

Meniscal Injuries Are Decreasing but Are Increasingly Being Treated Surgically With Excellent Return to Play Rates in Professional Baseball Players



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Purpose: The purposes of this study were to determine the incidence and key characteristics of meniscus injuries in professional baseball players, assess current treatment strategies, determine the return to play rates at any level (RTP) and at the same level (RSL), and identify prognostic factors that predict injury severity. **Methods:** After approval from the Major League Baseball (MLB) Research Committee and our institutional review board, the MLB Health and Injury Tracking System was used to identify meniscus injuries occurring across MLB and Minor League Baseball (MiLB) from 2011 to 2017. Analyzed injuries occurred during normal baseball activity in a player who was active on an MLB or MiLB roster and resulted in at least 1 day missed. **Results:** A total of 293 professional baseball players sustained 314 meniscus injuries from 2011 to 2017 (7 years) for a mean of 44.9 injuries/y. Pitchers were the most injured position (31.8%), followed by infielders (26.4%). Catchers and infielders missed the most median number of days (50 days). When comparing injuries to landing leg vs push-off leg in pitchers, injury to the push-off leg resulted in significantly more days missed per injury compared to the lead leg (59.6 vs 39.9 days, $P = .048$). Overall, RTP was 93.0%, while RSL was 84.4%. **Conclusions:** Over 7 professional baseball seasons, 314 meniscus injuries occurred in 293 players. Pitchers and catchers were most injured, and overall, the number of meniscal injuries per year declined while the percentage of injuries that required surgery increased over time. High rates of RTP were observed. **Level of Evidence:** Level IV, therapeutic case series.

General epidemiologic injury data in professional baseball have been well studied.¹⁻⁴ These comprehensive studies have analyzed a large number of injuries with the goals of gaining a better understanding of injuries that most commonly affect baseball players and anticipated outcomes. Traditionally, an emphasis was placed on upper extremity injuries, with rates of upper extremity injuries in collegiate and professional

baseball players reported over 50%.^{3,5} However, newer studies using more robust data (medical records rather than publicly available disabled lists and reports) suggest lower extremity and upper extremity injury rates are more equivalent than previously reported.² Lower extremity injuries may account for up to 35% of all injuries in professional baseball players.² Furthermore, certain baseball positions, such as catchers, actually

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Table 1. Injury Characteristics of 314 Meniscus Injuries in Major and Minor Leagues, 2011-2017

Characteristic	No. (%)
Medial vs lateral	
Lateral	156 (50)
Medial	158 (50)
Injury type	
Acute	223 (80.2)
Overuse	55 (19.8)
Unlisted	36
Reinjury	
Yes	6 (1.9)
No	308 (98.1)
Level of play	
MLB	77 (24.5)
MiLB	237 (75.5)
Season	
Preseason	66 (21.0)
Season	237 (75.5)
Postseason	11 (3.5)
Surgery required	
Yes	180 (57.3)
No	134 (42.6)
RTP	
Yes	292 (93.0)
No	22 (7.0)
RSL	
Yes	265 (84.4)
No	38 (12.1)
NA	11 (3.5)

MiLB, Minor League Baseball; MLB, Major League Baseball; NA, not available; RSL, return to play at same/prior level; RTP, return to play at any level.

reveal a higher predilection for lower extremity injuries (up to 68% of all injuries) compared to injuries to the upper extremities.⁶

In a recent review of knee injuries in professional baseball, Dahm et al.¹ reported that knee injuries accounted for 6.5% of all musculoskeletal injuries, resulting in 7,612 days missed per season. Anterior cruciate ligament (ACL) tears are responsible for the greatest mean days missed of all knee injuries, while lateral and medial meniscus tears were ranked second and third, respectively.¹ Accordingly, the ACL is well studied with a recent focus on rehab and return to sport.⁷⁻⁹ Notably, meniscus injuries have been investigated in other professional sports such as football and basketball.¹⁰⁻¹² Yeh et al.¹³ noted that meniscus injuries comprised 8.8% of all knee injuries and 0.8% of all injuries in the National Basketball Association over a 21-year span. Similar rates have been identified in professional baseball players.^{1,2} From 2011 to 2016, meniscus tears were collectively the 30th most common injury in Major League Baseball (MLB) and Minor League Baseball (MiLB) players.² Although relatively uncommon (280 meniscus tears), meniscus injuries resulted in 32,175 days out of play, which ranked 10th

in total time missed. Additionally, 31% of players with lateral meniscus tears and 24% of players with medial meniscus tears were not able to return to play in the same season, making them the fourth and sixth highest causes of season-ending injuries, respectively.

