A History of Anterior Cruciate Ligament Reconstruction at the National Football League Combine Results in Inferior Early National Football League Career Participation

CAPT Matthew T. Provencher, M.D., M.C., U.S.N.R., James P. Bradley, M.D., Jorge Chahla, M.D., Ph.D., Anthony Sanchez, B.S., Brendin R. Beaulieu-Jones, B.A., Justin W. Arner, M.D., Nicholas I. Kennedy, M.D., George Sanchez, B.S., Mitchell I. Kennedy, B.S., Gilbert Moatshe, M.D., Mark E. Cinque, M.S., and Robert F. LaPrade, M.D., Ph.D.

Purpose: To evaluate whether players with a history of an anterior cruciate ligament reconstruction (ACLR) before the National Football League (NFL) Combine played or started fewer games and/or participated in fewer eligible snaps compared with NFL Combine participants without a history of knee injury or surgery. **Methods:** We performed a retrospective review of all players who participated in the NFL Combine between 2009 and 2015 and who had a history of an ACLR. NFL Combine participants were included if they had a previous ACLR or combined anterior cruciate ligament (ACL) injury and nonoperatively managed medial collateral ligament injury. The number of games started, number of games played, draft number, overall draft pick, and snap percentage for each position were determined. The mean value of each outcome metric was compared between case and control players. **Results:** We identified 110 players who had an ACL injury (n = 76) or a combined ACL and medial collateral ligament injury (n = 34). Players in the ACLR group had a significantly worse mean draft pick number (difference of 30.2, $P = .002$) and mean draft round (difference of 0.8, $P = .019$) versus controls. Compared with control players, players in the ACLR group started and played significantly fewer games in both season 1 (difference of 2.7 games started, $P < .001$; difference of 2.7 games played, $P < .001$) and season 2 (difference of 7.4 games started, $P < .001$; difference of 3.0 games played, $P = .003$) and had a significantly lower snap percentage in both season 1 (difference of 23.1%, $P < .001$) and season 2 (difference of 24.0%, $P < .001$). **Conclusions:** Athletes at the NFL Combine who previously underwent an ACLR had significantly lower early-career NFL player metrics, including fewer games started, fewer games played, and a lower snap percentage, than uninjured controls. Defensive linemen, defensive backs, and linebackers were the 3 most affected positions. Players with a prior ACLR and combined meniscal-chondral pathology had significantly lower numbers of games started and games played in seasons 1 and 2 and a significantly lower season 2 snap percentage. **Level of Evidence:** Level III, case-control study.

Anterior cruciate ligament (ACL) tears have been reported to have an annual incidence of 0.17 per 1,000 players in college football and 0.7 per 1,000 players in the National Football League (NFL).[1-3] Previous data have shown that up to 8% of all participants at the NFL Combine had a history of an ACL injury.[4,5]

From The Steadman Clinic (M.T.P., R.F.L.); and Steadman Philippon Research Institute (M.T.P., J.C., A.S., N.I.K., M.I.K., G.M., M.E.C., R.F.L.), Vail, Colorado; Department of Orthopaedic Surgery, University of Pittsburgh (J.P.B., J.W.A.), Pittsburgh, Pennsylvania; and Geisel School of Medicine at Dartmouth (B.R.B-J., G.S.), Hanover, New Hampshire, U.S.A.

The authors report the following potential conflicts of interest or sources of funding: M.T.P. receives support from patent numbers (issued): 9226743, 20150164498, 20150150594, 20110040339. Arthrex, SLACK Incorporated. Publishing royalties. Arthrex and JRF Ortho. Consultant fees. J.P.B. receives support from Arthrex. IP royalties. G.M. receives support from Arthrex. Other financial or material support. R.F.L. receives support from Arthrex; Smith & Nephew; Ossur; Health East, Norway; NIH R-13 grant for biologics. Institution provided support by Arthrex, Ossur, Siemens, Smith & Nephew. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received September 19, 2017; accepted March 2, 2018.

