Return to Play Following Nonoperative Treatment of Partial Ulnar Collateral Ligament Injuries in Professional Baseball Players: A Critically Appraised Topic

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Clinical Scenario: Ulnar collateral ligament (UCL) injuries are highly prevalent in professional baseball players with the success of operative management being well known in the literature. Return to play (RTP) rates following nonoperative management of partial UCL injuries in professional baseball players are not well established in the literature. With a UCL tear being a potential career-ending injury, it is imperative that the best treatment option is provided to these throwing athletes. There is an increase in the incidence of UCL surgical rates and a lack of general agreement on nonoperative treatment of partial UCL injuries as reported by the American Shoulder and Elbow Surgeons in 2017. There is also a lack of clarity on when to initiate rehabilitation, which may be due to the limited amount of studies reporting success of RTP rates and time to RTP following conservative interventions of partial UCL injuries. Evidence on the RTP rates seen following conservative management of partial UCL tears injuries can help guide health care providers in deciding on the best treatment option for professional baseball athletes who desire to return to their athletic careers. These rates of RTP will add valuable objective input when determining if conservative management is the best choice. To determine the current evidence, inclusion criteria for the literature search consisted of RTP rates following conservative treatment in professional baseball players between inception and 2018. **Clinical Question:** Is there evidence for successful RTP rates in professional baseball players following conservative treatment of a UCL injury? **Summary of Key Findings:** Three retrospective studies met the inclusion criteria and were included. Of those, 2 reported RTP rates following a nonoperative rehabilitation program of a UCL injury, whereas 1 reported RTP rates after injection therapy in subjects who attempted a trial of conservative treatment. All 3 studies considered location and grade of UCL tear. Successful RTP rates (66%–100%) were reported in professional baseball players following nonoperative treatment of partial UCL injuries. **Clinical Bottom Line:** Current evidence supports high success with RTP rates up to 100% after nonoperative treatment of grade 1 UCL injuries in professional baseball players and between 66% and 94% for a grade 2 and above. **Strength of Recommendation:** There is level C evidence for high RTP rates following nonoperative treatment of partial UCL injuries in professional baseball players.

Keywords: rehabilitation, elbow, overhead athlete

Clinical Scenario

Numerous studies have reported on postoperative return to play (RTP) rates, between 66% and 98%, in professional baseball players after ulnar collateral ligament (UCL) reconstruction.^{1–5} Currently, there is limited evidence following nonoperative management. There has been an increase in the incidence of UCL reconstructions performed annually, which is projected through 2025.⁶ A recent survey distributed to 159 active members of the American Shoulder and Elbow Surgeons assessed current trends related to the treatment of UCL injuries in athletes and found divided opinions among surgeons on how to treat partial tears.⁷ The decision to treat these partial tears with surgery may be due to published studies that have reported improved outcomes and RTP rates.^{5,8} Nonoperative treatment of UCL injuries has progressed with both preventive and rehabilitative strategies and may lead to good outcomes; however, consistent evidence in regard to RTP rates is lacking in the literature.⁸ Interventions for nonoperative treatment can include platelet-rich plasma (PRP) injection therapy, rest, and/or strengthening programs.^{9–12} As a partial UCL tear is a

potential career-ending injury, it is imperative that the best treatment option is provided to these professional throwing athletes. Immediate and long-term RTP rates after conservative management of partial UCL injuries can help guide health care providers in deciding the best treatment in professional throwing athletes.

Focused Clinical Question

Is there evidence for successful RTP rates in professional baseball players following conservative treatment of a partial UCL injury?

Summary of Search, “Best Evidence” Appraised, and Key Findings

- The literature was queried for studies of level 4 evidence or higher that investigated RTP rates after nonoperative treatment of a UCL injury in professional baseball players.
- The literature search returned 11 articles that included professional baseball players as subjects. Five articles met the inclusion criteria by reporting RTP rates after a period of conservative treatment.
- Two articles were excluded because they were abstract only, leaving 3 articles for review.^{10–12}

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Clinical Bottom Line

Current evidence supports high success RTP rates (66%–100%) after conservative treatment of UCL injuries in professional baseball players.

Strength of Recommendation

Based on the low level of evidence, a grade C¹³ recommendation is given for high RTP rates following conservative management of UCL injuries in professional baseball players. Further investigation is warranted due to the limited quality of studies available due to both limited quantity and quality of evidence.

Search Strategy

Terms Used to Guide Search Strategy

- **Patient/Client group:** Professional baseball OR Elite baseball OR High-level baseball OR Major league OR Minor league
- **Intervention:** Nonoperative OR Rehabilitation OR Physical therapy OR Conservative OR Injection therapy
- **Comparison:** None
- **Outcome:** Return to sport or same level of play after partial UCL injury (tear OR insufficiency OR sprain)

Sources of Evidence Searched

- CINAHL
- Academic Search Complete
- MEDLINE
- SPORTDiscus
- Health Source
- SAGE
- PubMed

Inclusion and Exclusion Criteria

Inclusion Criteria

- Reported RTP rates after nonoperative treatment
- RTP rates were reported in professional baseball players
- Magnetic resonance imaging confirmed diagnosis of a UCL injury
- Level 4 evidence or higher
- Reported in English language
- Literature search included dates between inception and 2018

Exclusion Criteria

- Did not report separate RTP rates on professional baseball players
- No evidence for conservative management
- Abstract only

Results of Search

Three relevant studies^{10–12} were identified and categorized in Table 1 (based on Levels of Evidence, Centre for Evidence-Based Medicine).¹⁴

Table 1 Summary of Study Designs of Articles Retrieved

Level of evidence	Study design	References
4	Retrospective	Dines et al ¹⁰
4	Retrospective	Ford et al ¹¹
4	Retrospective	Frangiamore et al ¹²

Best Evidence

Studies selected for inclusion in this critically appraised topic are listed in Table 2. The 3 studies included were identified as the best evidence and selected as the most appropriate given the inclusion and exclusion criteria and focused clinical question. The Downs and Black¹⁵ checklist was used to assess the quality index of the studies. This checklist has been validated and is used to assess methodological quality of nonrandomized studies.¹⁵

Implications for Practice, Education, and Future Research

Previous research has explored nonoperative treatment outcome rates of partial UCL injuries in throwing athletes,¹⁶ but only the articles^{10–12} reviewed in this critically appraised topic reported RTP rates in professional baseball players. The results from this appraisal support nonoperative treatment as a successful treatment option for professional baseball players with a partial UCL tear with a grade 1 having the most success.^{10–12} The most important clinical implication proposed by all 3 articles is that UCL grade, location, and severity can be potential predictors of successful RTP in professional baseball players. It is also highly suggestive that magnetic resonance imaging alone cannot provide substantial enough information for treatment making decisions in professional baseball players.^{11,17} Rehabilitation strategies after injury should also be considered in the success of RTP but consistency lacks in transparency and reporting of interventions.^{10–12} In the articles reviewed, history, physical examination, and magnetic resonance imaging results were all considered in the methods for UCL injury diagnosis.^{10–12} Ford et al¹¹ reported the highest RTP of 100% for grade 1 tears. High-grade tears had reported rates of 94%¹¹ (grade 2B) and as low as 66%.¹² Dines et al¹⁰ and Ford et al¹¹ reported that proximally located tears resulted in higher RTP rates when compared with distally located tears but did not specify tear location for the professional baseball players in the study as an outcome variable. Frangiamore et al¹² emphasized that tear location should be strongly considered and discussed with throwers when deciding between operative and nonoperative management of a UCL injury, with proximal tears resulting in higher odds of success. Furthermore, Frangiamore et al¹² found that high-grade tears were more likely to fail nonoperative management.