As the prevalence of these lower extremity injuries is better understood, there is a need for increased characterization of these injuries in the professional baseball athlete. Specifically, a better understanding of what positions get injured, when, and how often these injuries occur; how they are treated; and the impact on return to play. These data would be valuable for physicians, athletic trainers, physical therapists, players, and coaches. The purposes of this study were to determine the incidence and key characteristics of meniscus injuries in professional baseball players, assess current treatment strategies, determine the return to play rates at any level (RTP) and at the same level (RSL), and identify prognostic factors that predict injury severity. We hypothesized that (1) surgical management of meniscus injuries will increase over time, resulting in greater days missed per injury; (2) overall meniscus injuries will not increase over time; and (3) meniscus injuries will be disparate between position, with pitchers and catchers sustaining more meniscus injuries.

Methods

After approval by our institutional review board and the MLB Research Committee, detailed data regarding meniscus injuries were obtained using the MLB Health and Injury Tracking System (HITS). The HITS medical record system was used with assistance from the MLB Commissioner's Office and the MLB Players Association per their standard protocol and as previously described.¹⁴ This system records injury data from all 30 MLB teams and their 230 minor league affiliates. The HITS database was developed to efficiently track player medical histories, identify

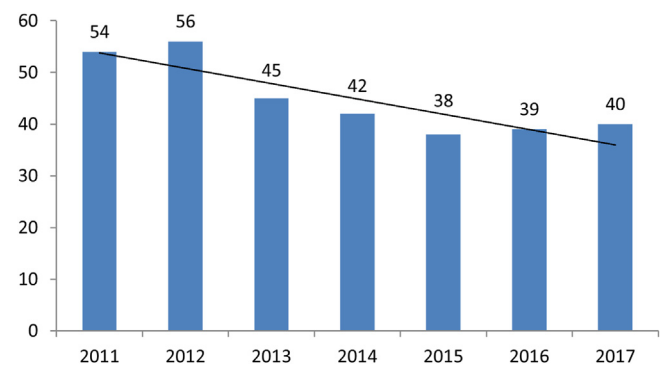


Fig. 1. The number of meniscus injuries sustained per year in both Major and Minor League Baseball players changed significantly from 2011 to 2017 ($R^2 = 0.767$, $P = .010$).



Fig. 2. The number of meniscus injuries sustained during each month in both Major and Minor League Baseball players from 2011 to 2017 ($R^2 = 0.062$, $P = .519$).

trends in injuries, and use for epidemiologic research to optimize player safety.¹⁴ The medical record was queried to identify all meniscus injuries that occurred in MLB and MiLB from the 2011 to 2017 seasons. Only injuries that were classified as occurring in the knee and diagnosed as a meniscus tear in the HITS database were included. The investigators collected and analyzed data in an anonymous manner. Inclusion criteria were as follows: primary injury was to the meniscus, injuries that resulted in at least 1 day out of play, injury that occurred as part of baseball activities (training, practice, or games), and the player was on an active MLB or MiLB roster at the time of injury. Injuries were excluded if they resulted in less than 1 day out of play, did not occur during normal baseball activity, occurred during the offseason, or occurred concomitantly with another knee injury (e.g., ACL injury).

The data analyzed included both player and injury characteristics. Player characteristics were as follows:

level of play (MLB or MiLB), batting-side dominance (right, left, or switch), throwing-side dominance (right or left), height, weight, age at the time of injury, and position. The number of injuries per position was also normalized based on the number of players on the field at each position (i.e., 4 infielders, 3 outfielders, 1 pitcher, and 1 catcher). Injury characteristics included date of injury, days missed, injury type (acute or chronic), session in which the injury occurred (i.e., training, game, practice, etc.), laterality (left or right), meniscus involved (medial or lateral), activity during which the injury occurred (throwing, pitching, batting, base running, etc.), location on the field when the injury occurred (pitcher’s mound, home plate, outfield, etc.), mechanism of injury, season (spring training, season, postseason), and whether surgery was required. Injuries were classified as “reinjury” if the player experienced the same injury previously during the study period. This information, along with the diagnosis and chronicity, is included for each injury by the team medical staff member (typically the athletic trainer), who inputs the injury into the medical record. To most accurately assess the days missed from each injury, 2 distinct groups of data were excluded from the analysis. Players who were not followed during the offseason but only provided medical clearance at the next spring training were excluded from “days missed per injury” calculations as it was determined these players were not appropriately assessed in a timely manner while other players were provided clearance in the offseason. Severe injuries that resulted in a valid clearance date that was a year or more from the date of injury were included from the days missed per injury analysis as it was determined that the median could be reported without skewing the interpretation of days missed. These players and their respective injuries were identified as injuries that resulted in

