

## CRITICALLY APPRAISED TOPIC

### FOCUSED CLINICAL QUESTION

For a 19 year-old male college baseball player with an elbow UCL tear, is non-operative conservative treatment as effective as surgical intervention (Tommy John Surgery/UCL reconstruction) in return to sport/throwing outcomes?

### AUTHOR

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### CLINICAL SCENARIO

The patient is a 19 year-old Division 1 college baseball pitcher. He is a freshman, and was heavily recruited to be an integral part of the teams pitching staff. He had dealt with some medial right elbow pain in the past while pitching, but it usually subsided after a few days rest, and did not impact his performance. Once he got to college, the throwing program was significantly more intensive. His pain resurfaced during the pre-season, but he did not say anything to the coaches, since he was a freshman and was competing heavily for a starting spot. He continued to pitch through pain, and his throwing mechanics, as well as performance on the field, suffered. During only his 3<sup>rd</sup> in-season appearance the pain became too great, and he was forced to remove himself from the game. At this time, he was sent for an MRI which revealed a partially torn right UCL. He then presented to physical therapy shortly after. Clinical testing revealed pain with palpation at the medial elbow, tenderness of the surrounding forearm musculature, and slight valgus instability of the elbow.

The patient would like to return to the field as quickly as possible to help his team, but he also wants to be able to pitch effectively and without pain. The patient is seeking physical therapy to determine best course of treatment, and whether he can avoid Tommy John surgery (TJ) and the requisite year-long absence from baseball.

A knowledge gap currently exists regarding the efficacy of non-operative treatment of partial UCL tears, and the associated outcomes.

### SUMMARY OF SEARCH

[Best evidence appraised and key findings]

Eight studies were chosen for evaluation: 4 case series, 2 cohort studies, a case-control, and a systematic review of level 1-4 evidence.

- Very few, if any, studies exist that directly compare the results of surgery to non-operative interventions. Most studies are retrospective in nature, and lower-level evidence due to the practical restrictions caused by randomized and delayed intervention.
- Tommy John surgery is by far the most common method of treatment, and is an effective and efficacious intervention for UCL tears, with generally good outcomes requiring +/- 1 year of rehabilitation.
- Non-operative treatments do exist, chiefly rest and targeted strengthening protocols. Platelet-rich plasma injections (PRP) used in conjunction with rest and a gradual return-to-throw protocol have also shown high levels of promise. These approaches yield similar return to sport rates as TJ, however, are only effective for partial UCL tears. TJ is always recommended for complete tears.
- For partial tears, non-operative treatment can always be attempted first, since when successful it results in a much faster full return to participation (~4-8 weeks). If non-operative treatment fails, TJ is still a viable fall-back option. PRP has shown success in treating those who failed an initial non-operative protocol.

### CLINICAL BOTTOM LINE

Given that the patient has only a partial tear, research demonstrates that a conservative approach consisting of rest, targeted PRP injections, and a gradual return to throw program can safely be attempted. If successful, the patient could return to full participation in as little as 1-2 months. If unsuccessful, the patient

can still succumb to TJ surgery, and undergo a lengthy rehabilitation process. The good news is, that while the two courses of treatment provide drastically different timelines, both result in similarly high (70-100%) rates of return to prior level of sport participation. If surgery is eventually elected, the patient may be able to take a medical red-shirt season, and not lose out on a year of athletic eligibility.

***This critically appraised topic has been individually prepared as part of a course requirement and has been peer-reviewed by one other independent course instructor***

*The above information should fit onto the first page of your CAT*

## SEARCH STRATEGY

Terms used to guide the search strategy			
Patient/Client Group	Intervention (or Assessment)	Comparison	Outcome(s)
Baseball player Elbow UCL tear	PRP injection Non-operative management Rehabilitation	Tommy John surgery UCL reconstruction	Return to throw Return to sport

### Final search strategy (history):

*Show your final search strategy (full history) from PubMed. Indicate which "line" you chose as the final search strategy.*

1. Baseball OR pitcher OR thrower
2. UCL OR ulnar collateral ligament
3. PRP OR platelet-rich plasma OR non-operative management OR conservative treatment
4. Tommy John surgery OR UCL reconstruction OR UCL repair OR ulnar collateral ligament reconstruction
5. Return to throw OR return to sport OR return to play OR outcome\*
6. **1 AND 2 AND (3 OR 4) AND 5**

