Clinical Study for Preventing Elbow Ulnar Collateral Ligament Injuries in Youth Baseball Pitchers

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Elbow Ulnar Collateral Ligament Injury

Elbow Ulnar Collateral Ligament (UCL) Injuries are most often caused by gradual tearing of the ligament.
How UCL Injuries are Treated

- Tommy John surgery is the most common method for UCL repair.
- Partial UCL tears can be treated with platelet-rich plasma.

Reference [3]
Why UCL Injuries are More Important for Baseball Players

- In 2002, about half of 467 participants in a study of youth baseball reported elbow or shoulder pain.

Comparison of UCL injuries in different sports
Why it’s important to study UCL injuries in youth baseball pitchers

- Pitching basics begin being taught around 11 years of age
- UCL injuries are most common in baseball pitchers between the ages of 17-20 years old
- To understand how this gradual injury occurs we need to study how players develop as pitchers from the beginning
Steps of the Correct Biomechanics of Pitching

**Wind-up phase**
Preparing the body for massive power production.

- Hip rotation
- Neutral foot position

Hip rotation activates the core, adding its strength to the upcoming pitch.

**Early cocking phase**
Forward movement initiated by lower body while upper body aligns for delivery.

- Power position

**Acceleration phase**
Accumulated power from hips, legs, and upper body translates to intense acceleration of the ball up to the release point.

- Pitch delivery
- Rotational acceleration

In just 50 milliseconds, the ball travels from maximum external rotation to ball release.

**Late cocking phase**
Hips and torso rotate as the arm reaches maximum external rotation, placing extreme loads on the elbow.

- Maximum external rotation
- 55 lbs. of force

**Deceleration phase**
Focus switches from energy production to dissipation, gradually easing stresses.

- Force on shoulder
- Energy dissipation

Like a drawn bow, potential energy is at its highest point. Developing increased rotation can boost pitch velocity.

- $1 \frac{1}{2} \times$ the pitcher’s bodyweight is trying to dislocate the shoulder at the point of release.
Trends of Biomechanics and the Occurrence of a UCL Injury

- 45% pitched in a league without pitch counts or limits
- 30.4% pitched on multiple teams with overlapping seasons
- 19% pitched in multiple games on the same day
- 13.2% pitched competitive baseball for more than 8 months per year
- Not quitting pitching after hitting pitch count

- 43.5% pitched on consecutive days
Stress and Fatigue the UCL can endure vs. what pitching asks of it

During the cocking phase of pitching the elbow experiences significant valgus stress
- Youth: 28 Nm of valgus stress
- High School Age: 48 Nm of valgus stress
- College Age: 55 Nm of valgus stress
- Professionals: 64 Nm of valgus stress
Set up of the Study

01 Control Group
- Start at age 11 follow until 20
- Observe without being taught proper mechanics of Pitching

02 Early Training Group
- Start at age 11 follow until 20
- Teach proper mechanics of pitching at 11 and monitor improvements till 20

03 Late Training Group
- Players with range of 11-20
- Find players who have already been playing without learning proper mechanics
- Teach players proper mechanics then follow career
Equipment for Measurements
Future Works

- Being able to teach and distribute lessons on how to teach the correct mechanics of baseball pitching to coaches.
- Having more teams to acquire technology that can help to prevent injuries such as the MotusBaseball sleeve.
- Creating more types of wearable tech like the MotusBaseball that can predict fatigue of the ligament.
Questions?
References:


References:


