



# A systematic review comparing return to play data for adolescent and professional baseball players

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## **A systematic review comparing return to play data for adolescent and professional baseball players**

### **Abstract**

Ulnar collateral ligament (UCL) reconstruction surgery is commonly performed in adolescent and professional baseball players. Return to play times differ among these two age groups. Adolescent players return to play in a shorter time after UCL reconstruction surgery than do professional baseball players. A literature review was conducted of studies documenting return to play and return to same level of play for both adolescent and professional baseball players. Return to play time and rates were compared. In four studies involving adolescent baseball players, the mean time of return to play ranged from a low of 10.1 months to a high of 13.4 months. In five studies involving professional pitchers, the mean time of return to play was 14.3 months for two studies, and ranged from 17.3 to 20.5 months for the three studies that reported only return to the same level of play. Adolescent baseball players return to play sooner than professional pitchers after UCL reconstruction surgery.

Keywords: ulnar collateral ligament reconstruction (UCLR); Tommy John; elbow; pitcher; baseball

## Introduction

The anterior bundle of the medial ulnar collateral ligament (UCL) stabilizes the motion of the elbow joint [6]. UCL injuries are pervasive and cause a decrease in functioning among athletes who utilize overhead throwing motions [11]. In the past twenty years, UCL reconstruction surgeries among Major League Baseball (MLB) pitchers have approximately doubled, and such surgeries among minor league, college, and high school players have increased even more sharply [5]. The surgery aims to restore the function of a damaged UCL in a patient with an impaired UCL [4]. This procedure, known familiarly as Tommy John surgery, was pioneered by Dr. Frank Jobe, who first described it in the medical literature in the 1980s [4]. UCL reconstruction surgeries are typically successful, with rate of return to play at any level (RTP) and rate of return to the previous level (RTL) consistently measuring 70 to 90% [5].

My hypothesis is that adolescent baseball pitchers will return to play more quickly than adult baseball pitchers, because research has shown that young athletes heal more rapidly and return to full activity in a shorter time frame than adult athletes [1].

## Methods

A comprehensive search was conducted of the databases EBSCOhost, Gale Academic OneFile, Medline, PubMed Central, SAGE Journals, and ScienceDirect for articles reporting on UCL surgeries performed from 1995 to 2019 on adolescent baseball players and professional baseball pitchers. The key phrases used were: ulnar collateral ligament reconstruction, adolescent baseball pitchers, professional baseball pitchers, and MLB baseball pitchers. Articles were included only if they addressed the time to RTP or RTL for either adolescent (high school or college) or professional baseball pitchers. In addition, this research focused only on data relating to male athletes who underwent a primary UCL surgery, excluding data relating to non-males and those who had revision surgeries.

## Results

### *Adolescent return to play after UCL surgery.*

Research revealed a total of four studies that reported RTP data after UCL surgery on baseball pitchers and catchers in the adolescent age group, which this project defines as youth aged 13 to 19 years. These four studies are summarized in Table 1 where Mean RTP is the number of months from surgery to return, and Rate RTP is the percent of players who returned. Empty cells indicate the data was not provided by the study.

Jones et al. reported on 47 baseball players aged 15 to 18 years, with a mean age of 17.6 years, 91% of whom were pitchers. These players underwent UCL reconstruction from 2008 to 2010 and were followed up with at least two years post-operatively. For these players, 92% of whom returned to play, the mean time to RTP was 10.1 months [9]. O'Brien et al. reported on 19 overhand-throwing athletes aged 16 to 19 years who underwent UCL reconstruction from 2004 to 2009 and were followed up with at least 2.2 years later. For these players, 84% of whom returned to play, the mean time to RTP was 13.4 months [10]. Petty et al. reported on 27 high school baseball players who underwent UCL reconstruction from 1995 to 2000, 89% of whom were pitchers and 11% of whom were catchers. These players, who ranged in age from 15.9 to 19 years, with a mean age of 17.4 years, were followed up with a mean of 35 months after surgery. For these players, 74% of whom returned to play at the high school or college level, the mean time to RTP was 11 months [11]. The largest of these studies, by Saper et al., reported on 140 baseball players aged 13 to 19 years, with a mean age of 18 years, 94.3% of whom were pitchers. These

players underwent UCL reconstructions from 2007 to 2014 and were followed up with at a mean of 4.8 years later. For these players, 97.8% of whom returned to play, the mean time to RTP was 11.6 months [13].

Table 1. Summary of adolescent studies reviewed. Mean RTP is the number of months from surgery to return, and Rate RTP is the percentage of players who returned.

1st author	Year	Player type	No. players	Surgery years	Follow-up	Mean age in years	Age range in years	Mean RTP in months	Rate RTP
Jones	2014	Adolescent baseball (91% pitchers)	47	2008-2010	Mean 31 mos, range 24-37	17.6	15-18	10.1	92%
O'Brien	2015	Adolescent; mostly baseball	14	2004-2009	2.2 yr min; mean 3.7 yrs		16-19	13.4	84%
Petty	2004	High School (89% pitchers; 11% catchers)	27	1995-2000	Mean 35 mos; range 18-75	17.4	15.9-19	11	74%
Saper	2018	Adolescent baseball (94.3% pitchers)	140	2007-2014	Mean 57.9 mos; range 32.4-115.4	18	13-19	11.6	97.8%

#### *Adult return to play after UCL surgery.*

This research used five studies of professional players' return to play after UCL reconstruction surgery, with each study either including players solely in Major League Baseball (MLB) or in both the MLB and the minor leagues. It should be noted that unlike adolescent players, post-surgical adult players can return to the same league, switch from the MLB to the minor league, or, less commonly, from the minor league to the MLB. For this reason, studies of professional players may report their data as RTP and/or RTL. These five studies are summarized in Table 2 where Mean RTP or RTL is the number of months from surgery to return, and Rate RTP or RTL is the percentage of players who returned. Empty cells indicate the data was not provided by the study.

