
# Ulnar Collateral Ligament Injury History and College Pitcher Fastball Profiles: A Retrospective Observational Live Pitching Analysis

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# Disclosures

- Mr. Yoshida – No financial disclosures.

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- Dr. Krupp - Arthrex, Inc: Paid presenter or speaker; Biomet: Paid consultant; DJ Orthopaedics: Research support; Rotation Medical: Research support; Stryker: Paid consultant; Paid presenter or speaker; Zimmer: Paid consultant; Paid presenter or speaker; Research support.

# Summary

Increased contralateral trunk tilt among pitchers with an ulnar collateral ligament injury history may occur to increase pitch velocity at the expense of ball movement, while placing the pitching elbow in a potentially injurious position.

# Purpose

- The anterior ulnar collateral ligament (UCL) bundle is the most important non-contractile elbow valgus stress stabilizer during pitching. The annual rate of UCL reconstruction is increasing, with up to 25% of major league baseball pitchers having undergone surgical repair or reconstruction.[1]

- This study retrospectively compared the fastball profiles of pitchers who had sustained previous grade I or II ulnar collateral ligament (UCL) injuries, were rehabilitated, and released back to competition with pitchers that had no previous elbow injury history. The hypothesis was that pitchers with an injury history **(Group 1)** would display differing fastball velocity – ball movement relationships compared to those who did not **(Group 2)**.

# Methods

- Eighteen pitchers from one NCAA Division III baseball team participated in this study. **Group 1** had a grade I or II UCL injury history (n = 8), and **Group 2** (n = 10) did not. A computerized pitch tracking device (CPTD)[3,7] analyzed ball movement and pitching mechanics during live pitching intra-squad games.

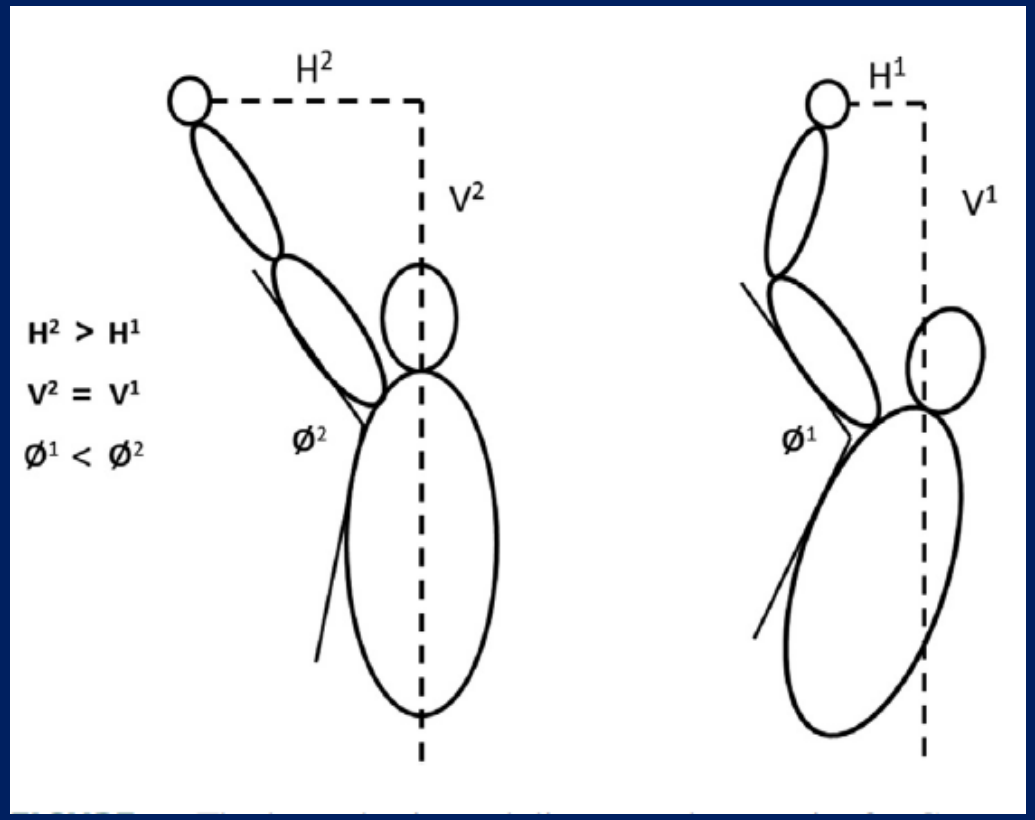
# Results

- Groups had similar height, weight, pitching experience, and arm slot positions at ball release. Pitching coach determined pre-injury arm slot position identification and post-injury CPTD measurements after return to competition displayed strong agreement ($r = 0.83$, $p = 0.05$) suggesting comparable pitching techniques before and after the index UCL injury.

- Group glenohumeral joint range of motion and fastball profiles were comparable with the exception of **Group 1** releasing the ball at a 2.5 times lesser horizontal distance away from the pitching rubber center **(Fig. 1 and Fig. 2)**.

- **Group 2** also displayed consistently more robust, and more frequent fastball movement relationships with velocity, horizontal break, and vertical break than **Group 1 (Fig. 3)**.