**(((((Baseball OR pitcher OR thrower))) AND ((UCL OR ulnar collateral ligament))) AND ((return to throw OR return to sport OR return to play OR outcome\*)))) AND (((PRP OR platelet-rich plasma OR non-operative management OR conservative treatment))) OR ((tommy john surgery OR UCL reconstruction OR UCL repair OR ulnar collateral ligament reconstruction)))**

*In the table below, show how many results you got from your search from each database you searched.*

Databases and Sites Searched	Number of results	Limits applied, revised number of results (if applicable)
PubMed	118	Switched sort by "most recent" to "best match" = 127 results. Applied "English" = 127. Applied "Humans" = 80. Applied "last 10 years" = 59. Note: if "clinical trial" and "review" are applied, this yields 19 results.
CINAHL	57	N/A
Embase	155	Applied "human" = 150.

## INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria
High-level overhead throwers UCL tear Return to sport/throw outcomes English Published in the last 10 years
Exclusion Criteria
Thumb UCL Duplicate studies Animal studies

## RESULTS OF SEARCH

### Summary of 8 articles retrieved that met inclusion and exclusion criteria

*For each article being considered for inclusion in the CAT, score for methodological quality on an appropriate scale, categorize the level of evidence, indicate whether the relevance of the study PICO to your PICO is high/mod/low, and note the study design (e.g., RCT, systematic review, case study).*

Author (Year)	Risk of bias (quality score)*	Level of Evidence**	Relevance	Study design
Ford (2016)***	17/29	4	High	Case Series
Podesta (2013)	12/29	4	Mod	Case Series
Erickson (2014)	21/29	3b	Mod	Cohort Study
Jack (2018)	19/29	3b	Mod	Cohort Study
Erickson (2015)	12/29	4	Low	Systematic review of level 1-4 evidence
Frangiamore (2017)	19/29	3b	Mod	Case-control
Chauhan (2019)	13/29	4	Mod	Case Series
Saper (2018)***	17/29	4	Mod-High	Case Series

\*Downs and Black Checklist

\*\*Use Portney & Watkins Table 16.1 (2009); if downgraded, indicate reason why

\*\*\* Selected articles for appraisal

## BEST EVIDENCE

The following 2 studies were identified as the 'best' evidence and selected for critical appraisal. Rationale for selecting these studies were:

- **Ford (2016)** – I selected this article because it was the only one I found that had a direct comparison of return to sport outcomes for both Tommy John surgery, and non-operative treatment, thus making it the most directly relevant to my PICO question.

- **Saper (2018)** – I chose this article because it was also most closely related to my PICO question, since it utilized the most similar patient population (adolescent baseball players, mean age of 18, as opposed to professional players). While it only looked at results post UCL reconstruction, this is the most common intervention for UCL tears, and I felt confident in my ability to recommend (or not recommend) non-operative treatment based on my other article choice and literature review.

I also want to note, while some other articles I reviewed had higher “quality scores”, they were much less directly relevant to my question. I also felt that the quality scores and levels of evidence were overall similar throughout, which made me gravitate more towards choosing the two articles I felt best related to my PICO question.

## SUMMARY OF BEST EVIDENCE

### (1) Description and appraisal of (Return-to-Play Outcomes in Professional Baseball Players After Medial Ulnar Collateral Ligament Injuries: Comparison of Operative Versus Nonoperative Treatment Based on Magnetic Resonance Imaging Findings) by (Ford et al. 2016)

