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ORIGINAL ARTICLE

Following ulnar collateral ligament reconstruction, professional baseball position players return to play faster than pitchers, but catchers return less frequently

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Background: Although much has been done to characterize trends of medial ulnar collateral ligament (UCL) reconstruction in pitchers, outcomes in position players (PPs) (non-pitchers) remain undefined in the current literature.

Methods: Three resources were combined to identify all known Major League Baseball and Minor League Baseball (MiLB) PPs who have ever undergone UCL reconstruction. A multitude of player and surgical variables were included. Trends over time were analyzed collectively, based on level of play, revision status (primary vs revision), and position. Additional comparisons were made with a known cohort of professional baseball pitchers having undergone UCL reconstruction.

Results: We identified 168 UCL reconstructions in professional PPs. The annual rate of primary UCL reconstruction rose significantly from 1984 to 2015 ($P < .001$), and the proportion of cases performed in MiLB PPs (vs Major League Baseball PPs) increased steadily ($P < .001$). Of PPs, 75.5% returned to play at any level at a mean of 342 days. Catchers demonstrated the lowest return-to-play (RTP) rate (58.6%) compared with infielders (75.6%) and outfielders (88.9%). The overall revision rate was low, at 4.8%. Compared with pitchers, PPs demonstrated a lower rate of RTP (75.5% for PPs vs 83.7% for pitchers, $P = .040$) but shorter RTP times for those able to return (342 days for PPs vs 435 days for pitchers, $P < .001$).

Conclusions: The incidence of UCL reconstruction in PPs continues to rise, a trend that is significantly more pronounced at the MiLB level. Although PPs (particularly catchers) are less likely to return to professional baseball compared with pitchers, those who are able to RTP do so more rapidly.

Level of evidence: Level II; Retrospective Design; Prognostic Study

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This retrospective comparative review was approved by Major League Baseball (MLB), the MLB Research Committee, the MLB Players Association, and the Institutional Review Board of the Hospital for Special Surgery and was granted exempt status by the Hospital for Special Surgery Institutional Review Board (study No. 2015-922).

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Although recent research has indicated that shoulder injuries may be on the decline in Major League Baseball (MLB), disabled-list assignments for elbow injuries continue to rise every year,⁴ and medial ulnar collateral ligament (UCL) injuries continue to represent a significant source of time out of play.^{1,4,9,11,16} This injury is due, in large part, to the excessive valgus torque experienced by the medial elbow during the overhead throwing motion. During late cocking and early acceleration, the arm can rotate at speeds in excess of 7000°/s, generating up to 90 Nm of torque at the elbow.^{12,14,21} Nearly 50 Nm of this force is experienced by the UCL alone, which is greater than the mean maximal load to failure of 32 Nm observed in cadaveric studies.^{13,21} Ligament reconstruction remains the mainstay of treatment for UCL injuries, and up to 80%-90% of players are generally able to return to play (RTP) following surgery.^{2,7,8,10,17,19,22-24}

Although recent studies have significantly advanced our understanding of this common injury, most have focused on injuries that occur in pitchers, and very little research has been dedicated to understanding the epidemiology and outcomes of UCL reconstruction among position players (PPs) (all defensive positions other than pitchers) in baseball. In the largest report on UCL injuries to date, 125 of the 1210 baseball players studied (10.3%) were PPs; however, the outcomes of these athletes were not analyzed separately from those of pitchers.² Other reports have combined PPs with pitchers to analyze outcomes of UCL reconstruction in baseball players.^{6,8,9,15,18,23} In a recent systematic review of 20 studies (2019 patients), Erickson et al¹⁰ determined that PPs made up nearly 15% of the baseball players undergoing UCL reconstruction; however, the outcomes of UCL reconstruction in these PPs have not yet been reported in isolation. A survey of 2382 active, professional baseball PPs from the 2012 season (published in 2015) found that 3% (60 of 2382) had previously undergone UCL reconstruction at some point in their careers.⁵ In a more recent report of all UCL reconstructions performed in MLB since 1974, Conte et al⁴ determined that 39 of 400 procedures (10%) were performed for PPs, and the mean time to RTP at the MLB level was 7.4 months faster for PPs compared with pitchers (10.4 months vs 17.8 months).

On the basis of the limited evidence available, PPs may RTP sooner than pitchers at similar levels of play.⁴ Intuitively, this makes sense; however, further study is needed to determine the true difference in outcomes for these patient populations. Accordingly, the purposes of this study were (1) to provide a robust epidemiologic report on UCL reconstruction in professional baseball PPs; (2) to assess the outcomes of surgery in terms of RTP rates, time to RTP, and career longevity; and (3) to compare these results with a known cohort of professional baseball pitchers who have

also undergone UCL reconstruction.³ We hypothesized that the rate of UCL reconstruction is on the rise for PPs but that they will experience improved rates of RTP and time to RTP compared with pitchers. It is our hope that this work will fill a critical need in the medical literature and provide valuable information for medical professionals treating these high-demand athletes.

Materials and methods

The MLB Health and Injury Tracking System database and an online search were used and cross-referenced to identify all baseball PPs (non-pitchers) who had ever undergone UCL reconstruction (primary or revision) while they were active on an MLB or Minor League Baseball (MiLB) team roster. All procedures performed prior to 2010 were identified using an online search. Procedures occurring after 2010 were identified using the MLB Health and Injury Tracking System database (since it was initially implemented in 2010). To maintain anonymity, all players were deidentified and assigned a random study number. A number of player demographic characteristics were analyzed, including age at the beginning of professional career, age at the time of surgery, age at retirement, overall career length, position, and level of play (MLB vs MiLB). Surgical factors studied included date of procedure, RTP status, time required to RTP, career length prior to surgery, career length following surgery, revision status, and time between primary and revision surgery if revision was performed.

Trends in UCL reconstruction over the years were analyzed collectively, based on level of play at the time of surgery (MLB vs MiLB) and based on revision status (primary vs revision). RTP at any level was deemed to have occurred if a player played in at least 1 game following surgery regardless of the level. RTP at the prior level was defined as RTP in at least 1 game at the same professional level (A, AA, AAA, or MLB) or higher. For RTP analysis, players undergoing surgery between 2005 and 2014 were included in the "RTP at any level" analysis while only players undergoing surgery between 2007 and 2014 were included in the "RTP at the prior level" analysis. This allowed for a minimum of 2 years of follow-up and improved analysis of RTP since RTP at any level was most reliably recorded beginning in 2005 and RTP at the prior level was most reliable from 2007 onward. Multiple comparisons were made based on type of surgery (primary vs revision), level of play (MLB vs MiLB), and position (catcher vs infielder vs outfielder). Only players with a minimum of 2 years of follow-up (surgery during or prior to 2014) were included in the calculation of revision rates. The length of time following surgery that the player was free from revision and still playing professional baseball was used to determine revision-free survivorship. Only players no longer on an active roster in 2017 were used to calculate survivorship and overall career length. Using a known cohort of all professional baseball pitchers who have ever undergone UCL reconstruction, the outcomes of PPs were compared with these pitchers to identify potential differences between the groups in terms of RTP rates and times.

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