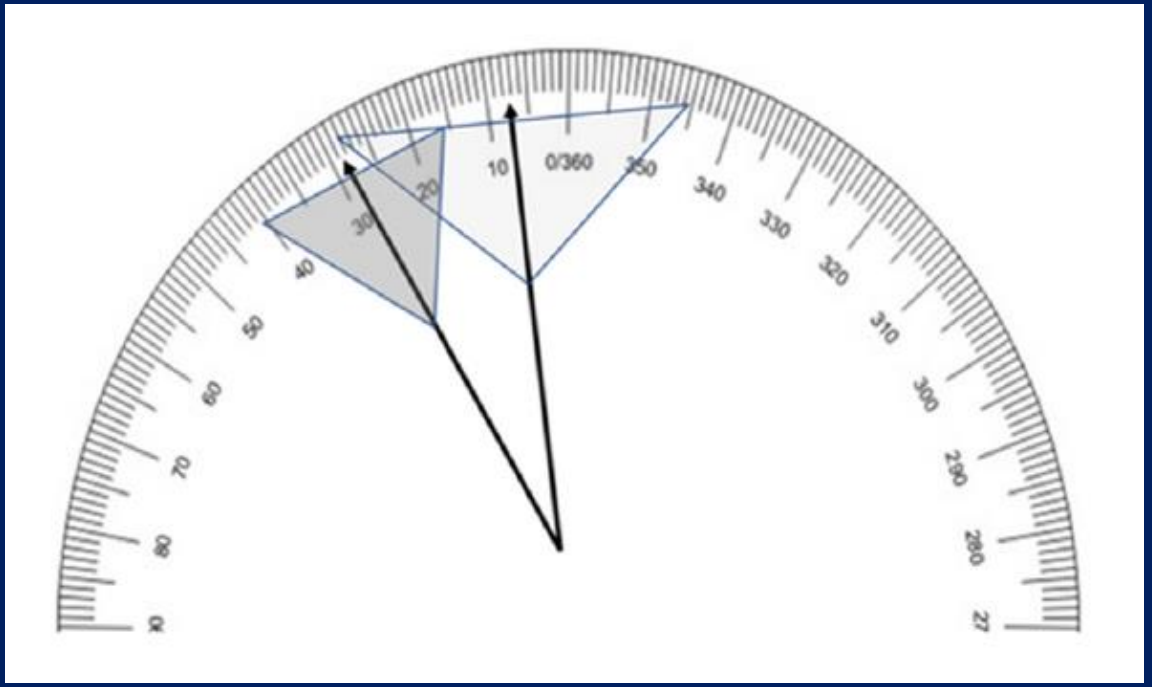
# Figure 1.




- The lesser horizontal distance release point for **Group 1** ($H^1 < H^2$) and less trunk-arm angle ($Ø^1 < Ø^2$) suggests that pitchers with a grade I or II UCL injury history likely displayed some combination of greater contralateral trunk tilt and greater elbow flexion compared to the group with no UCL injury history.[2,4-6] The vertical release points ($V^1$ and $V^2$) did not differ between groups.

- $H^1$ = horizontal distance release point for Group 1; $H^2$ = horizontal distance release point for Group 2; $V^1$ = vertical release point for **Group 1**; $V^2$ = vertical release point for **Group 2**; $Ø^1$ = trunk-arm angle for **Group 1**; $Ø^2$ = trunk-arm angle for **Group 2**.

# Figure 2.

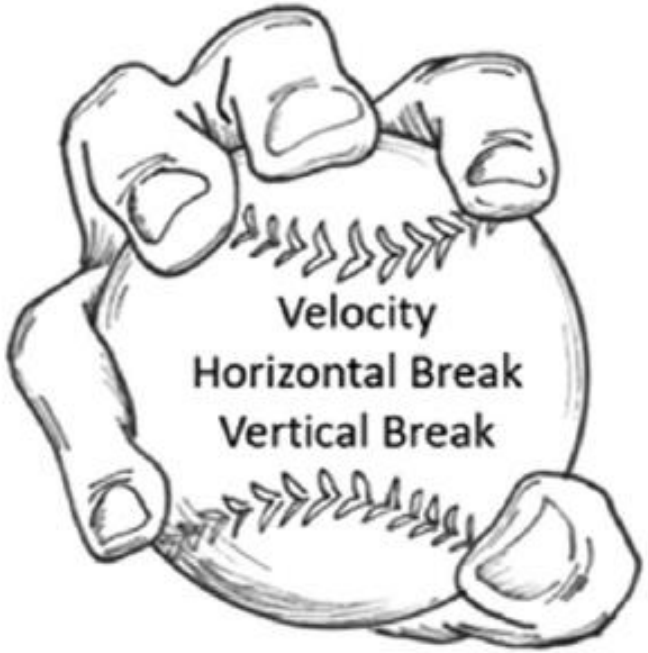



- Adjusted angular pitching arm slot position at ball release. The values are shown in degrees (mean ± SD). Although the group differences did not achieve statistical significance ($p = 0.15$), the results suggest that the group with a grade I or II UCL injury history (lighter shading) tended to rely on a more vertical release point than the group that had not experienced previous UCL injury (darker shading).

# Figure 3.

- Contralateral trunk tilt and a more vertical arm position contributed to weaker fastball movement, velocity, horizontal break, and vertical break relationships.

***Greater contralateral trunk tilt and elbow flexion in pitchers with a grade I or II UCL injury history reduced fastball movement relationships with….***



# Conclusion

- Reduced horizontal ball release distance at comparable vertical ball release height without arm slot position changes suggest that pitchers with a grade I or II UCL injury history had greater contralateral trunk tilt and greater elbow flexion at ball release.

- Increased contralateral trunk tilt may represent an attempt to increase pitch velocity at the expense of ball movement, while placing the pitching elbow in a potentially injurious position. Computerized fastball profile analysis using a CPTD in conjunction with coach pitching technique observation, and team medical staff clinical examination may help better identify pitchers who are at increased UCL injury risk so that preventative interventions can be initiated earlier.

# *Thanks for your attention!*

- **Thanks to Coach Matt Downs and the Spalding University Baseball Team.**

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ご清聴ありがとうございました

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