<b>Aim/Objective of the Study/Systematic Review:</b>
To determine the ability to return to play, as it pertains to Major League Baseball players, after the non-operative treatment of UCL tears, based on MRI grade and compare this return to play rate to those who undergo Tommy John surgery.
<b>Study Design</b>
[e.g., systematic review, cohort, randomised controlled trial, qualitative study, grounded theory. Includes information about study characteristics such as blinding and allocation concealment. When were outcomes measured, if relevant]  Note: For systematic review, use headings ‘search strategy’, ‘selection criteria’, ‘methods’ etc. For qualitative studies, identify data collection/analyses methods.
<ul style="list-style-type: none"> <li>• Case series</li> <li>• A retrospective review of elbow injuries among a professional baseball organization (6 minor league teams and 1 major league team) between 2006 and 2011 was conducted, yielding 43 UCL injuries</li> <li>• 8 players had complete (grade 3) tears and underwent UCL reconstruction. 35 players had partial tears (grade 1, 2A, 2B), 7 of them had UCL reconstruction and 28 proceeded with non-operative treatment</li> </ul>
<b>Setting</b>
[e.g., locations such as hospital, community; rural; metropolitan; country]  A retrospective review of a single professional baseball organization, consisting of 6 minor league teams and 1 major league team.
<b>Participants</b>
[N, diagnosis, eligibility criteria, how recruited, type of sample (e.g., purposive, random), key demographics such as mean age, gender, duration of illness/disease, and if groups in an RCT were comparable at baseline on key demographic variables; number of dropouts if relevant, number available for follow-up]  Note: This is not a list of the inclusion and exclusion criteria. This is a description of the actual sample that participated in the study. You can find this descriptive information in the text and tables in the article.
72 individuals were found in the review with medial elbow injuries. 27 were excluded as non-UCL injuries, and 2 were excluded as they had undergone UCL reconstruction previously in college. Of the remaining 43, 8 had complete tears, were all pitchers, and were all treated operatively. 35 had incomplete tears, 7 of which were treated operatively. Of these 7, 2 had grade 2A tears and 5 had grade 2B tears. Of the final 28 treated non-operatively (this group was the ultimate goal of the review study), 10 were positional players, and 18 were pitchers. 4 had grade 1 tears, 6 had grade 2A, and 18 had grade 2B. The mean age of the 43 players included in the study was 23.38 +/- 2.3 years. Naturally, all were male. The level of participation for those

with complete tears were: 1 MLB, 1 AAA, 2 AA, and 4 A. For those with incomplete tears, the distribution was: 2 MLB, 3 AAA, 5 AA, and 25 A. There were no noted physical differences between the two groups (complete and incomplete), most importantly, no difference in valgus laxity. Since this was retrospective, there was no dropout, as only those who ultimately underwent some form of intervention were included.

### Intervention Investigated

[Provide details of methods, who provided treatment, when and where, how many hours of treatment provided]

#### Control

No control

#### Experimental

15 total players ended up having TJ surgery. 12 of the surgeries were performed by the team physician, with 2 unaffiliated physicians performing the remaining 3 surgeries. 13 players received a palmaris graft, and 2 received a gracilis graft.

For those who did not initially elect for surgery, the standard timeline for attempting non-operative treatment was 6-8 weeks. Non-operative treatment was not held standard, but was instead individualized for each specific player. Initial priorities were to reduce pain and restore full ROM. Modalities were used during this phase, and included: e-stim, soft tissue mobilization, massage, scraping, ultrasound, and/or laser therapy. The next priority was regaining strength via a targeted rotator cuff and periscapular exercise program. Once the player was asymptomatic and demonstrated good strength, an interval throwing program was initiated. If a player developed medial elbow pain during rehabilitation, then surgery was considered. Otherwise, the only factors considered in the decision to cease rehabilitation and elect for surgery were whether the injury was recurrent (weighted more towards surgery) and the player's desire – some elected for surgery despite a recommendation for rehabilitation.

- Specifics about exercises, sets, repetitions, frequency of treatment, etc. were not provided.

### Outcome Measures

[Give details of each measure, maximum possible score and range for each measure, administered by whom, where]

The only official measures of success were rates of return to play (RTP) and return to same level of play (RTSP). There were no evaluations of performance once the player returned from injury, nor any long-term follow-up. Simply, did the player return to playing baseball, and if so, did they return to the same level of competition as prior to injury (MLB, AAA, AA, A).

### Main Findings

[Provide summary of mean scores/mean differences/treatment effect, 95% confidence intervals and p-values etc., where provided; you may calculate your own values if necessary/applicable. You may summarize results in a table but you must explain the results with some narrative.]

Of the 8 with complete tears who underwent TJ surgery, RTP was 75% and RTSP was 63%. Of the 7 who had incomplete injuries and underwent TJ, RTP was 100% and RTSP was 86%. The 28 players who were treated non-operatively had an RTP and RTSP of 93%. Only 3/31 players with incomplete tears who attempted rehabilitation (4 had surgery without attempting rehab) failed and needed TJ surgery, which gives us our final 28 non-operatively treated players.