Address correspondence to Robert F. LaPrade, M.D., Ph.D., The Steadman Clinic, 181 W Meadow Dr, Ste 400, Vail, CO 81657, U.S.A. E-mail: drlaprade@sprivail.org

0749-8063/171132/$36.00

https://doi.org/10.1016/j.arthro.2018.03.018

Football players have a high risk of ACL injury because of the contact and pivoting nature of the sport, and the ACL injury rate has been found to be up to 10 times higher during competitive games than during practice.[6]

Persistent rotational knee instability has been reported in up to 25% of patients after anterior cruciate ligament reconstruction (ACLR), which can potentially affect athletic performance. ACL tears often result in an extended period away from sport, extensive rehabilitation, and anxiety about future performance and ultimately may lead to decreased performance.[7,8] Previous studies in NFL players have reported that the return-to-play rate after an ACLR ranges from 63% to 92%.[9] However, return to sports has been shown to depend on player position,[9-12] with quarterbacks having the highest return-to-play rates.[11]

The findings of studies on performance after return to play are inconsistent, with some reporting that most players return to their previous level of participation[10,11,13] but others reporting that, despite a high rate of return to play, the rate of return to the same competitive level was lower.[12,14] Literature on the effect of ACLR on draft status and the initial performance of NFL players participating in the NFL Combine is lacking. Therefore, the purpose of this study was to evaluate whether players with a history of an ACLR before the NFL Combine played or started fewer games and/or participated in fewer eligible snaps compared with NFL Combine participants without a history of knee injury or surgery. We hypothesized that players with a previous ACLR would start and play fewer games and participate in fewer eligible plays (lower percentage of snaps) in the first 2 seasons in the NFL than those without a previous knee injury.

Methods

Study Design

Our institution's institutional review board (Vail Health Hospital) and the NFL Physicians Society Research Committee approved this study. We completed a retrospective review of all players who participated in the NFL Combine between 2009 and 2015 and underwent a previous ACLR to identify those eligible for study inclusion. This was performed by an iterative process analyzing each player's existing medical records, surgical history, and presence of surgical knee incisions and reviewing prior operative reports. Operative reports were used to identify patients who underwent prior ACLR. Once these players were identified, they underwent magnetic resonance imaging to evaluate graft status, meniscal injury, and chondral damage grading. This magnetic resonance imaging scan was performed at the NFL Combine in the presence of a prior knee operation.

Selection of Cases

The inclusion criteria were any prospective NFL player who was examined at the NFL Combine between 2009 and 2015 with a previous isolated primary ACLR or primary ACL—medial collateral ligament (MCL) injury in which the ACL was reconstructed and the MCL injury was managed nonoperatively. Players had to have played in the NFL for at least 2 seasons after NFL Combine participation to be included. Players were excluded if they did not have a previous ACLR; if they underwent a prior meniscectomy; if they had a contralateral knee injury, multiple knee ligament injuries (other than MCL injuries managed nonoperatively), or concomitant meniscal root tears; or if they did not play in the NFL for at least 2 years after NFL Combine participation. Figure 1 shows a flowchart of player inclusion and exclusion. Two years' playing experience was used to eliminate the confounder of players not playing in their first season because of inexperience, more qualified players in their position, and/or injuries during preseason training camps. Furthermore, we aimed to show that players with ACL injuries could have an inferior performance compared with uninjured players during their early NFL careers, and we believed 1 season would not be sufficient and could introduce selection bias. In addition, the data would not show the effect of the injury on actual NFL play, and instead, the data would just reflect a bias toward players unable to make the team more so than players potentially affected by injury.

