Treatment of Elbow Injuries in Overhead Athletes: *How has it Evolved?*

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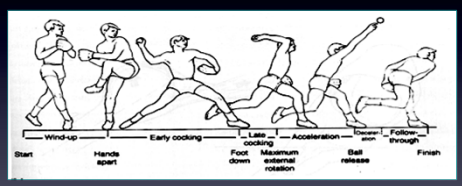
Throwing is *NOT* Normal



- **Excessive Joint Forces**
- **High angular velocities**
  - Angular velocities up to 7200˚/sec (Fleisig *AJSM* 95)

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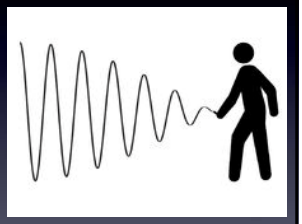
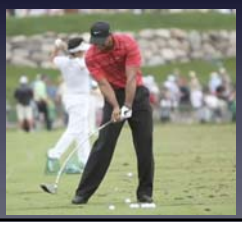
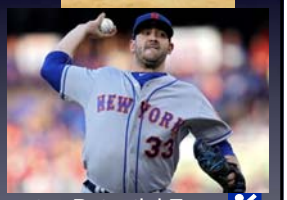
Final Links in the Kinetic Chain

- Smaller motion segments see higher forces/torques
- Underscores proper technique with good timing



"LAG"





- Creates Potential Energy

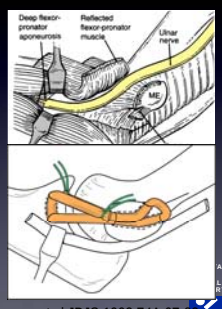
Figure-of-8 Jobe Original TJ

Flexor mass detached
- 2 tunnels distally
- 3 tunnels proximally

Tendon graft woven in fig 8

Not Docked

Ulnar nerve transposed submuscular



Jobe et al JBJS 1986;68A:1158-63; Conway et al JBJS 1992;74A:67-8

Post- Op Care

- Brace: 45-90º x 2 weeks
  30-115º x 1 week
  15-120º x 1 week
  → 4 weeks
- Elbow / Shoulder Rehab
- Tossing 4 months
- Pitching 9 months
- **Competition 12 months???**

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Original Tommy John Method

Dr Jobe's First 13 year experience

56 Reconstructions

20 MLB, 14 MnLB

68% Excellent

21% Ulnar nerve complications

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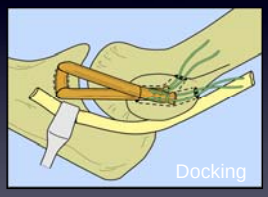
Evolutionary Pressure

- Complexity of the Surgery
- Extensive Dissection
  - Flexor Mass Mobilization
- Research: Anatomical and biomechanical studies

Isometry, Fixation strength



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New Methods - Reasonable Goals

Restore the anatomy: functional, strong, valgus torque restraint with anatomic length and isometry

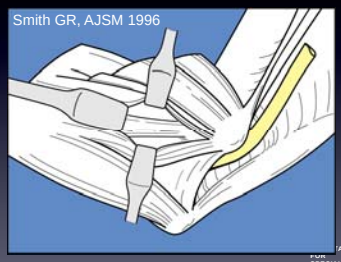
Minimize surgical complications

Increase initial fixation strength

Improve outcomes

Surgical Approaches

1. Flexor Mass detached
2. FCU detached
3. FCU elevated
4. Muscle Split



Muscle Splitting Approach to UCL

Smith, Altchek et al. *AJSM*, 1996

Two part study
Cadaver elbows
Determined safe zone b/w branches of median nerve and ulnar nerve through flexor mass

- 22 pts underwent repair/reconstruction using muscle splitting approach
  - No neuropathy

Outcomes: *Modified TJ Procedure*

Thompson *JSES* 2001

- 83 Patients
- 33 Elite Throwers
  - 82% RTP
- If no previous surgery, 93% RTP
- 5% with transient ulnar n. sxs
  - All resolved without surgery