- Overall RTSP rates by grade of tear, regardless of treatment were: 100% for grade 1, 88% for grade 2A, 91% for grade 2B, and 63% for grade 3.
- No significant differences were found in RTP rates at any level between operative and non-operative groups, or between complete and incomplete tears.
- RTSP operatively vs. non-operatively: 73% vs. 93%, p value of 0.07
- RTP operatively vs. non-operatively: 87% vs. 93%, p value of 0.32

## Original Authors' Conclusions

[Paraphrase as required. If providing a direct quote, add page number]

Most incomplete UCL injuries in professional baseball players can effectively be treated without surgery. If surgery is performed for a partial UCL tear, RTSP rates are very high. Pitchers are more likely to have UCL tears of any kind, and more likely to have the most severe, grade 3 complete tears. Grade 3 tears always require surgical intervention. MRI findings can help predict the course of treatment, and whether or not surgery will be required.

## Critical Appraisal

### Validity

[Summarize the internal and external validity of the study. Highlight key strengths and weaknesses. Comment on the overall evidence quality provided by this study.]

Downs and Black internal validity score: 17/29

Being a retrospective review, no randomization occurred at any level. There was no blinding of subjects or evaluators, as this would not be plausible given the interventions of interest. There is no mention of the subjects' demographics, nor how those who were successful vs. unsuccessful could be similar/different from each other. However, they were of similar age, and recruited from a very similar population. Given that rehabilitation was individualized, no, the subjects were not managed in the exact same way, leading to a higher risk of bias. Given that this was retrospective, there was no need for a "follow-up", as the outcomes of interest had already occurred. If there was any attrition of subjects, it was either not mentioned or not found with the authors' search criteria. It would be very difficult for them to find any players who withdrew, since they were only analyzing those who finished a course of treatment. The authors did not attempt to extrapolate their findings to other populations or subsets.

Although no effect size can be determined from the data provided, these results seem clinically significant for elite level throwers (including collegiate, like our patient), mainly as it pertains to partial UCL tears (since no one with a complete UCL tear received any intervention other than surgery).

Overall, I would conclude this is solid evidence within a narrow scope. Again, since this was not a direct comparison study, the best we can conclude from it is that patients recruited from a similar population, with similar physical examination characteristics at baseline, had similar outcomes whether they underwent surgery or non-operative treatment. Therefore, for elite throwers with incomplete UCL tears, non-operative intervention is as effective as TJ surgery for return to sport outcomes.

## Interpretation of Results

[This is YOUR interpretation of the results taking into consideration the strengths and limitations as you discussed above. Please comment on clinical significance of effect size / study findings. Describe in your own words what the results mean.]

There was no control group, nor any control for potential biases. It is not ethically possible to have participants be blinded to the intervention when the comparisons are surgery or no surgery. Also, the fact that non-operative intervention was often individualized, means there is no set standard with which to make future recommendations or generalizations, nor any account for treatment confounders. We also do not know what kind of rehabilitation interventions those who underwent surgery received, and whether or not they all were treated with the same protocol.

Here are my takeaways:

- Grade 3 tears always require surgery
- Outcomes between TJ surgery and non-operative treatment (the main focus of this CAT) are remarkably similar, however, must be taken with a grain of salt since a difference in severity (complete vs. incomplete tear) necessitated differing interventions
- Overall, complete tears have similar success rates as incomplete tears, albeit with differing approaches
- Level of competition, chronicity of tear, location (proximal or non-proximal) of tear, and player position (pitcher or non-pitcher) do not have a significant bearing on success rate
- RTP and RTSP rates are fairly similar, although RTSP will always be lower, as expected

### Applicability of Study Results

[Describe the relevance and applicability of the study to your clinical question and scenario. Consider the practicality and feasibility of the intervention in your discussion of the evidence applicability.]

- To narrow this down to those with incomplete tears, like our clinical example patient, RTP and RTSP rates are remarkably high (and not statistically different) no matter what intervention is selected. However, those who elected for TJ surgery required a much lengthier rehabilitation process (~1 year) than those who attempted conservative rehabilitation (6-8 weeks)
- These findings suggest it is absolutely worthwhile to attempt an initial 6-8 week period of non-operative treatment for our patient with a partial UCL tear. If our patient still has pain or recurrent symptoms after the 6-8 weeks of intervention, TJ surgery can be elected for, and outcomes will not be affected by the delay in surgical intervention
- Lastly, a non-operative course of treatment is perfectly feasible, especially since those who undergo TJ surgery will require a much more extensive and lengthy rehabilitation period anyway

## (2) Description and appraisal of (Outcomes and Return to Sport After Ulnar Collateral Ligament Reconstruction in Adolescent Baseball Players) by (Saper et al. 2018)

### Aim/Objective of the Study/Systematic Review:

Evaluate the outcomes and rates of return to sport for adolescent baseball players who underwent UCL reconstruction, and to identify any patient or surgical factors that may impact patient-reported functional outcomes.