Control Group

To analyze play during the initial NFL career, players participating in the NFL Combine from 2009 to 2015 with isolated ACLR were compared with matched controls described previously.[15] The control group was built from players who participated in the NFL Combine from 2009 to 2015 based on the following set of criteria: (1) players with no knee injury or surgery before the NFL Combine, (2) players with no significant missed time before the NFL ($\leq$2 total missed games in college), (3) players drafted in the respective NFL Draft after the NFL Combine, and (4) players who played for a minimum of 2 years in the NFL after NFL Combine participation. The eligible players (n = 300) were then matched to players with a previous ACLR by position, specifically, offensive lineman, quarterback, running back, wide receiver, tight end, defensive lineman, linebacker, and defensive back. This ultimately yielded a control group that consisted of 40 players for each position, except for quarterback and tight end, which were limited to 33 and 27 players, respectively, because of the narrow criteria and the lower overall number of players in each position. This matching of control players by position allowed us to eliminate variability among the different positions in terms of the unique

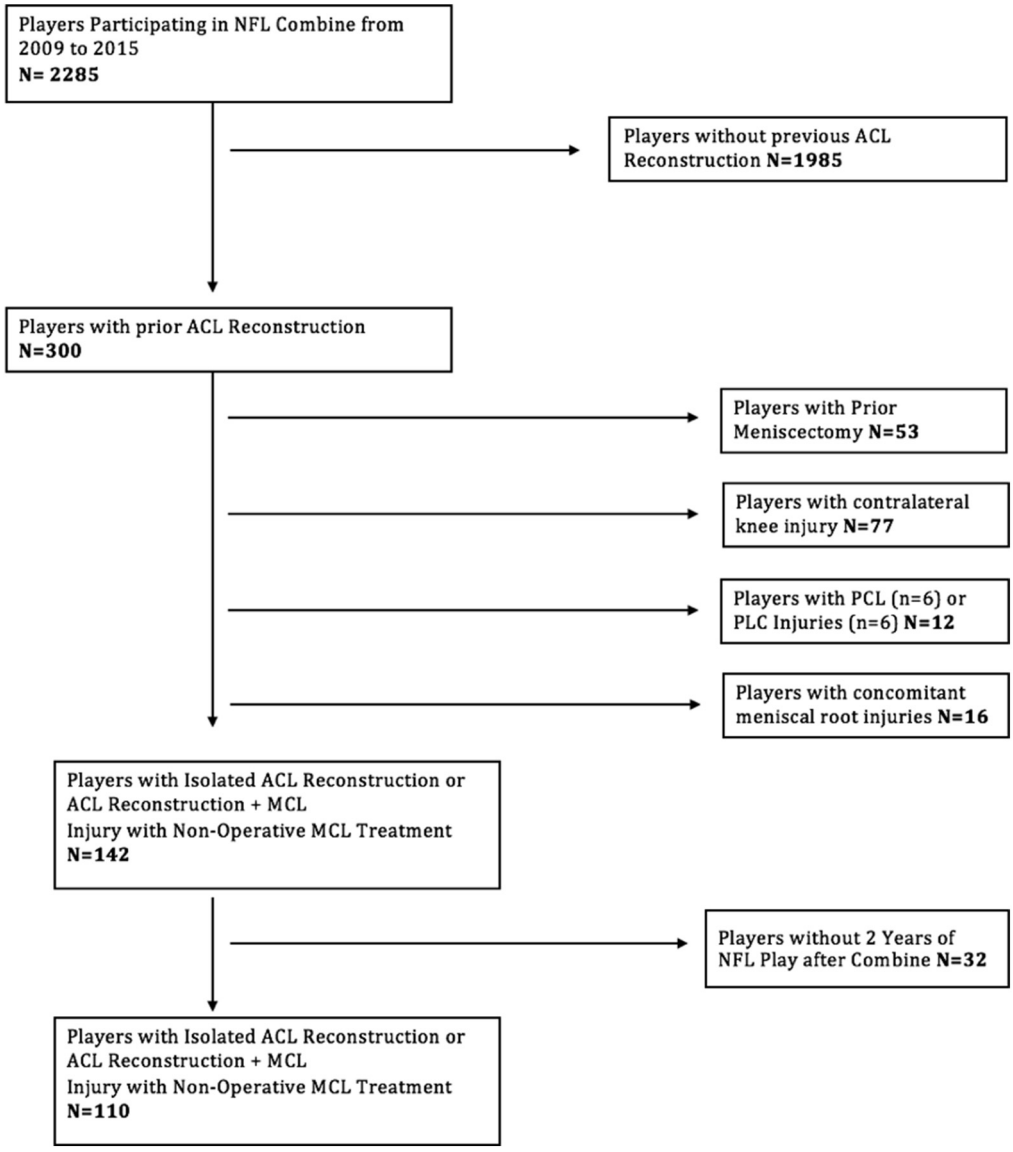

Fig 1. Flowchart showing distribution of patients included in final analysis or excluded. (ACL, anterior cruciate ligament; MCL, medial collateral ligament; NFL, National Football League; PCL, posterior cruciate ligament; PLC, posterolateral corner.)

