**Throwers Elbow – Management and Treatment**

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**Anatomy**

- Complex hinge
- 3 Articulations
  1. Ulnohumeral joint
  2. Radiocapitellar
  3. Proximal radio-ulnar

**Anatomy - Medial**

- Medial collateral ligament
- Anterior bundle -16
- Transverse bundle – 17
- Posterior bundle -18
- Annular ligament -19

**Anatomy - Lateral**

- Lateral Collateral Ligament
- Annular -12
- Radial collateral – 13
- Lateral collateral -14
- Accessory lateral col-15

**Biomechanics**

- Elbow Stability
  - Unhohumeral Joint
    - $< 20^\circ$ / $> 120^\circ$
  - Valgus
  - Varus
  - MCL
    - $20^\circ - 120^\circ$
  - LCL
    - $20^\circ - 120^\circ$

**Pathomechanics**

- Overhead throwing
  - 90 mph
Pathomechanics

64 Nm of valgus torque

Medial side pathology

Tensile load

Tensile strength of the

UCL is only 34 Nm

Posterior side pathology

- Valgus extension overload syndrome
- Posteromedial impingement
- Inflammation
- Chondropathy
- Osteophyte / spur formation
- Loose bodies
- Olecranon stress fractures
**Ulnar collateral ligament injury**

- Attenuation to complete rupture
- Medial elbow pain
- Pain during acceleration phase
- Loss of velocity, accuracy
- POP sensation in acute cases
- Ulnar nerve symptoms
- Pain w/ palpation over MCL (50°-70° flexion)

**UCL examination**

- Valgus stress test
- 30° of elbow flexion
- Opening of the medial joint space +/- pain

**UCL examination**

- Milking maneuver
- 90° elbow flexion
- Grabbing the affected thumb with the opposite hand passed under the affected arm
- Pulling to stress the medial elbow

**UCL imaging**

- UCL injury / tear
  - Usually do not respond to conservative treatment

**Surgical treatment indications**:  
- Acute ruptures  
- Instability  
- Chronic pain
**Ulnar collateral ligament injury**

**UCL reconstruction**

- Jobe et al. JBJS Am 1986
  - Tommy John procedure
  - Free tendon graft
  - 63% return to sports (10 out of 16 athletes)
  - 31% postop ulnar nerve complication

**Ulnar collateral ligament reconstruction**

- Modified Jobe Technique
  - No neuropathies

- Docking technique
  - Alchek et al. AJSM 1996
  - Rohrbaugh et al. AJSM 2002
  - 95% (31 pts) return to sports
  - Azar et al. AJSM 2010
  - 79% (78 pts) return to sports

**Ulnar collateral ligament reconstruction**

- Bone tunnels
  - anterior and posterior aspects of the sublime tubercle
  - central or lateral to the midpoint of the epicondyle

- Byram, Ahmad et al. AJSM 2013
  - bone bridge of 6 to 8 mm
  - 15° in the coronal plane
  - 30° in the sagittal plane

**A Systematic Review of Ulnar Collateral Ligament Reconstruction Techniques**

Jonathan N. Watson, MD, Peter McQueen, MD, and Mark R. Hutchinson, MD

Investigation performed at the University of Illinois at Chicago, Chicago, Illinois

**Results:** A total of 21 studies, 7 biomechanical and 14 clinical, met the inclusion criteria. There were 1384 patients. The overall complication rate was 18.6% (203/1086), further subdivided into 27% for the Jobe technique (29/109), 10% for the modified Jobe technique (13/131), 0% for the interference screw technique (10/10), 2% for the modified docking technique, and 16% for the docking technique (16/103). The most common complication across all studies was ulnar nerve neuropathy in 176 (12.9%). The overall rate of return to play was 78.4%.

**Conclusions:** Ulnar collateral ligament reconstructions utilizing the docking technique results in a significantly higher rate of return to play and a lower complication rate when compared with the Jobe and modified Jobe techniques.
**UCL Reconstruction- Rehab**

- Splint immobilization for 1 week in 75 deg of flexion
- Transition to hinged elbow brace with initial ROM of 30 to 90 deg
- Advance to 15 – 105 deg between 3 and 5 weeks with active and passive ROM as tolerated
- DC hinged brace at 6 weeks
- 6 to 16 weeks start active ROM and strengthening of whole arm, adv as tolerated

**UCL Reconstruction- Rehab**

- 16 weeks start throwing at 45 foot distance on flat ground
- No pain and able to throw 180 feet on flat ground
- At 7 months and start mound throwing
- Advance speed and endurance over the next 3 months
- Return to play at 1 year

**Valgus Extension Overload Syndrome**

- Posteromedial impingement
- Chondropathy
- Osteophyte formation
- Loose bodies

**Valgus Extension Overload Syndrome**

- Posterior elbow pain
- Loss of full extension
- Crepitus / locking
- Arm bar test
**VEO - Treatment**

- Rest, NSAIDs
- Therapy regimens
  - Flexor pronator mass strengthening
  - Pitching instruction, focus on proper mechanics and improve poor technique
  - Inverted ‘W’