### Study Design

[e.g., systematic review, cohort, randomised controlled trial, qualitative study, grounded theory. Includes information about study characteristics such as blinding and allocation concealment. When were outcomes measured, if relevant]

Note: For systematic review, use headings 'search strategy', 'selection criteria', 'methods' etc. For qualitative studies, identify data collection/analyses methods.

- Case series, retrospectively reviewed
- 140 adolescent male baseball players, age 19 or less who underwent UCL reconstruction
- Surgery performed with the American Sports Medicine Institute (ASMI) technique, by the same surgeon, Dr. James Andrews
- All outcomes assessed after a minimum 2-year follow-up

### Setting

[e.g., locations such as hospital, community; rural; metropolitan; country]

Andrews Institute for Orthopaedics & Sports Medicine, Gulf Breeze, Florida, USA

### Participants

[N, diagnosis, eligibility criteria, how recruited, type of sample (e.g., purposive, random), key demographics such as mean age, gender, duration of illness/disease, and if groups in an RCT were comparable at baseline on key demographic variables; number of dropouts if relevant, number available for follow-up]

Note: This is not a list of the inclusion and exclusion criteria. This is a description of the actual sample that participated in the study. You can find this descriptive information in the text and tables in the article.

140 adolescent males, age 19 or less, who underwent UCL reconstruction at the Andrews Institute for Orthopaedics & Sports Medicine by Dr. James Andrews between January 2007 and March 2014. 301 patients were identified via a Current Procedural Terminology (CPT) code search of an institutional computerized database. The code used was for: reconstruction medial collateral ligament, elbow, with tendon graft. The search was limited to patients ages 10-19, to be consistent with the WHO's definition of adolescence. A UCL tear had to be confirmed via MRI. No limits were applied to restrict those who underwent concomitant procedures with their UCL reconstruction. Those who played a sport other than baseball, were unable to be

contacted, or wished not to participate in the study were excluded. 161 patients failed to meet the established criteria, leaving 140 who could be contacted for follow-up for the study.

Mean age at time of surgery was 18.0 years, with a range of 13-19. Mean follow-up was conducted at 57.9 months, range 32.4-115.4 months. 60% of those in the study were high school athletes and 37.1% were collegiate athletes. Mean duration of symptoms prior to surgery was 6.9 months, ranging from 0.5-60.0 months. 57.9% of patients had partial tears, 37.1% had complete tears. 41.3% of patients had preoperative ulnar nerve symptoms. 25% of these patients received some form of concomitant procedure. 85% of the patients were right handed. Of interest, 94.3% of patients were primarily pitchers.

**Intervention Investigated**  
 [Provide details of methods, who provided treatment, when and where, how many hours of treatment provided]

*Control*

No control

*Experimental*

Again, all patients underwent UCL reconstruction at the Andrews Institute for Orthopaedics & Sports Medicine in Gulf Breeze, FL, performed by Dr. James Andrews between January 2007 and March 2014. They all received the ASMI technique, with a free autologous graft and a subcutaneous ulnar nerve transposition. Post-op rehab started the day after surgery, and consisted of 5 phases. For 5-7 days, the elbow was immobilized in a posterior splint at 90 degrees of flexion, to allow healing. After this period, a hinged elbow brace was applied. Shoulder isometrics started within the first week, excluding ER exercises, which did not begin until week 3. AROM targeted to achieve full extension began by 2 weeks post-operatively. Elbow flexion and extension strengthening began at week 4. At week 5, the hinged brace was discontinued. An initial throwing program began at week 6, and continued to be slowly progressed throughout the course of treatment. Plyometric and sport-specific training occurred after strengthening, and was implemented between weeks 10-16. A formal interval throwing program did not start until around week 16, if the athlete was able to complete the prior phase symptom free.