stresses on the ACLR for each position. For both groups—players with a previous ACLR and players in the control group—we collected the number of games missed during collegiate play, position of play, and draft position in the NFL Draft.

Data Collection

The participation of both cases and controls was evaluated by analysis of draft position, number of games played and games started, and snap percentage, defined as the total number of plays a player participated in out of the total number of plays the player was eligible to participate in over the course of a season during the first 2 NFL seasons. The number of games played and games started during the first 2 seasons of play was obtained from stats.com (STATS, Northbrook, IL), whereas the snap percentage for each of the first 2 seasons of play is a standardized statistic that was collected using profootballfocus.com (Pro Football Focus, Cincinnati, OH) as previously reported.[9]

Concomitant Injuries

At the NFL Combine, the medical staff of all 32 NFL teams performed all musculoskeletal evaluations and 1 comprehensive orthopaedic note was dictated after examination of the athlete by all teams. These notes were reviewed and analyzed for involved structures, concomitant injuries at the time of index surgery, and associated soft-tissue and bony pathology of the knee, by use of previously published methods.[15] Players with chondral injuries were included and compared with control players if they were found to have a full-thickness cartilage defect (Outerbridge grade IV)[16] in

the medial compartment (femoral or tibial) and/or lateral compartment (femoral or tibial) of the knee at the time of initial injury. Similarly, players with meniscal injuries were compared with control players if they were found to have a medial, lateral, or bicompartmental meniscal injury at the time of ACL injury. However, players were excluded from meniscal subanalysis if they underwent a meniscectomy before their ACLR.

Statistical Analysis

Data were first checked for a normal distribution by use of the Kolmogorov-Smirnov test. To compare the participation of players with prior ACLR and the control group, independent *t* tests were used. Data in players with ACL injury and concomitant pathology were also normally distributed and were compared between groups by use of independent *t* tests. Statistical power was determined a priori with an α of .05, showing that 90 players with prior ACL injuries was sufficient to detect an effect size of d = 0.6 with 80% power on independent-sample tests. All graphs and analyses were completed with SPSS Statistical Software (IBM, Armonk, NY).

Results

The database review yielded 2,285 players who participated in the NFL Combine between 2009 and 2015. Of the 2,285 players identified, 300 players (300 knees, 13%) had undergone a prior ACLR. Among this group of 300 players, we excluded 77 because of contralateral knee injury, 53 because of prior meniscectomy, 16 because of ipsilateral meniscal root injury, 12 because of bicruciate or concomitant posterolateral corner injury, and 32 because they did not play 2 seasons in the NFL after NFL Combine participation. The resultant study group was composed of 110 players who had sustained either an isolated ACL injury (n = 76) or a combined ACL-MCL injury (n = 34) in which the MCL injury was treated nonoperatively. A flowchart of patient inclusion and exclusion is displayed in Figure 1. The control group had a mean draft round pick of 2.7 (range, 1-8), with a mean overall draft pick number of 99.3 (range, 1-254), whereas the ACLR group had a mean draft round pick of 3.5 (range, 1-7), with a mean overall draft pick number of 129.5 (range, 1-254). Players with a prior ACLR had a significantly greater mean draft pick number and round than controls ($P = .002$ and $P = .019$, respectively). Detailed demographic data for the ACLR group are displayed in Table 1.

