



Figure 1 (A) Coronal slide of T2-weighted MRI image demonstrating (A) ulnar collateral ligament hyperintensity and (B) radiologic posteromedial impingement in two professional MLB pitchers.

from 2005 – 2017 for MRI images of their pitching elbow. Publicly available databases were queried to exclude pitchers with injury prior to earliest elbow MRI. Three blinded reviewers, reviewed all MRI studies independently to evaluate for presence of chondral damage of the joint, loose bodies, UCL heterogeneity or tear, flexor pronator mass defect, and signs of posteromedial impingement. Binary imaging findings were related to future placement on the disabled list (DL) for elbow complaints and future elbow surgery.

Results: A total of 41 pitchers had asymptomatic MRI imaging with no prior DL placement. Average age of pitchers was 28.9 ± 4.6 and average career games was 115.0 ± 132.8 . For players who eventually went on the DL, there were a statistically greater number of players with heterogeneous signal of the ulnar collateral ligament ($P = .021$), humeral sided partial tearing of the ulnar collateral ligament ($P = .031$), and posteromedial impingement ($P = .004$) on pre-injury MRI in comparison to players that remained healthy. Pitchers that were placed on the DL spent an average of 123.1 ± 69.7 days only due to elbow-related injuries. Pitchers with UCL heterogeneity were associated with reduced career strike zone percentage, innings pitched, and fastball percentage.

Conclusion: This study demonstrates that UCL heterogeneity, posterior medial impingement and humeral-sided partial tears are correlated with future placement on the DL in MLB pitchers. In addition, asymptomatic posteromedial impingement may be a precursor to future surgery. Overall, this data may prove useful for coaches, trainers and team physicians to appropriately risk stratify new players and establish preventative algorithms to prevent the overall impact of these elbow injuries (Fig. 1).

Paper #11 RISK FACTORS FOR ULNAR COLLATERAL LIGAMENT INJURY IN PROFESSIONAL AND AMATEUR BASEBALL PLAYERS: A SYSTEMATIC REVIEW WITH META-ANALYSIS

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Background: Ulnar collateral ligament injury (UCL) risk factors are unclear despite increasing injury rates.

Hypothesis/Purpose: Summarize UCL injury risk factors across professional and amateur baseball players.

Study Design: Systematic review and meta-analysis

Methods: A computer-assisted search of four databases was performed utilizing keywords related to UCL risk factors. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses

(PRISMA) guidelines were utilized for study methodology. Odds ratio and 95% confidence interval (CI) were calculated for dichotomous outcomes, while mean differences and 95% CI were calculated for continuous outcomes using a random effects model. Risk of bias of the included studies was assessed using the modified Downs & Black grading tool.

Results: Of the 1255 identified studies, 13 qualified for inclusion. Greater shoulder internal rotation (IR) range-of-motion (ROM) at 90° abduction in the non-dominant (ND) arm demonstrated strong evidence as a significant risk factor for UCL ($P < .001$) when compared to a control group [mean difference 6.2 (95% CI: 3.8 to 8.6)]. Mean pitching fastball ($P = .0003$) [mean difference 0.6 (95% CI: 0.29 to 1.00)], changeup ($P = .03$) [mean difference 0.49 (95% CI: 0.04 to 0.94)], curveball ($P = .01$) [mean difference 0.78 (95% CI: 0.18 to 1.38)], and overall ($P < .001$); [mean difference 0.90 (95% CI: 0.86 to 0.94); $I^2=0\%$] pitching velocity; as well as fewer years of player experience ($P < .00001$) [mean difference -1.19 (95% CI: -1.41 to -0.96)], less humeral retrotorsion in the ND arm ($P = .0009$) [mean difference 5.4 (95% CI: 2.2 to 8.5)], and greater absolute side-to-side differences in retrotorsion ($P = .006$) [mean difference 6.2 (95% CI: 1.83 to 10.68)] were all moderate evidence risk factors when compared to control groups. Strong evidence suggests total ROM arc in 90° abduction in dominant arm was not a risk factor for UCL ($P = .81$) [mean difference -1.0 (95% CI: -9.4 to 7.3); $I^2=81\%$].

Conclusions: Greater ND shoulder IR ROM and less humeral retrotorsion (in professional and amateur players), as well as pitching velocity (in professional players) demonstrated strong to moderate evidence as risk factors for UCL. Dominant arm total arc of motion, external, or internal ROM were not risk factors for UCL. Standardized collection and reporting of risk factors is recommended to more clearly elucidate definitive risk factors for UCL.

Clinical Relevance: Clinicians should consider educating coaches, parents, and players of the potential risk of increased pitching velocity relative to incidence of UCL. Clinicians should also consider assessment of ND shoulder internal ROM and humeral retrotorsion relative to UCL risk, but also realize UCL are multi-factorial and simply focusing on ROM/torsion is not the key to prevention of these injuries.

What is Known About the Subject: UCL and subsequent UCL surgery prevalence is increasing at all levels of baseball. Many risk factors have been described across various levels of evidence without a systematic consensus of the published literature.

What this Study Adds to Existing Knowledge: To our knowledge, this is the first systematic review with meta-analysis of published risk factors for UCL. We stratify UCL risk factors into significant and non-significant risk factors. Additionally, we utilize risk of bias assessment to provide evidence-based strength of evidence for the included recommendations (e.g. strong, moderate, limited, very limited and conflicting evidence).

Paper #12 REVERSE SHOULDER ARTHROPLASTY WITH AND WITHOUT CONCOMITANT LATISSIMUS DORSI AND TERES MAJOR TRANSFER FOR SHOULDER PSEUDOPARALYSIS WITH TERES MINOR DYSFUNCTION: A PROSPECTIVE, RANDOMIZED INVESTIGATION

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