Platelet-rich plasma injections were used as a conservative treatment in one of the studies.¹⁰ The author concluded a successful RTP rate (66%) with the use of PRP.¹⁰ The professional baseball players in the study had failed previous conservative treatment, and the PRP injections were given in conjunction with a rehabilitative program. After injection, the athlete refrained from throwing and followed a progressive stretching and strengthening program for 4 to 6 weeks before starting an interval throwing program.¹⁰ This provides evidence for both rehabilitation and injection therapy as a nonoperative treatment strategy in partial thickness UCL tears. Ford et al¹¹ utilized modalities (electrical stimulation, soft tissue massage,

Table 2 Characteristics of Included Studies

Article	Dines et al ¹⁰	Ford et al ¹¹	Frangiamore et al ¹²
Study design	Retrospective case series	Retrospective case series	Retrospective cohort
Participants	44 baseball players <ul style="list-style-type: none"> • 6 professional players with an MRI diagnosed partial UCL tear • Mean age: 17.3 y (range: 16–28 y) 	43 professional baseball players <ul style="list-style-type: none"> • 7 chose surgery • 8 with complete UCL tear • 28 (10 position players and 18 pitchers) eligible for nonoperative group with partial UCL tears diagnosed via MRI • Mean age: 23.38 (2.3) y (range: 19–23 y) 	39 professional baseball pitchers <ul style="list-style-type: none"> • 7 removed due to incomplete MRI findings of UCL and immediate operative intervention • 32 pitchers analyzed nonoperatively • Mean age: 22.3 y
Intervention	After 3 mo of failed conservative treatment, 3 mL of PRP (autologous conditioned plasma system—Arthrex [Arthrex, Naples, FL]) was injected in the partial UCL tears <ul style="list-style-type: none"> • Acetaminophen and ice were used to control pain along with rest • Progressive stretching and strengthening for 4–6 wk before starting ITP (needed to be asymptomatic subjectively and clinically) • No anti-inflammatories for 2 wk Failed conservative treatment had included rest, activity modification, anti-inflammatories, and physical therapy followed by an attempt to return to throwing using an ITP	Treatment for 6–8 wk: <ul style="list-style-type: none"> • Electrical stimulation • STM • Massage • Scraping • Ultrasound • Laser therapy • Strength training that focused on a rotator cuff and periscapular program • An ITP was initiated once the player was asymptomatic with good strength (good strength not defined by author) Tear location, grade, RTP, and return to same level of play or higher (RTSP)	Weekly progressions: <ul style="list-style-type: none"> • First week consisted of rest and ROM exercises • Second week followed a protected rotator cuff strengthening program • Third week focused on advanced rotator cuff and forearm strengthening • Fourth week consisted of 2-hand plyometric exercises • Fifth week consisted of 1-handed plyometrics • Sixth week began progressive return to throwing program Tear location, grade, and RTP
Outcome measures	Tear location, grade, and RTP RTP defined by modified Conway Scale: <ul style="list-style-type: none"> • Excellent = RTSP • Good = RTP at a slightly lower level • Fair = RTP with residual pain and lower performance ability • Poor indicated inability to RTP 	Tear location, grade, RTP, and return to same level of play or higher (RTSP)	Tear location, grade, and RTP
Tear location	<ul style="list-style-type: none"> • Proximal • Distal • MRI signal 	<ul style="list-style-type: none"> • Proximal • Distal • Diffuse/nonspecific 	<ul style="list-style-type: none"> • Proximal • Middle • Distal
Tear grade	<ul style="list-style-type: none"> • Partial • Diffuse signal without partial tear 	<ul style="list-style-type: none"> • Grade 1: intact ligament with or without edema • Grade 2A: partial tear • Grade 2B: chronic healed injury • Grade 3: complete tear (surgical group) 	<ul style="list-style-type: none"> • Partial • High grade
Diagnosis	<ul style="list-style-type: none"> • Proximal partial tears = 22 • Distal partial tears = 7 • Diffuse signal without partial tear on MRI = 15 Unable to determine which diagnoses were for the professional players	<ul style="list-style-type: none"> • Grade 1 = 4 • Grade 2A = 6 • Grade 2B = 18 • Grade 3 = 8 	<ul style="list-style-type: none"> • Distal = 4 • Proximal = 17 • High grade = 8 • Chronic change = 3

(continued)

Table 2 (continued)