Table 1. Demographic Characteristics of Included Players With Prior ACL Injury at NFL Combine

	NFL Combine Participants With Prior ACL Reconstruction (n = 110)
Mean draft No.	3.5 (range, 1-8)
Mean overall draft pick	129.5 (range, 2-249)
Player position (n = 110), n	
Quarterback	5 (5%)
Running back	18 (16%)
Wide receiver	12 (11%)
Tight end	8 (7%)
Defensive back	14 (13%)
Linebacker	16 (15%)
Defensive lineman	22 (20%)
Offensive lineman	15 (13%)
Ligament injury pattern (n = 110), n	
Isolated ACL	76 of 110 (69%)
ACL plus MCL	34 of 110 (31%)
Concomitant meniscal pathology (84 of 110, 76%), n	
Medial meniscus	11 of 84 (13%)
Lateral meniscus	33 of 84 (39%)
Medial and lateral meniscus	40 of 84 (48%)
Concomitant chondral pathology (62 of 110, 65%), n	
Medial femoral condyle	22 of 62 (35%)
Medial tibial plateau	3 of 62 (5%)
Lateral femoral condyle	30 of 62 (48%)
Lateral tibial plateau	7 of 62 (12%)

ACL, anterior cruciate ligament; MCL, medial collateral ligament; NFL, National Football League.

Number of Games Played and Snap Percentage

Players in the ACLR group started and played significantly fewer games in seasons 1 and 2 (all $P < .001$) than controls. Similarly, players with previous ACLR had a significantly lower snap percentage in both seasons 1 and 2 than control players (both $P < .001$) (Table 2).

Position-by-Position Analysis

Detailed position-by-position analysis is reported in Table 3. Results by position group are outlined in the following sections.

Offensive Skill Position Players (Quarterbacks, Running Backs, Wide Receivers, and Tight Ends). Quarterbacks with prior ACLR (n = 5) started significantly fewer games in season 2 than control quarterbacks ($P = .031$). Running backs with prior ACLR (n = 18) had a significantly lower season 1 snap percentage than controls ($P = .035$). Wide receivers with prior ACLR (n = 12) played in significantly fewer games during season 1 ($P = .015$) and had a significantly lower snap percentage during season 2 ($P = .006$) than controls. There were no significant differences in games played, games started, or snap percentage between tight ends with and without a previous ACLR ($P \geq .175$).

Defensive Skill Position Players (Defensive Backs and Linebackers). Compared with defensive back controls,

Table 2. Cohort-wide Performance Metric Analysis

	Season 1			Season 2		
	Games Started	Games Played	Snap %[9]	Games Started	Games Played	Snap %[9]
ACL reconstruction (n = 110)	2.7	9.2	21.0	5.2	7.4	25.4
Control group (n = 300)	5.4	11.9	44.1	12.6	10.4	49.4
P value	<.001*	<.001*	<.001*	<.001*	.003*	<.001*

NOTE. Mean values are presented.
ACL, anterior cruciate ligament.
*$P < .05$.

defensive backs with a prior ACLR (n = 14) started and played significantly fewer games during season 1 ($P = .039$) and had a significantly lower snap percentage during seasons 1 ($P < .001$) and 2 ($P = .049$). Linebackers with a previous ACLR (n = 16) played significantly fewer games in seasons 1 ($P = .005$) and 2 ($P = .020$) and had a significantly lower snap percentage in seasons 1 ($P = .003$) and 2 ($P = .046$) than linebacker controls.

Lineman Position Players (Defensive Linemen and Offensive Linemen). Compared with controls, defensive linemen with a prior ACLR (n = 14) started and played significantly fewer games in seasons 1 ($P = .001$) and 2 ($P = .019$) and had a significantly lower snap percentage in seasons 1 ($P = .022$) and 2 ($P < .001$). Offensive linemen had significantly lower season 1 and season 2 snap percentages than offensive linemen controls (both $P < .001$).