**Valgus Extension Overload Syndrome**

**VEO Syndrome Treatment**

- Open vs. arthroscopic debridement
- Reddy et al. Arthroscopy 2000
  - 85% return to sports (55 athletes)
- Blonna et al. AJSM 2010
  - 91% return to sports (24 athletes)

**VEO - Rehab**

- Splint immobilization for 1 week in 75 deg of flexion
- DC splint and start active and passive ROM as tolerated at follow up
- 6 weeks start active ROM and strengthening of whole arm, adv as tolerated
- Return to throwing as pain and strength allow

**Etiology of OCD in the elbow**

- Adolescent athletes ages 11-21
- Differentiate from Panner disease
  - Boys age less than 10, osteonecrosis of entire capitellum
- Male >> female
- Sports including baseball, gymnastics, weightlifting, rock-climbing
- Usually dominant arm, occasionally bilateral

- Typically overhead throwing athlete
- Repetitive trauma
- Poor throwing mechanics
- Compression of the lateral condylar blood supply in late cocking phase of throw
- Axial twisting load across the elbow in gymnasts

**Etiology of OCD in the elbow**

- Vascular anatomy of the distal humerus supports ischemia as a possible cause of OCD
- Capitellum
  - supplied by posterior end arteries that traverse the epiphyseal articular cartilage
  - no metaphyseal collateral contribution
- Repetitive compression of may result in subchondral ischemia and the characteristic osteonecrosis
- Loss of subchondral - articular cartilage fragmentation and loose body formation
Insidious onset of lateral elbow pain
• Worse with and after use
• Improves with rest
• May have small effusion
• Lack of 10-20 deg of terminal extension
• Pain with palpation over radial head, lateral epicondyle
• Occasional locking, catching of elbow
• Passive pronation/supination with axial load exacerbates lateral pain

Plain radiography
CT
MRI +/- gadolinium

Minami Xray:
• Grade I: translucent cystic shadow
• Grade II: clear zone or split line between lesion and underlying bone
• Grade III: loose bodies

MRI grading of lesions of talus/knee developed by Nelson can be used for the elbow

Arthroscopic (Gestalt) classification
• Stable
• Unstable but attached
• Detached

Nonoperative
Takahara et al. (Am J Sports Med 1999)
– 24 patients who were treated nonsurgically
– mean follow-up of 5.2 years.
– Found poor subjective outcome to be independent of lesion grade
– Radiographic healing and improvement not associated with the status of growth plate
– Poor prognosis - large, advanced lesions, degenerative changes

Mihara et al. (Am J Sports Med 2009)
– 39 baseball players, mean age of 12.8 years, mean follow-up of 14.4 months
– 25 of 30 early lesions were healed, only 1 of 9 advanced lesions
– Healing in 16 of 17 with open physes, only 11 of 22 closed

Operative
– Open Debridement and Fragment Excision
– Arthroscopic Debridement and Marrow Stimulation
– Fragment Fixation
– Osteotomy
– Osteochondral Transplantation
• Autograft or allograft
Autograft for OCD in the elbow

- Indications include large Baumgarten grade 4 and 5 lesions, ICRS grade IV lesions
- Lesions involving >50% of the articular surface area
- Disruption of the lateral buttress
- Radial head engagement
  - Technically demanding
  - Donor site morbidity, donor site pain
  - Curvature best fit
  - Multiple plugs for large lesions
  - Limited donor area

- Takahara, JBJS, 2007

Fresh Allograft for OCD in the elbow

- Reports in the knee show:
  - 90% survival at 10 years - pediatric
  - 82% survival at 10 years - adults
- Indicated in knee for large >2cm² lesions - similar in elbow
- Match radius of curvature
- One stage operation

- Levy YD, Clin Orthop Relat Res 2013

Case example

- 12 yo female, right elbow dx with OCD at 10.5 years
- Gymnast but not high level
- Treated with fragment debridement
- Continued pain / stiffness
- ROM 30 to 110
- Bilateral involvement

- Mirzayan, JSES, 2016

Case example

- Left elbow asyptomatic

- Mirzayan R, JSES, 2016

Case example

- R elbow OCD, 11 diameter
- Joint effusion, no obvious loose bodies
- ICRS Grade III
- Large lesion, failed previous operation
- Did not want to use knee, donor site morbidity
- Match radius of curvature

- Mirzayan R, JSES, 2016
- Kocher interval
- Posterior to it
- Elevate anconeous off ulna
- Hyperflex elbow

Case example

- Sizer - 15 mm
- 1.76 cm² graft

Case example

- Sizer - 15 mm, reamer

Case example

- Graft harvest

Case example

- Graft harvest

Case example

- Graft preparation
Case example

- Insetting
- Press fit

Rehab:
- Soft dressing
- Immediate gentle ROM
- PT/OT stretching at first post op visit
- NWB for 6 weeks
- Strengthening at 6 weeks
- Repetitive WB at 3 months
- CT scan

Case example

- CT scan at 3 months
- Pain free
- Nearly Full ROM
- Lacking extension 10 deg
- Begin light gymnastics
- Full arm weight bearing at 6 mo

Case example

[Images of a person performing physical therapy exercises]

Case example

[Images of a person's arm with a cast and a CT scan]

Discussion

- Thank you