Table 2. Comparisons of Days Missed From 267 Meniscus Injuries, 2011-2017

Characteristic	No.	Days Missed					P Value
		Mean	SD	Minimum	Maximum	Median	
MLB	65	59.5	72.1	1	438	40	.23
MiLB	202	73.7	86.2	1	510	47.5	
Lateral	129	71.6	77.3	1	485	50	.80
Medial	138	69.0	88.3	1	510	40	
Nonoperative	123	30.9	35.1	1	178	18	<.01
Operative	144	103.9	96.5	1	510	66.5	
Acute	192	68.5	83.0	1	510	42	.17
Overuse	43	88.6	103.0	1	485	50	
Left	136	68.7	89.9	1	485	39	.75
Right	131	71.9	75.7	1	510	50	
Total	267	70.3	83.1	1	510	44	

NOTE. Analysis of days missed included 267 of the 314 injuries due to exclusion of injuries with invalid days missed. Bold values indicate statistical significance (P value $< .05$).

MiLB, Minor League Baseball; MLB, Major League Baseball .

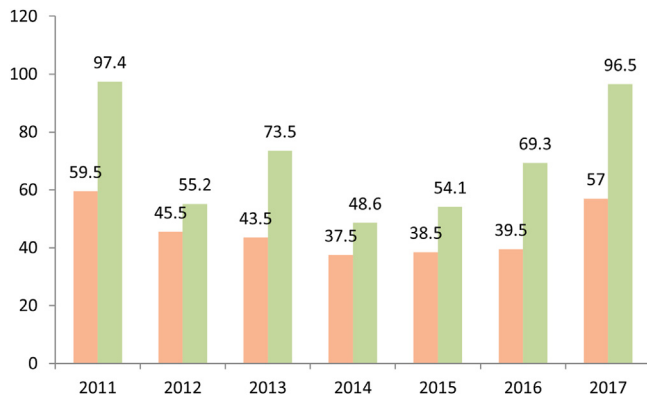


Fig. 3. The median (orange) and mean (green) number of days missed per meniscus injury in both Major and Minor League Baseball players from 2011 to 2017. Analysis of days missed included 267 of the 314 injuries due to exclusion of injuries with invalid days missed.

days missed beyond a baseball year, or BBY. A baseball year was defined as any 4 consecutive sessions (spring training, season, postseason, and off-season) of a baseball season. Medical clearance dates that occurred within a baseball year of the injury date, including the session of injury, were considered valid and used to calculate return to play times. Return to play rates were reported as return to play at any level (RTP) or return to play at the same level (RSL) prior to injury, and achieving “return to play” was defined as playing in a live, scheduled baseball game. For this study, professional baseball levels of play were defined as MLB, AAA, AA, and A.

Subgroup analyses was performed that compared age, mean days missed from play, and rate of surgery. Comparisons were made based on position, injured side, medial or lateral meniscus injury, level of play, and between nonoperative and surgically managed injuries. Analyses were performed on whether the injured side involved the front leg vs back leg for batters and lead (landing) vs trailing (push-off) leg in pitchers. A batter’s front leg was defined as the right leg for left-

handed batters and the left leg for right-handed batters. Similarly, the lead leg was defined as the right leg in left-handed pitchers and the left leg in right-handed pitchers.

Statistical Analysis

Epidemiologic data are reported with descriptive statistics, including means \pm standard deviations, ranges, and medians. Trends over time (such as injuries per year) were analyzed using linear regression modeling with corresponding R^2 and P values. Medians were provided in addition to means given the nonnormal distribution of the data. All analyses were performed with SAS JMP version 14.0 (SAS, Inc). Paired and unpaired t tests were used for dependent and independent group continuous variables, respectively. Wilcoxon rank-sum test was also used for continuous variables, and χ^2 analysis or Fisher’s exact test was used for categorical variables. P values less than .05 were considered to represent statistical significance.