The general structure of the 5 phases is as follows:

Phase 1: weeks 1-3, focused on healing, protection, ROM, decreasing pain/inflammation

Phase 2: weeks 4-7, gradual increase to full ROM, improve muscular strength

Phase 3: weeks 8-24, continue improving strength/power/endurance, gradually begin pre-throwing drills

Phase 4: weeks 25-36+, continue strengthening progression, gradually progress to competitive throwing and sport-specific exercises

Phase 5: months 9-12, continued progression to full sport participation

**Outcome Measures**  
 [Give details of each measure, maximum possible score and range for each measure, administered by whom, where]

All patient reported outcome data was gathered via telephone follow-up conducted by research assistants after a minimum of 2 years post-surgery. None of the research assistants were involved in the original surgery or care of the patients in any way.

Outcome measures utilized include:

- Conway scale: assesses RTP based on pre-operative level of play. Assigns an outcome score of excellent, good, fair, or poor
- Andrews-Timmerman (A-T) score: only the subjective portion was used. This scale assigns points based on the patient's self-reporting for areas of pain, locking, swelling, and activity limitation. A higher score is better, although it is hard to quantify the quality of the patients' scores in this study since the authors only used the subjective portion of the assessment. When both the subjective and objective are utilized, scores range from 20-200
- Kerlan-Jobe Orthopaedic Clinic (KJOC) score: a subjective questionnaire used to assess elbow function in overhead athletes. 100 is a perfect score.



- Patient satisfaction on a 0-100 point scale: 0 was defined as completely dissatisfied, and 100 is completely satisfied
- Would you undergo the surgery again: yes/no
- Unique questionnaire to assess return to sport: patients asked to provide details of the level of sport they participated in before symptom onset and at latest follow-up, and the time it took for them to return to sport. They were also asked to describe any limiting reasons if they returned to a lower level of participation, or did not return at all.

### Main Findings

[Provide summary of mean scores/mean differences/treatment effect, 95% confidence intervals and p-values etc., where provided; you may calculate your own values if necessary/applicable. Use a table to summarize results if possible.]

- Per the Conway scale, 86.4% of patients had "excellent" outcomes
- Mean A-T scores were 97.3 +/- 6.1
- Mean KJOC scores were 85.2 +/- 14.6
- Mean patient satisfaction score was 94.4
- 93.6% of patients said they would elect to have the surgery again
- 138/140 patients attempted to return to sport after surgery. Of these patients, 97.8% were able to RTP, with a mean time of 11.6 months, ranging from 5-24 months
- 89.9% returned to sport at the same level or higher for at least 1 full season
- The most common reason for failure to RTP or RTSP was recurrent elbow pain

Independent variables that proved to have no significant relationship to patient reported outcome measures were age, level of sport at the time of surgery, and presence of any associated lesions.

### Original Authors' Conclusions

[Paraphrase as required. If providing a direct quote, add page number]

UCL reconstruction using the ASMI technique is effective for adolescent baseball players. Outcomes are generally excellent following this surgery, and after at least 2-year follow-up, nearly 90% of patients were able to return to sport at their pre-injury level.

### Critical Appraisal

#### Validity

[Summarize the internal and external validity of the study. Highlight key strengths and weaknesses. Comment on the overall evidence quality provided by this study.]

Downs and Black internal validity score: 17/29

No randomization or blinding occurred during this study. Given how the sample was selected, there is a high likelihood of sampling bias, as all participants were selected from the same pool. There is also no mention of how those who were unable to be contacted during the sampling period, or refused to participate, may have differed from those who participated in the study, since sampling was not random. Having the questioning conducted by research assistants that had no affiliation with the patients, the surgery, or the recovery was a good step to control for researcher bias. The fact that all surgeries were performed by the same surgeon using the same technique is a plus for consistency. Another positive is that all subjects received a standardized rehabilitation protocol. No effort was made to control for demographic differences or other confounding variables, given that this was a retrospective review. While follow-up times were variable, this is controlled for by the main outcome being if the patient was able to return to full sport participation for at least 1 full season, and not if they were still currently playing.

Again, no effect size can be calculated from the data provided, however, we can state that TJ surgery with the ASMI technique is effective for adolescent baseball players, with high rates of RTP and RTSP. The authors made no attempts to generalize these findings to other populations, however, this population directly aligns with our patient in question in the clinical scenario presented, and can be applied appropriately.