A study by Camp et al. reported on 853 professional pitchers who returned to play, out of a larger cohort studied. These pitchers underwent UCL reconstruction surgery from 2005 to 2014 and were followed up with a minimum of two years later. For these players, 83.7% of whom returned to the same or a higher level of play, the mean time to RTP was 14.3 months [2]. A study by Erickson et al. reported on 179 MLB pitchers, with a mean age of 28.4 years, who underwent UCL reconstruction surgery from 2010 to 2013 and were followed up with a minimum of 18 months later. For these players, 83% of whom returned to the MLB, the mean time to RTL was 20.5 months [3]. A study of professional players by Fury et al. reported on 63 MLB pitchers, with a mean age of 26.9 years, who underwent UCL reconstruction surgery from 2015 to 2019. For these players, 57% of whom returned to the MLB, the mean time to RTL was 17.3 months [6]. RTP was not reported. Fury et al.'s study presents a lower RTL rate than the other studies of professional players, both because it included the criterion that a player threw at least 100

pitches at the MLB level and because the follow up occurred within a short time frame after the surgery [6]. A study by Gibson et al. reported on 68 MLB pitchers, with a mean age of 28.2 years, who underwent UCL reconstruction surgery from 1998 to 2003. For these players, 82% of whom returned to the MLB, the mean time to RTL was 18.5 months [7]. A study by Griffith et al. reported on 566 MLB pitchers, with a mean age of 23.5 years, who underwent UCL reconstruction surgery from 2010 to 2014. For these players, 79.9% of whom returned to the same or a higher level of play, the mean time to RTP was 14.3 months [8].

Table 2. Summary of professional studies reviewed. Mean RTP or RTL is the number of months from surgery to return, and Rate RTP or RTL is the percentage of players who returned.

1st author	Year	Player type	No. players	Surgery years	Follow-up	Mean age in years	Age range in years	Mean RTP or RTL in months	Rate RTP or RTL
Camp	2018	Professional pitchers	1429 <sup>a</sup>	1974-2016 <sup>a</sup>	min 2 yr			14.3	83.7%
Erickson	2014	MLB pitchers	179	2010-2013	min 18 mos	28.4		20.5 <sup>b</sup>	83% <sup>b</sup>
Fury	2021	MLB pitchers	63	2015-2019		26.9	22-33	17.3 <sup>b</sup>	57.% <sup>b</sup>
Gibson	2007	MLB pitchers	68	1998-2003		28.2	22-42	18.5 <sup>b</sup>	82% <sup>b</sup>
Griffith	2019	MLB pitchers	566	2010-2014		23.5	16.5-48	14.3	79.9%

<sup>a</sup>RTP analysis based on 853 players with surgery from 2005-2014.

<sup>b</sup>Indicates only RTL reported.

## Discussion

The results are consistent with my hypothesis that adolescent baseball players return to play more quickly than professional baseball players after UCL reconstruction surgery. In the four studies involving youth players, the mean time of RTP ranged from a low of 10.1 months to a high of 13.4 months, while in the five studies involving professional players, the mean time of RTP was 14.3 months for two studies and ranged from 17.3 to 20.5 months for the three studies that reported only RTL.

There are several factors that may have impacted the results of this study. First, for adult professionals, this study considered data on RTP except in cases where the only data available was on RTL. RTL data is often measured for MLB players because they do not necessarily return to the same level of play, and may instead return to play in the minor leagues after UCL reconstruction. For adolescents, however, generally only data on RTP is available, since they may not have the option to return to a different level of play. Therefore, the return times for some professionals cited in this study may be longer than if RTP data had been available for these professionals. Indeed, the three studies on professionals that reported RTL, Fury, Erickson (2014), and Gibson, reported longer return times than the two that reported RTP, Griffith and Camp. Fury et al. note that sports medicine research increasingly reports data on RTL in order to address athletes' post-operative expectations [6].



Second, although the studies of adolescent players included here report data mostly on pitchers, with 89% or more of the youth included in these studies playing this position, each adolescent study also included a small number of other baseball players or even other overhand-throwing athletes. In contrast, the studies of professional players included here report data on pitchers only. It could be that the inclusion of a small number of non-pitchers in the adolescent studies lowers the RTP time for the adolescents as compared to the professionals. This theory is supported by data in O'Brien et al.'s study of baseball players showing that field position players returned to play in 6.3 months on average, while pitchers returned in 11.2 months on average [10].

Third, adolescent players experiencing longer rehabilitation times may be more likely to abandon returning to play, thereby skewing adolescent RTP shorter. However, the data does not support this theory, given that the RTP rates for adolescents were generally higher than those of professionals.

Fourth, this study did not control for differing surgical techniques for UCL construction. Erickson et al. (2016) describe several surgical methods and graft sources, such as the docking technique, the double-docking technique, an ipsilateral palmaris longus graft, a hamstring autograft; and subcutaneous transposition of the ulnar nerve [4].

Nevertheless, these results indicate that adolescent baseball players return to play sooner than professionals after UCL reconstruction surgery. This shorter return to play time for adolescents is notable considering that professionals may face pressure from their employers to return to work and personal pressure to augment their careers. On the other hand, professionals may receive more intensive medical evaluations and treatment regimens that delay their return to play, given the financial value to their employers of their pitching arms.

## **Conclusion**

Adolescent baseball players return to play sooner than professional pitchers after UCL reconstruction surgery.

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