Results

A total of 293 professional baseball players sustained 314 meniscus injuries between 2011 and 2017 (Table 1). The mean number of annual injuries was 45 (range, 38-56), and this steadily decreased over time ($R^2 = 0.767$, $P = .010$) (Fig 1). There was no significant trend based on the number injuries sustained per month over the course of the season ($R^2 = 0.062$, $P = .519$) (Fig 2). In total, 256 injuries were included in the analysis of days missed, with 58 injuries excluded due to invalid days missed or extended days beyond a baseball season. This analysis included 14,848 days missed (Table 2). The mean number of days missed per injury ranged from 48.6 to 97.4 annually (median range, 37.5-59.5) (Fig 3).

Of these injuries, 77 (24.5%) occurred in MLB players and 237 (75.5%) occurred in MiLB players. MiLB players who sustained meniscus injuries were younger than MLB players (23.0 vs 30.3, $P < .001$). There were no significant differences between the 2 leagues with

Table 3. Age, Treatment and Return to Play Comparisons of 314 Meniscus Injuries, 2011-2017

Characteristic	No.	Mean Age, y	P Value	% Requiring Surgery	P Value	RTP, %	P Value	RSL, %	P Value
MLB	77	30.3	<.01	59.7	.69	100	<.01	89.6	.01
MiLB	237	23.0		56.5		90.7		82.7	
Lateral	156	24.1	.01	57.1	1.00	94.2	.51	86.5	.40
Medial	158	25.4		57.6		91.8		82.3	
Nonoperative	134	24.8	.68			93.3	1.00	82.8	.77
Operative	180	24.8				92.8		85.6	
Total	314	24.8		57.3		93.0		84.4	

Bold values indicate statistical significance (P value $< .05$).

MiLB, Minor League Baseball; MLB, Major League Baseball; RSL, return to play at same/prior level; RTP, return to play at any level.

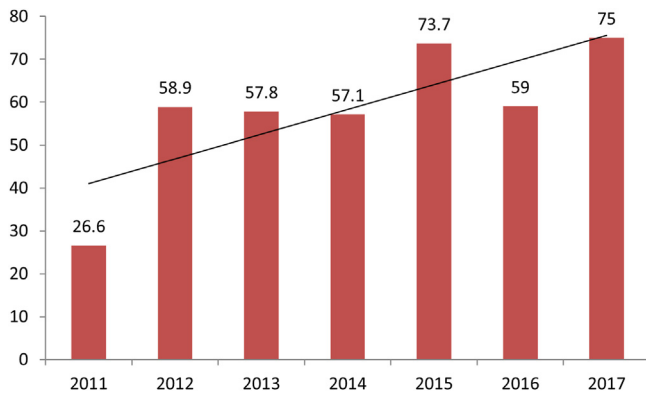


Fig. 4. The percentage of meniscus injuries requiring surgical management per year in both Major and Minor League Baseball players increased significantly from 2011 to 2017 ($R^2 = 0.609$, $P = .038$).

regard to median days missed from play ($P = .378$). However, MLB players had higher rates of RTP (100% vs 90.7%, $P = .003$) and RSL (89.6% vs 82.7%, $P = .013$) compared to MiLB players (Table 3).

Surgery was performed in 57.3% of injuries (59.7% in the MLB and 56.5% in the MiLB), and the percentage of injuries requiring surgery increased over time ($R^2 = 0.609$, $P = .038$) (Fig 4). With regard to nonoperative vs surgical management, there were no differences in player weight ($P = .416$), level of play (MLB vs MiLB, $P = .621$), medial vs lateral meniscus ($P = .999$), reinjury ($P = .715$), or acute vs overuse injury type ($P = .142$). There was, however, a difference in days missed with nonoperative treatments, resulting in a median of 18 days missed compared to surgical treatment, resulting in a median 66.5 days missed ($P < .001$) (Table 2). Medial and lateral meniscus injuries were nearly equal with 158 and 156, respectively (Table 3). Most injuries were acute in nature (80.2%), were not a reinjury (98.2%), and occurred during the regular season (75.5%). The mechanism of injury was usually noncontact (67.4%) in the infield (24.8%) or home plate area (21.7%) and occurred while fielding over one-third of the time (37.6%) (Table 4).

