurements
  - Circumferential measurements, ROM
- Heat (Parafin, MHP) w/ composite flexion stretch
  - Coban
- Gentle soft tissue massage and PROM
- Dynamic Splinting
- Transitional Movement
- Strengthening
- Do we finish with ICE or HEAT??
- Measure throughout!!!

Re-gaining ROM

- Dynasplint
  - Low-load long-duration stretching
  - Implemented at 8 wks post-op
  - Initial wear time of 15'
  - Progressive increase of wear time to 1 hour
- Solely targeted PIP Joint
  - Is that enough??

Re-Gaining ROM

- Dynamic Splint w Extension Block
  - Stabilizing joints with appropriate motion to encourage movement at areas with limitations
  - Active elongation of interosseous and lumbrical muscles
  - AROM stimulates lymphatic system
- Subjective
  - Stretch sensation over greater surface area compared to Dynasplint
- What about passive motion?
  - Avoid "aggressive" ranging
  - Provides limited glide of the tissue planes other than particular stretching
  - Doesn't necessarily increase AROM
Motion Progression

- Pre-Treatment
- Post-Hot Pack
- Post-Active Stretch w/ Splint

Transitional Movement

- Focus of rapid transition from flexion and extension
- Goal of increasing ease and fluidity when moving from flex/ext

Therapeutic Exercise

- Goals on increasing ROM and strength
  - Make it fun!
  - Incorporate equipment that relates to patient
    - Baseball, Baseball bat
  - Total body exercises
    - Balance with ball toss
    - Verbal cues for sustained grasp with exercises in gym
Strengthening
• BTE Simulator II
  – Baltimore Therapeutic Equipment
  – Replications hundreds of jobs and daily living activities
  – Objective, data-driven equipment
  – Isometric and Isotonic concentric modes

Strengthening
• Wrist Flexion - BTE Simulator II
  – Repeated wrist flexion against resistance
  – Machine monitors numerous factors
    • Distance, force output, time, etc
  – Verbal cues for player to focus on sustained grasp with index finger

Strengthening
• Gripping - BTE Simulator II
  – Repeated gripping against resistance
  – Verbal cues for player to focus on sustained grasp with index finger
**Baseball Activity**

- Began LIGHT baseball activity at 14wks post-op
  - Throws into netting
  - Dry Swings
  - Swings off the Tee
- Continuous re-assessment to determine appropriateness of progression
- Subjective Reports
  - "Initially it was a little sore"
  - "I feel good with activity now, no pain"
  - "I feel strong"

**Clinical Pearls**

- Avoid early "aggressive" ROM!
  - Increasing tissue damage during healing process
- Objectively monitor throughout plan of care
  - ROM, Swelling, Strength, Tissue quality, etc.
- Rehab is a team approach
  - MD, PT, ATC, OT, S&C, Mental Conditioning
  - Seek out healthcare professionals with different skill sets as needed
  - Medical staff must communicate frequently