Non-operative Treatment of Ulnar Collateral Ligament Injuries of the Elbow

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Disclosures

- Arthrex: Consultant
- DJO: Education
- Smith Nephew: Education
- American Journal of Sports Medicine
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- Journal of Shoulder and Elbow Surgery
- Orthopaedic Journal of Sports Medicine
- The Physician and Sports Medicine
- American Orthopaedic Society for Sports Medicine (AOSSM): Education and Industry Relations Committee
25% of major league pitchers have had MUCLR (86% as a pro)

15% of minor league pitchers have had MUCLR (61% during HS or college)
Pearl Diver computer database
CPT code 24346 (MUCLR); 790 cases
Average annual incidence:
- Overall population = 3.96+/- .38 per 100K
- **Age 15-19 = 22+/- 3.4 per 100K**
- Incidence increased **9.2%** annually in the 15-19 age group
- 56.8% of all cases done in the 15-19 age group
Treatment

- Literature almost exclusively addresses surgical treatment techniques and results
- Most recent studies have focused on performance metrics after UCL reconstruction
- 67%-83% of MLB pitchers (RTSP) after reconstruction
- RTP avg. 20.5 months

Non-Operative Management

• Results much less reported, more variable
  • 42%-94% return to play

Return-to-Play Outcomes in Professional Baseball Players After Medial Ulnar Collateral Ligament Injuries

Comparison of Operative Versus Nonoperative Treatment Based on Magnetic Resonance Imaging Findings

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Investigation performed at Steadman Hawkins Clinic–Denver, Greenwood Village, Colorado, USA

- 43 pro baseball players with 43 UCL sprains
- 8 complete by MRI => early surgery
- 35 partial (24 pitchers, 11 position players)
  - 7/35 went on to surgery
  - 26/28 non-op RTP at same level
Treatment Algorithm

• Current algorithms largely based on surgeon experience and preference

• No published studies have isolated variables that predict success and failure in non-operative management

SO WHO NEEDS SURGERY AND WHO DOESN’T?
RESEARCH QUESTION

Can we identify predictors for success or failure in non-operative management of UCL injuries in professional pitchers?
MRI Predictors of Failure in Non-operative Management of Ulnar Collateral Ligament Injuries in Professional Baseball Pitchers.

- Retrospective Cohort – Level III
- 32 pitchers (mean age 22.3 years) who underwent initial non-operative management of UCL injuries were evaluated.
  - Data collected from one MLB organization (all levels) from 2006 to 2015

- 34% (11/32) failed and required subsequent ligament reconstruction.
- 66% (21/32) successfully returned to the same level of play for 1 year without surgical intervention.
- No significant difference seen in physical exam findings or performance metrics between these patients
- MRI findings:
  - 82% (9/11) (p<0.001) who failed non-operative management (could not RTPSL) had distal tears
  - 81% (17/21) who were able to RTPSL had proximal tears (p<0.001).

- When adjusting for age, location and evidence of chronic changes on MRI, the likelihood of failing non-operative management was 12.4 times greater (P=.02) with a distal tear.
WHY DO DISTAL TEARS DO WORSE?
MUCL ANATOMY

- MUCL has a much longer ulnar insertion than previously described.

  - Sublime Tubercle averaged 5.8mm from joint line
  - The MUCL ridge length was 21.6 mm in length
  - The ulnar soft tissue attachment averaged 29.2 mm
  - The average length of the entire anterior band of MUCL was 53.9 mm

Yellow Triangles = MUCL Ulnar Ridge
Arrows = reflected anterior band of MUCL
LIKE OTHER ANATOMIC AREAS:

- Other areas where **DISTAL lesions** do worse:
  - MCL Knee
  - UCL Thumb

WHY??

**Less stability – Biomechanics**

Blood supply – decreased healing
RESEARCH QUESTION

• Are **distal** anterior band of MUCL lesions **biomechanically inferior** to proximal lesions?
BIOMECHANICAL EVALUATION OF MEDIAL ULNAR COLLATERAL LIGAMENT INJURIES OF THE ELBOW
Methods

- **8 cadaveric elbow specimens** (all male, ages 65-82, average age: 73.5)
- Medial dissection with minimal elevation of superficial soft tissues
  - Split common flexor mass longitudinally within raphe adjacent to FCU
- The native UCL (after dissection) was tested with the 6-axis force-torque sensor (Theta, ATI Industrial Automation, Apex, NC) and controlled using custom simVITRO® software
- Each elbow was flexed to 70, 90 and 120 degrees
- At each flexion angle, valgus torques of 2.5 Nm and 5 Nm were applied and held consecutively for 45 seconds
• Each specimen had a 50% of fibers lesion created with a sharp 15-blade.
• The partial cut location was either
  • 1) anterior-distal
  • 2) posterior-distal
  • 3) anterior-proximal
  • 4) posterior-proximal
• The 8 specimens (2 for each type of lesion) were tested and then the lesion completed for all 8 and retested with a complete lesion
• Stiffness was determined as the change in torque over the change in angle between the two superposition angles.
RESULTS

