MLB Pitching Performance after Tommy John Surgery and the Effect of Tear Characteristics, Technique and Graft Type

MLB Winter Meetings
December 6, 2019

Brian Schulz, MD
Team Physician Los Angeles Angels
Kerlan-Jobe Orthopedic Clinic
Disclosures

- I have no financial disclosures.
Major League Baseball Pitching Performance After Tommy John Surgery and the Effect of Tear Characteristics, Technique, and Graft Type

Nathan E. Marshall,*‡ MD, Robert Keller,‡ MD, Orr Limpisvasti,‡ MD, Brian Schulz,‡ MD, and Neal ElAttrache,‡ MD

Investigation performed at Kerlan Jobe Orthopaedic Clinic, Los Angeles, California, USA

The American Journal of Sports Medicine
2019:47(5):713-720
DOI: 10.1177/0363546518817760
Introduction

- Ulnar collateral ligament reconstruction has high rate of return to play
  - 90–97%

- Return to MLB play
  - 80–90%

- MLB pitching studies on performance outcomes
  - Maintained or improved performance
Introduction

- Since the first reconstruction in 1974, multiple variations of technique have been performed
  - Modified Jobe
  - Docking
  - Muscle Splitting
  - Nerve transposition
- Tear characteristics have effect on treatment and outcome
  - Partial tears
    - Dines: PRP – 67%
    - Ford: Non-op – 93%
  - Distal tears non-op
    - Frangiamore: 81% that failed non-op were distal tears
Introduction

Purpose of our study:

- Evaluate MLB pitchers who underwent UCL reconstruction at our institution
- Use clinical and surgical data to evaluate technique, graft use and tear characteristics, effect on performance and return to play
Methods

- Identified MLB pitchers with UCL reconstruction performed at KJOC between 2002–2016
- Only MLB pitchers, only Primary reconstructions
- Collected years played, pitching level (starter vs. relief), return to play, return to MLB play and time to return
- Performance data – 3 years prior and 3 years post
- Used MRI findings, clinical data and surgical data to determine technique, graft and tear characteristics (Distal vs. proximal; acute vs. chronic; partial vs. complete)
Technique

Modified Jobe vs. Docking

- Years played post
  - 6.3 vs. 1.9 (p<0.001)
  - Trend of docking in recent years

- Similar performance post reconstruction
  - ERA: 4.13 vs. 4.07 (p=0.433)
  - WHIP: 1.39 vs. 1.31 (p=0.180)
  - Walks/9 innings: 3.7 vs. 2.8 (p=0.044)

- Similar return to play
  - 100% vs. 88% (p=0.063)
  - MLB return: 89% vs. 71% (p=0.112)
Graft

Palmaris vs. Gracilis

- **Age**
  - Gracilis: 28.4 years vs. Palmaris 25.7 (p=0.043)
  - Years post surgery: Gracilis 3.3 vs. Palmaris 5.2 (p=0.007)

- **Return to play**
  - Gracilis 82% (9/11) vs. Palmaris 100% (35/35) (p=0.010)
  - Return to MLB 73% vs. 83%, p=0.460

- **Performance similar after return**
  - ERA: 4.14 vs. 4.05 (p=0.410)
  - WHIP: 1.35 vs. 1.43 (p=0.180)
Proximal vs. Distal

- **Fastball velocity – Pre injury**
  - Proximal: 90.6 mph
  - Distal: 93.0 mph ($p=0.023$)

- **ERA – Pre**
  - Proximal: 5.11
  - Distal: 3.93 ($p=0.003$)

- **WHIP – Pre**
  - Proximal: 1.47
  - Distal: 1.32 ($p=0.021$)

- **Win % – Post**
  - Proximal: 58.3%
  - Distal: 42.4% ($p=0.029$)

- **Return to play:**
  - 94% vs. 96%; MLB: 88% vs. 74%
Complete vs. Partial Tear

- **Years played – Post-Surgery**
  - Complete: 5.9 years
  - Partial: 4.0 years (*p*=0.033)
  - Pre–Surgery: 7.6 vs. 7.1 (*p*=0.383)
  - Age: 26.9 vs. 26.1 years (*p*=0.325)

- **ERA–pre**
  - Complete: 3.82
  - Partial: 4.70 (*p*=0.041)

- **WHIP–post**
  - Complete: 1.27
  - Partial: 1.41 (*p*=0.037)

- **Return to play**:
  - 100% vs. 94%; MLB 71% vs. 81%
Chronicity

Acute vs. Chronic Tears

- **Age**
  - Chronic: 28.1 years
  - Acute: 24.6 years  
    \( (p=0.004) \)

- **Performance**
  - ERA post: acute 4.31 vs. chronic 3.80  
    \( (p=0.076) \)
  - Chronic: ERA pre: 4.49, ERA post: 3.80  
    \( (p=0.040) \)

- **Return to play**
  - 100% vs. 91%
  - MLB 87% vs. 73%
Discussion

- Overall high rate of return
  - 96% overall
  - 82% to MLB

- Good performance after reconstruction

- Tear characteristics play a big role in performance leading up to injury and after reconstruction
Technique: no performance difference

Graft: Gracilis appears to return at lower rate and play less after
  - Small sample size, older age at reconstruction

Tear Location: Effect on Performance prior to injury
  - Greater fastball velocity in distal tears (Better ERA, strikeouts)

Tear Grade:
  - Complete tears play almost 2 years longer with better WHIP
  - Partial tears have worse performance (ERA) prior to injury

Chronicity: Chronic tears with significant improvement in performance (ERA) after reconstruction

Best case scenario: Chronic, complete, proximal tear treated with palmaris graft.
Study gives more reliable data compared to internet–based information about performance at MLB level after reconstruction

Many variables associated with tear characteristics can lead to variable performance outcomes

Future research should look to expand upon tear characteristics and importance on performance and expanding data to other cohorts such as college and minor league pitchers
Thank You