Table 3. Performance Analysis in Seasons 1 and 2 by Position

	Games Played in Season 1	Games Started in Season 1	Games Played in Season 2	Games Started in Season 2	Season 1 Snap %	Season 2 Snap %
Quarterbacks						
With prior ACLR (n = 5)	4.2	1.2	10.5	1.5	15.6	12.7
Without prior ACLR (n = 33)	5.9	4.2	8.5	7.3	37.3	23.1
P value	.512	.072	.950	.031*	.206	.073
Running backs						
With prior ACLR (n = 18)	9.6	2.7	11.4	6.4	13.8	20.0
Without prior ACLR (n = 40)	11.5	2.9	11.1	3.6	25.6	27.1
P value	.260	.868	.878	.191	.035*	.325
Wide receivers						
With prior ACLR (n = 12)	7.8	3.1	8.6	4.7	44.9	28.1
Without prior ACLR (n = 40)	13.3	4.6	13.3	8.2	47.5	58.5
P value	.015*	.431	.090	.183	.937	.006*
Tight ends						
With prior ACLR (n = 8)	11.6	4.4	9.9	5.1	30.6	33.5
Without prior ACLR (n = 27)	11.6	4.4	12.8	5.5	32.4	69.2
P value	.999	.999	.175	.902	.871	.805
Defensive backs						
With prior ACLR (n = 14)	9.7	1.5	13.9	6.6	8.4	39.1
Without prior ACLR (n = 40)	13.5	7.4	12.8	7.2	60.3	60.0
P value	.039*	.001*	.307	.801	<.001*	.049*
Linebackers						
With prior ACLR (n = 16)	9.4	4.3	9.1	5.9	11.4	18.5
Without prior ACLR (n = 40)	13.7	6.9	13.8	8.8	45.9	47.8
P value	.005*	.153	.020*	.197	.003*	.046*
Defensive linemen						
With prior ACLR (n = 22)	9.9	1.5	10.5	3.7	29.4	24.2
Without prior ACLR (n = 40)	14.1	5.1	13.7	8.2	41.8	51.2
P value	.001*	.002*	.019*	.011*	.022*	<.001*
Offensive linemen						
With prior ACLR (n = 15)	8.5	3.9	8.9	5.9	11.4	18.6
Without prior ACLR (n = 40)	10.0	7.3	11.6	8.9	54.5	63.9
P value	.556	.173	.211	.254	<.001*	<.001*

NOTE. Mean values are presented.
ACLR, anterior cruciate ligament reconstruction.
*$P < .05$.

Table 4. Summary of Performance Metrics Organized by Injury Pattern

	Games Played in Season 1	Games Started in Season 1	Games Played in Season 2	Games Started in Season 2	Season 1 Snap %	Season 2 Snap %
Control group (n = 300), mean	11.9	5.4	12.6	7.4	44.1	49.4
Isolated ACL injury (n = 19)						
Mean	9.0	2.1	8.9	2.4	16.4	22.2
P value†	.051	.005*	.094	.002*	<.001*	<.001*
ACL injury with meniscal injury (n = 55)						
Mean	10.0	3.3	11.1	6.3	21.9	32.5
P value†	.022*	.008*	.054	.278	<.001*	<.001*
ACL injury with chondral lesion (n = 6)						
Mean	10.2	6.6	11.4	6.2	6.4	9.9
P value†	.482	.746	.969	.603	<.001*	.001*
ACL injury with meniscal and chondral injury (n = 30)						
Mean	7.6	1.5	9.5	4.4	26.4	18.3
P value†	.002*	<.001*	.027*	.038*	.223	<.001*

ACL, anterior cruciate ligament.
*$P < .05$.
†*P* value for comparison with players in control group.

Effect of Concomitant Meniscal or Chondral Injury

Players who underwent a prior ACLR were divided into the following groups for further analysis: (1) isolated ACL injury, (2) ACL injury with isolated meniscal injury, (3) ACL injury with isolated chondral injury, and (4) ACL injury with meniscal and chondral injury. Players with isolated ACL injuries (n = 19) started significantly fewer games in seasons 1 and 2 than control players ($P = .005$ and $P = .002$, respectively). These players also had significantly lower snap percentages in seasons 1 and 2 than control players (both $P < .001$).