- Overall partial distal cuts (including PD and AD) had a greater contribution to rotational stiffness than partial proximal cuts (including AP and PP)

- Distal lesions → stiffness drops of 0.73 Nm/degree compared to the intact elbow

- Proximal lesions → 0.31 Nm/degree compared to the intact elbow
DISCUSSION

• **Conclusion:**

  - Distal partial lesions (especially posterior distal) to the UCL appear to be biomechanically inferior to proximal UCL lesions at resisting valgus moment arms in cadaver elbows.

• **Limitations:**

  - Dissection may disrupt important secondary soft tissue restraints to the medial elbow
  - Only 8 specimens
  - Accuracy of cuts (exactly 50%?)
    - Attempted to account for this by measuring with ruler and marking
    - Cut with UCL under valgus tension to improve accuracy
  - Age of cadavers not representative of throwing population
  - Changes in throwers elbows – adaptive anatomy
WHAT DOES IT ALL MEAN?

- Our results lend biomechanical support to MRI findings associated with successful clinical non-operative treatment of MUCL injuries.

- Distal UCL injury throwers should be counseled on higher failure rate and discuss early reconstruction.

- **Proximal injury throwers should be counseled on higher success rate of non-op treatment**
Non-Operative Treatment

- No throwing for 4-6 weeks
- Avoid all valgus
- Take the opportunity to address the entire kinetic chain:
  - Shoulder
  - Scapula
  - Core
  - Hips
- Maintain cardio fitness
Post Injury Rehab Progression

- Week 1: ROM
- Week 2: Pre’s including protected cuff
- Week 3: advanced cuff and forearm work in 90/90 with stabilization
- Week 4: 2 handed plyos
- Week 5: 1 handed plyos
- Week 6: ITP
WHAT ABOUT BIOLOGICS??
**Biologics**

- **Goal is to optimize the local healing environment**
- **Categories include:**
  - Cells (e.g. PRP, stem cells)
  - Non-viable compounds (e.g. growth factors)
  - Tissues (e.g. allograft, placental tissue)
Biologics

- Sources include:
  - Autologous/autograft (PRP; bone marrow aspirate)
  - Allograft
  - Xenograft
  - Synthetic
Human Placental Tissue

- Technically an allograft; supplement and/or replace damaged connective tissue
- Extracellular Matrix of:
  - Collagen
  - Growth factors
  - Bioactive molecules
- No blood draw or aspiration
Biologics

- Very little EBM to support routine use in the treatment of ligament injuries
- Majority of literature focuses on laboratory studies (most of it positive)
- Multitude of products available; most have no clinical trials demonstrating efficacy or safety
REGARDLESS, MANY OF US ARE USING THEM!
# of Stem Cell Injections, 2010-2016

Note: Includes players who received Stem Cell Injections as well as Injections with a Combination of PRP and Stem Cells
Our Current Biologics Protocol

- Proximal sprain (partial or complete)
- Select distal injuries (typically partial)
- Inject within the 1st week after injury
Platelet Rich Plasma

• Current clinical usage for tendon or ligament injury:
  Leukocyte Rich Tendon Protocol, LR-PRP

• Small aliquot intra-ligamentous injection:
  Typically, .5 to 1.0 maximal injection

• Fascial dissection is key with remaining injectate:
  1.0 to 2.0 cc MSK US guided separation of UCL from scarred Flexor/Pronator using “floating ligament” technique
Post Procedure Pearls

- NSAIDs
  - Avoid, where possible, for 7 days prior and 7 days post.
  - No NSAID-containing topical for 7 days
  - Usually oral narcotic day of procedure and for 2 days post.
- Ice
  - No icing for first 3 days, then ok to resume on limited basis
- Return to throw
  - Typical time down 2 weeks to allow progression through inflammation-to-remodeling cycle
- Gentle ROM
  - Begin flushing maneuvers at 3 days
• 34 athletes (27 baseball players; 2 pro, 11 college)
• Partial MUCL sprain
• Failed 2 months other treatment
• Single US guided injection of leukocyte-rich PRP (Arteriocyte)

**88% RTP at 12 weeks**

• Significant decrease in medial joint valgus laxity
Final Thoughts

• Not all UCL injuries are created equal
• Carefully assess the nature of the injury; location very important
• Non-operative treatment can be successful in a high percentage of proximal injuries
• The role for biologics has yet TBD
THANK YOU!!