Overall, pitchers were most injured (31.8%), followed by infielders (26.4%), catchers (25.2%), and outfielders (15.9%). When normalized by players at that position (infielder/4, outfielder/3, pitcher/1, catcher/1), pitchers remained the most injured with 100 injuries per position followed by catchers (79), infielders (20.8) and outfielders (16.7). Catchers and infielders missed the greatest number of days (median 50 days) (Table 5). Catchers also had the lowest rates of RTP and RSL at 89.9% and 74.7%, respectively. Batters with injuries to their back leg resulted in more days missed compared to their front leg, although this was

not statistically significant (84.4 days vs 64.9 days, $P = .163$). There were also no differences in the percentage of injuries requiring surgery in back- vs front-leg injuries ($P = .381$) (Table 6). Additional subgroup analysis revealed that injuries to the push-off leg in pitchers resulted in significantly more days missed per injury compared to the landing leg (59.6 vs 39.9 days, $P = .048$) but no significant difference in the percentage requiring surgery ($P = .792$) (Table 7).

Discussion

The principal finding of the current study was that 293 professional baseball players sustained 314 meniscus injuries between 2011 and 2017. Pitchers and catchers were most injured, and overall, the number of meniscal injuries per year declined while the percentage of injuries that required surgery increased over time. RTP and RSL rates were very high overall, with 93.0% of players returning to play and 84.4% returning to the same level of play after injury. Further analysis showed that pitchers who sustained a meniscus injury to their push-off leg missed significantly more days than pitchers who injured their landing leg. A similar trend was found in batters, which showed more days missed when the back leg was injured, but this was not found to be statistically significant.

Table 4. Advanced Injury Characteristics of Meniscus Injuries in MLB and MiLB Baseball Players From 2011-2017

Characteristic	No.	%
Injury mechanism		
Noncontact	212	67.4
Contact with ground	63	20.0
Other	19	6.0
Contact with person	12	3.8
Unlisted	7	2.2
Contact with ball	1	0.3
Injury location on the field		
Infield—other	78	24.8
Home plate area	68	21.7
Other	59	18.8
Pitcher’s mound area	44	14.0
Outfield	39	12.4
Injury activity		
Fielding	118	37.6
Base running	38	12.1
Other	35	11.1
Pitching	34	10.8
Conditioning	25	8.0
Sliding	22	7.0
Throwing	16	5.1
Batting	15	4.8
Weight training	5	1.6
Unlisted	4	1.3
Observing	2	0.6

MiLB, Minor League Baseball; MLB, Major League Baseball.

Table 5. Frequency of Meniscus Injuries, Days Missed, and Surgery Percentage by Position, Ranked in Descending Order by Normalized Injuries per Position, 2011-2017

Position	No. (%) of Injuries*	Normalized Injuries per Position [†]	P Value [†]	Days Missed per Injury,		Surgery Performed,			P Value	
				Rank	Median (Mean \pm SD) [‡]	Rank [‡]	% (No.)	RTP, %	RSL, %	RSL
Pitcher	100 (31.8)	100	<.001	1	40.5 (51.0 \pm 48.4)	3	55.0 (55)	94.0	87.0	.489
Catcher	79 (25.2)	79		2	50 (71.2 \pm 78.0)	1	67.1 (53)	89.9	74.7	
Infielder	83 (26.4)	20.8		3	50 (95.9 \pm 117.7)	1	54.2 (45)	91.6	85.5	
Outfielder	50 (15.9)	16.7		4	42 (64.5 \pm 61.3)	4	52.0 (26)	98.0	94.0	

Bold values indicate statistical significance (P value $<$. 05).

RSL, return to play at same/prior level; RTP, return to play at any level.

*Two players with an unidentified position and/or injury activity were not included in this table.

[†]The number of injuries per position was normalized (infielder/4, outfielder/3, pitcher/1, catcher/1).

[‡]Analysis of days missed per injury included 267 of the 314 injuries due to exclusion of injuries with invalid days missed.

[‡]Rank determined by median days missed.

The present study showed catchers, as well as pitchers, sustained most meniscus injuries. Although we cannot say definitively what predisposes these positions to a higher rate of meniscus injuries compared to outfielders based on this study, it is likely related to the differing physical demands of each position. Catchers had the largest number of days missed and the lowest rate of RTP and RSL. Of all positions, catchers require the greatest amount of twisting and loading of the knee while in deep flexion, which places more stress on the menisci. Similarly, the defensive demands of pitchers and infielders require quick loading and twisting of a flexed knee more often than outfielders, who tend to field in a more upright position, which may explain the higher rates at those positions as well.