Players with an ACL injury and isolated meniscal injury (n = 55) started and played significantly fewer games during season 1 ($P = .008$ and $P = .022$, respectively) and had a significantly lower snap percentage in seasons 1 and 2 (both $P < .001$) than controls. Players with an ACL injury and isolated chondral injury (n = 6) had a significantly lower snap percentage in seasons 1 and 2 than controls ($P < .001$). Players with ACL injuries and combined meniscal-chondral injuries (n = 30) played and started significantly fewer games in seasons 1 and 2 (all $P < .038$) and had a significantly lower snap percentage during season 2 ($P < .001$) than control players. There were no significant differences between the groups with ACL plus meniscal injuries, ACL plus chondral injuries, and ACL plus combined meniscal-chondral injuries with respect to games started, games played, and snap percentage (all $P > .05$). Mean participation metrics and a summary of the injury-stratified analysis are reported in Table 4.

Discussion

The most important findings of this study were that players presenting to the NFL Combine with a history of an ACLR had a significantly lower number of games started, number of games played, and snap percentage in the first 2 seasons when compared with uninjured controls. Specifically, defensive linemen, defensive backs, and linebackers were the 3 most affected positions. Players with prior ACLR and concomitant meniscal or chondral lesions at the time of initial injury had significantly lower season 1 and season 2 snap percentages than control players. Finally, players with ACL injuries and combined meniscal-chondral injuries played and started significantly fewer games in seasons 1 and 2 and had a significantly lower snap percentage during season 2 than control players.

The number of athletes with a previous ACLR (13%) found in the NFL Combine over the study period (2009 to 2015) was slightly higher than previous findings by Brophy et al.,[4] who reported that up to 8% of all participants at the NFL Combine had a history of ACL injury. Furthermore, Brophy et al.[4] suggested that a history of an isolated partial meniscectomy, and not a history of ACLR, significantly shortened the average length of an NFL career. When evaluating functional performance in 98 NFL-caliber athletes at the NFL Combine, Keller et al. reported that equivalent levels of athletic performance could be achieved after ACLR when compared with matched controls.[17] Although our study does not evaluate performance, the findings indicate that players with a history of an ACLR at the NFL Combine start and play fewer games, in addition to participating in fewer eligible plays, compared with players without a history of knee injury or surgery.

The positions most affected by a prior ACLR in our study were defensive backs, linebackers, and defensive linemen. Historically, NFL linemen have had a lower overall return-to-sport rate after ACLR than other positions. However, recent evidence has shown that although linemen have a lower return-to-sport rate, they are able to return to a high level of participation when these players are able to return to playing in the NFL.[9] In contrast, running backs and wide receivers

have been reported to take longer to return to sport and, on their return, to have a decline in participation. In our study, both running backs and wide receivers had a reduction in play volume compared with controls, which may contribute to the inferior running back and wide receiver performance after ACLR reported in the literature.

The reasons for poorer participation after an ACLR are probably multifactorial. These can include functional limitations after an ACLR, including effusion with activity, lack of full return of strength and agility, and decreased motion. We recommend that further studies dig deeper into the etiology of poor performance after an ACLR in NFL players.

Limitations

We acknowledge some limitations in this study including the restraints associated with the retrospective design and the potential for inaccuracies in diagnosing and/or reporting ACLR at the NFL Combine. Regarding the diagnosis, different physicians evaluated the players and no objective measure was used to quantify residual anterior tibial laxity. Furthermore, this study did not differentiate between surgical techniques, grafts, or rehabilitation protocols used. Moreover, the time from ACLR to the NFL Combine was not consistently recorded, so this relation could not be calculated. However, this series constitutes important information for players and teams to take into account for the anticipated overall participation of players after an ACLR (stratified by position) compared with uninjured controls. In addition, stratifying the cases by various injury patterns reduced the sample sizes. Even though statistically significant differences were present between the ACLR group and control group, the minimal clinically important differences for the outcome parameters used in this study are unknown.

Conclusions

Athletes at the NFL Combine who previously underwent an ACLR had significantly lower early-career NFL player metrics, including fewer games started, fewer games played, and a lower snap percentage, than uninjured controls. Defensive linemen, defensive backs, and linebackers were the 3 most affected positions. Players with a prior ACLR and combined meniscal-chondral pathology had significantly lower numbers of games started and games played in seasons 1 and 2 and a significantly lower season 2 snap percentage.