Article	Dines et al ¹⁰	Ford et al ¹¹	Frangiamore et al ¹²
Main findings	Modified Conway Scale outcomes: <ul style="list-style-type: none"> • 15 = excellent • 17 = good • 2 = fair • 10 = poor Four (67%) of 6 professional baseball players returned to professional play Author did not indicate tear location or scaled outcomes specific to the 6 professional baseball players	26 (93%) of 28 in the nonoperative group RTSP Position: <ul style="list-style-type: none"> • 90% of the 10 position players RTSP • 94% of the pitchers RTSP Grade: <ul style="list-style-type: none"> • Grade 1 tears had a 100% RTSP • Grade 2A had an 83% RTSP • Grade 2B had a 94% RTSP rate Location: <ul style="list-style-type: none"> • Proximal UCL injuries had a 79% successful RTSP • Distal UCL injuries had an 89% RTSP rate • Diffuse, nonspecific had a 100% RTSP Not reported 19/26	21 (66%) of 32 professional baseball pitchers successfully RTSP 82% of pitchers who failed nonoperative management had distal tears ($P < .001$), whereas 81% of those who successfully RTP had a proximal tear ($P < .001$)
Time to RTP	4 mo		Not reported
Validity score (Downs and Black Checklist)	15/26		20/26
Level of evidence	4	4	4
Conclusions	The use of PRP in conjunction with rehabilitation can benefit athletes with UCL insufficiency	Incomplete UCL tears in professional baseball players can be managed nonoperatively with successful RTSP rates. MRI grading and location may help predict RTP	UCL tear location, with proximal tears resulting in higher odds of success, should be considered during treatment making decisions

Abbreviations: ITP, interval throwing program; MRI, magnetic resonance imaging; PRP, platelet-rich plasma; RTP, return to play; RTSP, return to same level of play or higher; STM; soft tissue mobilization; UCL, ulnar collateral ligament.

scraping, ultrasound, and laser therapy) for 6 to 8 weeks followed by a strength training program that consisted of a focused rotator cuff and periscapular program. An interval throwing program was implemented once the player was asymptomatic, had good strength, and was not based on a specific time frame. Frangiamore et al¹² was the only author who reported weekly descriptions of their nonoperative treatment intervention. Week 1 consisted of rest and range of motion exercises, week 2 followed a rotator cuff strengthening program, and week 3 consisted of advanced rotator cuff and forearm strengthening. Weeks 4 and 5 consisted of 2- and 1-hand plyometric exercises, respectively. Patients then began a progressive return to throwing program at the beginning of week 6. As part of the last phase in their nonoperative protocol, all 3 authors had consistently reported an interval throwing program. Overall, if a complete UCL tear was diagnosed, surgery was indicated. Greater variations existed in treatment methods when a partial UCL tear was diagnosed.^{10–12}

We acknowledge limitations of this critically appraised topic. First, all studies^{10–12} were retrospective in design, which limits the quality of data and results for interpretation. A second limitation is noted in the inability to generalize each of the nonoperative interventions. Each conservative treatment strategy was different, making it difficult to pool results or make recommendations on the best strategy. One of the authors¹⁰ used an RTP evaluation tool (Conway Scale) during follow-up examinations to measure outcomes, but this scale has not yet been validated. This lack of scale validation may weaken the outcome measures classified following their intervention. In addition, Dines et al¹⁰ did not define “conservative treatment failure” in the professional baseball players who later received PRP injections.

There are currently no prospective studies in the literature for professional baseball players that evaluate RTP rate or success of RTP after nonoperative treatment in partial UCL tears. The paucity of literature available on this topic makes it challenging to properly determine if high-level athletes can be successfully treated nonoperatively.¹¹ Given the rise in UCL surgical rates, future areas of research should focus on following professional baseball players with UCL injuries prospectively and over a longer period of time to see if the treatments provide long-term ability to RTP. Studies that incorporate measures of RTP rates after nonoperative management are paramount due to the foundational support they provide in treatment decisions and can further justify or support a conservative treatment plan. In addition, future UCL research should work toward formulating a treatment algorithm for decisions on operative and nonoperative management.

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