Over half (57.3%) of injuries underwent surgical management, and the percentage of injuries requiring surgery annually has trended up from 2011 to 2017. This may be due to improved surgical technique and management trends of meniscus injuries. Unfortunately, specific injury characteristics, such as tear pattern and location, were not consistently reported in the medical records, and this is likely a primary driver of these treatment decisions.¹⁵ Previous research has revealed that the percentage of meniscus injuries requiring surgical treatment has been much higher than surgical rates of other injuries, including other knee injuries.^{1,2} The higher surgical rate emphasizes the importance of anatomic reduction and surgical treatment to optimize healing of the meniscus.¹⁵ The present study did not show any significant differences

in RTP and RSL rates when comparing nonoperative and operative treatment of meniscus injuries. RTP rates for surgical management of other knee injuries are similar to the present study. RTP following operative treatment of meniscus injuries was 92.8%, which is slightly higher compared to the reported RTP following ACL reconstruction (ACLR; 90%).¹⁶

Over the 7-year study period, 44,824 days were missed by professional baseball players as a result of meniscus injuries. Overall, our findings are consistent with previous studies with regard to days missed from play.^{1,2} The most important influence on the number of days missed was the management (operative vs nonoperative) of the injury. While the management of meniscus injuries appears to significantly affect days missed, the prognosis may actually be more dependent on which knee is injured (front vs back) for both batters and pitchers. Subgroup analysis was performed to determine players at risk for longer duration of time out of play. Pitchers with injuries to their trailing leg missed more days compared to an injury to their landing leg (59.6 vs 39.9 days, respectively). Similarly, batters with injuries to their back leg (the pivot leg during the swing) had a trend toward more days missed compared to injury to their front leg (84.4 vs 64.9 days, respectively) despite there being no differences in rates of surgical management. Fabricant et al.¹⁷ identified similar trends in MLB players returning to play after ACLR. Players undergoing ACLR for a rear batting leg injury experienced a mean 18.7% decline in batting average compared to a player who had ACLR for a lead batting leg injury. Meniscus injuries may affect different

Table 6. Days Missed and Surgery Required Based on the Injured Side in MLB and MiLB Batters, 2011-2017

Injured Side	N	Days Missed per Injury, Mean \pm SD (Median)*	P Value	Required Surgery, %	P Value
Back leg	99	84.4 \pm 82.8 (54)	.16	61.6	.38
Front leg	93	64.9 \pm 86.8 (35)		54.8	

NOTE. Not included in table: 21 players who bat both sides.

MiLB, Minor League Baseball; MLB, Major League Baseball.

*Analysis of days missed per injury included 164 injuries (81 back leg; 83 front leg) due to exclusion of injuries with invalid days missed.

Table 7. Days Missed and Surgery Required Based on Injured Side in MLB and MiLB Pitchers, 2011-2017

Injured Side	No.	Days Missed per Injury, Mean ± SD, (Median)*	P Value	Required Surgery, %	P Value
Trailing leg	57	59.6 ± 58.2 (44)	.048	56.1	.79
Lead leg	43	39.9 ± 28.0 (39.5)		53.5	

Bold values indicate statistical significance (*P* value < .05).

MiLB, Minor League Baseball; MLB, Major League Baseball.

*Analysis of days missed per injury included 82 injuries (46 trailing leg; 36 lead leg) due to exclusion of injuries with invalid days missed.

positions to differing degrees, but when the meniscus injury occurs in the extremity required to push off during throwing and swinging, there are more days missed from play. Further research is needed to identify specific meniscus injury patterns and operative techniques in professional baseball players and their influence on return to play and days missed from play.

Limitations

Several limitations to this study merit discussion. As with all retrospective studies, the quality of the data analyzed is dependent on input of accurate injury information into the medical record. Although representing a large number of data points, the data were generated from 2011 to 2017 and may have changed over time. Given these data points and the retrospective nature, a power analysis to detect the differences in this study was not performed. This work is also limited by an inability to view magnetic resonance images or operative reports to provide a more robust analysis of precise meniscus injury patterns and treatment strategies. Details regarding surgical technique, intraoperative findings, rehabilitation, and radiographs were not available with the data provided by MLB. This could potentially influence days missed from play due to postoperative rehabilitation protocols and restrictions. RTP and RTS data may be influenced by injury factors outside of injury and management. Finally, because the medical record spans a multitude of medical providers across all professional baseball clubs, there was no standardized approach to treatment and rehabilitation of these injuries.