The authors admit limitations of their study regarding the ability to draw long-term conclusions, as well as the fact that telephone interviews could introduce recollection bias. Most conclusions drawn were subjective in nature, and little objective data was physically collected in regards to the outcome measures utilized. Most data were qualitative rather than quantitative, leading to the potential for varying reports based on individual differences.

### **Interpretation of Results**

[This is YOUR interpretation of the results taking into consideration the strengths and limitations as you discussed above. Please comment on clinical significance of effect size / study findings. Describe in your own words what the results mean.]

TJ surgery is an effective option for high school/college aged baseball players. RTP and RTSP levels are very high, with relatively low levels of complications. If the patient in our case example had a complete tear, or failed non-operative rehabilitation, he could confidently undergo TJ surgery and reasonably be expected to return to his prior competition level in approximately 1 year after surgery.

### **Applicability of Study Results**

[Describe the relevance and applicability of the study to your clinical question and scenario. Consider the practicality and feasibility of the intervention in your discussion of the evidence applicability.]

Given the population used in this study, the results are directly applicable to the described patient scenario. Since this patient has only a partial UCL tear, it is reasonable for him to attempt non-operative rehabilitation first, with TJ serving as a backup option. It is certainly practical for collegiate baseball players to undergo this surgery, since it happens very frequently, as described by this article. Again, while we have found that both TJ and non-operative rehab have strikingly similar RTP and RTSP outcomes, the main difference is that, when warranted, non-operative treatment results in a much faster return to full sport participation. Thus, making it less involved, and somewhat more feasible for those with incomplete UCL tears.

## **SYNTHESIS AND CLINICAL IMPLICATIONS**

[Synthesize the results, quality/validity, and applicability of the two studies reviewed for the CAT. Future implications for research should be addressed briefly. Limit: 1 page.]

Overall, there is a scarcity of research that directly studies my clinical scenario. There are numerous studies available that evaluate the efficacy of Tommy John surgery with various techniques and on various populations. There is less research available regarding non-operative methods of treatment for UCL tears, since TJ is by far the most common choice for treating a UCL tear, especially for competitive athletes. Naturally, there are almost no studies that directly compare outcomes between the two interventions, and those that do are usually retrospective in nature. Given the nature of the two interventions in question, it is basically impossible to conduct any sort of RCT, or blind the subjects or evaluators. This unfortunately means that the best available research tends to be of lower level evidence, such as case series or cohort studies. Given these restrictions, the route that I chose was to evaluate the efficacy of each intervention separately, and then extrapolate my comparisons, as they relate to this specific patient scenario. For these reasons, the two studies I chose for my CAT leaned more towards applicability to the specific patient case, rather than getting hung up on chasing higher quality studies that may or may not exist, and may or may not be relevant to my clinical question.

The bottom line of my findings is that either TJ surgery, or non-operative rehabilitation are viable options for the treatment of UCL tears in competitive baseball players, if the circumstances are right. A rehabilitation protocol consisting of pain/inflammation management, rest, targeted strengthening, and gradual return to throw, is as effective as TJ for those with partial UCL tears, and results in a much faster return to play. However, for those with complete UCL tears, TJ is always recommended. Some studies show lesser outcomes for TJ than non-operative treatment, however, fail to account for the fact that those who undergo TJ often inherently have a more severe injury to begin with (complete vs. incomplete tear) which lessens their rehab potential in the first place.

While neither of the chosen articles addressed it directly, it was mentioned in the Ford et al article that PRP injections are showing some initially very promising results in the UCL tear population. There is certainly an argument to be made that they can and should be used in conjunction with the above non-operative rehab protocol to enhance healing and outcomes for those who elect to avoid surgery. There is a lot of room for future study revolving around PRP injections, in both operative and non-operative patients. One thing that would be great to see in this area, is more prospective studies, which are then able to standardize protocols, which would decrease the likelihood of treatment confounders. As discussed above, it is not very plausible to conduct high-level prospective studies with elite athletes who cannot afford to wait for intervention, and cannot afford to test drive a potentially less effective treatment method. However, prospective cohort studies

for both TJ surgery and non-operative treatment separately, with standardized criteria and procedures, would serve as a helpful future directive in this area. There is also a need (and it is more plausible) to compare differing non-operative rehab approaches to determine the most effective methods for those who want to avoid TJ surgery, as no consensus currently exists.

## REFERENCES

[List all references cited in the CAT]

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