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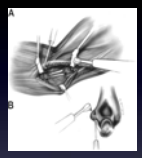
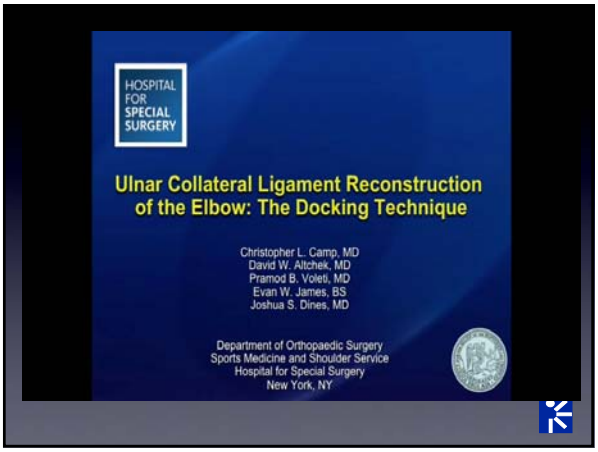
Reconstruction Technique Options: *Docking Procedure*

Rohrborough AJSM 02

- Flexor mass *divided without detachment*
- Reduced # bone tunnels
- *Two* strand free tendon graft
- Graft "docked" into medial epicondyle
- Sutures sewn over bone bridge
- Simplified graft tensioning
- Subcutaneous ulnar n. transposition *in a few*

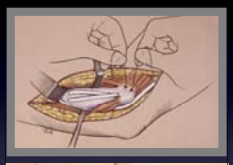




Outcomes: *Docking Technique*

Dodson, Altchek et al, AJSM 2006

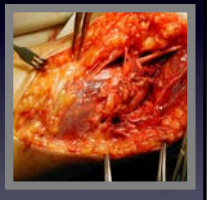
- 100 consecutive patients
- 90/100 competed at same or higher level for more than 12 months
  - 2 poor results
- 3 with postoperative complications
  - 2 late ulnar n. transpositions
  - 1 arthroscopic lysis of adhesions



ASMI *Modified TJ Procedure: Largest Series Published*

Cain, Andrews et al *AJSM* 2011

- **1266** UCL reconstructions
- 743 with minimum 2-yr f/u
- 617 (83%) returned to previous level
- Complications 20%
  - Ulnar n. neuropraxia (16%)



Do we need to change our rehab?

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Motus Sleeve

- mThrow by Motus is IMU sensor with tri-axial accelerometer and tri-axial gyroscope that records data at 1000 Hz.
- collects 3-Dimensional motion data relating to your every throw to calculate workloads for arm
- throw count, arm speed, maximal shoulder external rotation (ER), arm slot, and elbow varus torque

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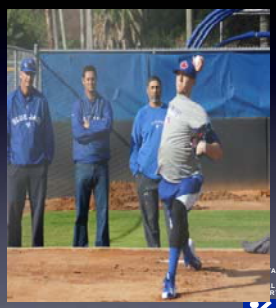
Pilot Study

Dines, Fleisig, et al. Accepted for Publication AJSM

- 80000 throws in professional baseball players
- Within individual athletes, a 1-Nm increase in elbow varus torque was associated with a:
  - 13˚ decrease in arm slot
  - 116/s increase in arm speed
  - 8˚ increase in shoulder rotation.

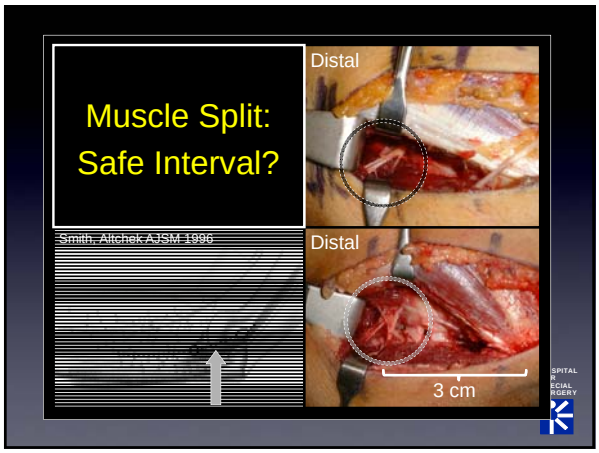
Pilot Study Conclusion

- Mound work actually had less torque than long distance (140') throwing
- Increased speed at the same distance increased torque less than increasing distance at the same speed.
- Should we change our progression?



Conclusions

- UCL insufficiency is potentially career ending injury
- Return to play expected in ~85% of throwers
- Preferred technique is Docking
  - Less volumetric bone loss
  - Easier tensioning
- We need to improve our outcomes and probably starts with rehab


Muscle Split:
Safe Interval?
Distal
Smith, Altchek AJSM 1996
Distal
3 cm