Conclusions

Over 7 professional baseball seasons, 314 meniscus injuries occurred in 293 players. Pitchers and catchers were most injured, and overall, the number of meniscal injuries per year declined while the percentage of injuries that required surgery increased over time. High rates of RTP were observed.

References

1. Dahm DL, Curriero FC, Camp CL, et al. Epidemiology and impact of knee injuries in Major and Minor League Baseball players. *Am J Orthop (Belle Mead NJ)* 2016;45:E54-E62.

2. Camp CL, Dines JS, van der List JP, et al. Summative report on time out of play for Major and Minor League Baseball: An analysis of 49,955 injuries from 2011 through 2016. *Am J Sports Med* 2018;46:1727-1732.
3. Posner M, Cameron KL, Wolf JM, Belmont PJ Jr, Owens BD. Epidemiology of Major League Baseball injuries. *Am J Sports Med* 2011;39:1676-1680.
4. Conte S, Camp CL, Dines JS. Injury trends in Major League Baseball over 18 seasons: 1998-2015. *Am J Orthop (Belle Mead NJ)* 2016;45:116-123.
5. McFarland EG, Wasik M. Epidemiology of collegiate baseball injuries. *Clin J Sport Med* 1998;8:10-13.
6. Kilcoyne KG, Ebel BG, Bancells RL, Wilckens JH, McFarland EG. Epidemiology of injuries in Major League Baseball catchers. *Am J Sports Med* 2015;43:2496-2500.
7. Betsch M, Darwich A, Chang J, et al. Wide variability in return-to-sport criteria used by team physicians after anterior cruciate ligament reconstruction in elite athletes: A qualitative study. *Arthrosc Sports Med Rehabil* 2022;4:e1759-e1766.
8. Rossi MJ, Brand JC. Rehabilitation is the critical ingredient to optimize return to sport in athletes. *Arthroscopy* 2022;38:7-9.
9. Turk R, Shah S, Chilton M, et al. Critical criteria recommendations: Return to sport after ACL reconstruction requires evaluation of time after surgery of 8 months, >2 functional tests, psychological readiness, and quadriceps/hamstring strength [published online October 7, 2022]. *Arthroscopy*.
10. Alvarez-Diaz P, Alentorn-Geli E, Llobet F, Granados N, Steinbacher G, Cugat R. Return to play after all-inside meniscal repair in competitive football players: A minimum 5-year follow-up. *Knee Surg Sports Traumatol Arthrosc* 2016;24:1997-2001.
11. Brophy RH, Lyman S, Chehab EL, Barnes RP, Rodeo SA, Warren RF. Predictive value of prior injury on career in professional American football is affected by player position. *Am J Sports Med* 2009;37:768-775.
12. Logan M, Watts M, Owen J, Myers P. Meniscal repair in the elite athlete: Results of 45 repairs with a minimum 5-year follow-up. *Am J Sports Med* 2009;37:1131-1134.
13. Yeh PC, Starkey C, Lombardo S, Vitti G, Kharrazi FD. Epidemiology of isolated meniscal injury and its effect on performance in athletes from the National Basketball Association. *Am J Sports Med* 2012;40:589-594.
14. Pollack KM, D'Angelo J, Green G, et al. Developing and implementing Major League Baseball's health and injury tracking system. *Am J Epidemiol* 2016;183:490-496.
15. Woodmass JM, LaPrade RF, Sgaglione NA, Nakamura N, Krych AJ. Meniscal repair: Reconsidering indications,

- techniques, and biologic augmentation. *J Bone Joint Surg Am* 2017;99:1222-1231.
16. Totlis T, Haunschild ED, Otountzidis N, et al. Return-to-sport rate and activity level are high following arthroscopic all-inside meniscal repair with and without concomitant anterior cruciate ligament reconstruction: A systematic review. *Arthroscopy* 2021;37:2351-2360.
 17. Fabricant PD, Chin CS, Conte S, Coleman SH, Pearle AD, Dines JS. Return to play after anterior cruciate ligament reconstruction in Major League Baseball athletes. *Arthroscopy* 2015;31:896-900.