References

1. Dodson CC, Secrist ES, Bhat SB, Woods DP, Deluca PF. Anterior cruciate ligament injuries in National Football League athletes from 2010 to 2013: A descriptive epidemiology study. *Orthop J Sports Med* 2016;4:2325967116631949.
2. Barrera Oro F, Sikka RS, Wolters B, et al. Autograft versus allograft: An economic cost comparison of anterior cruciate ligament reconstruction. *Arthroscopy* 2011;27:1219-1225.
3. Prodromos CC, Han Y, Rogowski J, Joyce B, Shi K. A meta-analysis of the incidence of anterior cruciate ligament tears as a function of gender, sport, and a knee injury-reduction regimen. *Arthroscopy* 2007;23:1320-1325.e6.
4. Brophy RH, Gill CS, Lyman S, Barnes RP, Rodeo SA, Warren RF. Effect of anterior cruciate ligament reconstruction and meniscectomy on length of career in National Football League athletes: A case control study. *Am J Sports Med* 2009;37:2102-2107.
5. 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.
6. Dragoo JL, Braun HJ, Durham JL, Chen MR, Harris AH. Incidence and risk factors for injuries to the anterior cruciate ligament in National Collegiate Athletic Association football: Data from the 2004-2005 through 2008-2009 National Collegiate Athletic Association Injury Surveillance System. *Am J Sports Med* 2012;40:990-995.
7. Kvist J, Ek A, Sporrstedt K, Good L. Fear of re-injury: A hindrance for returning to sports after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2005;13:393-397.
8. Morrey MA, Stuart MJ, Smith AM, Wiese-Bjornstal DM. A longitudinal examination of athletes' emotional and cognitive responses to anterior cruciate ligament injury. *Clin J Sport Med* 1999;9:63-69.
9. Cinque ME, Hannon CP, Bohl DD, et al. Return to sport and performance after anterior cruciate ligament reconstruction in National Football League linemen. *Orthop J Sports Med* 2017;5:2325967117711681.
10. Carey JL, Huffman GR, Parekh SG, Sennett BJ. Outcomes of anterior cruciate ligament injuries to running backs and wide receivers in the National Football League. *Am J Sports Med* 2006;34:1911-1917.
11. Erickson BJ, Harris JD, Heninger JR, et al. Performance and return-to-sport after ACL reconstruction in NFL quarterbacks. *Orthopedics* 2014;37:e728-e734.
12. Eisenstein ED, Rawicki NL, Rensing NJ, Kusnezov NA, Lanzi JT. Variables affecting return to play after anterior cruciate ligament injury in the National Football League. *Orthop J Sports Med* 2016;4:2325967116670117.
13. McCullough KA, Phelps KD, Spindler KP, et al. Return to high school- and college-level football after anterior cruciate ligament reconstruction: A Multicenter Orthopaedic Outcomes Network (MOON) cohort study. *Am J Sports Med* 2012;40:2523-2529.
14. Shah VM, Andrews JR, Fleisig GS, McMichael CS, Lemak LJ. Return to play after anterior cruciate ligament

reconstruction in National Football League athletes. *Am J Sports Med* 2010;38:2233-2239.
15. McHale KJ, Vopat BG, Beaulieu-Jones BR, et al. Epidemiology and outcomes of Lisfranc injuries identified at the National Football League Scouting Combine. *Am J Sports Med* 2017;45:1901-1908.
16. Borchers JR, Kaeding CC, Pedroza AD, Huston LJ, Spindler KP, Wright RW. Intra-articular findings in primary and revision anterior cruciate ligament reconstruction surgery: A comparison of the MOON and MARS study groups. *Am J Sports Med* 2011;39:1889-1893.
17. Keller RA, Mehran N, Austin W, Marshall NE, Bastin K, Moutzouros V. Athletic performance at the NFL scouting combine after anterior cruciate ligament reconstruction. *Am J Sports Med* 2015;43:3022-3026.