Rates And Determinants Of Return To Play After Anterior Cruciate Ligament Reconstruction In National Collegiate Athletic Association Division I Soccer Athletes

By: **Jennifer S. Howard, PhD, ATC**, Mark L. Lembach, MD, Adam V. Metzler, MD, and Darren L. Johnson, MD

Abstract

Purpose: To evaluate return to play among collegiate female soccer players, specifically examining the effect of surgical and individual athlete characteristics on the return-to-play rate. Sports medicine and athletic training staff at institutions from the National Collegiate Athletic Association Southeastern Conference (SEC) were contacted to request participation in the study. All institutions were sent a standardized spreadsheet with response choices and instructions regarding athlete inclusion criteria. Athlete, injury, surgical technique, and return-to-play data were requested for ACL reconstructions performed on female soccer athletes at the participating institutions over the previous 8 years. x2 analyses were used to compare the return-to-play rate by year in school, scholarship status, position, depth chart status, procedure, graft type, graft fixation, concomitant procedures, and previous ACL injuries. All 14 of the SEC institutions chose to participate and provided data. A total of 80 ACL injuries were reported, with 79 surgical reconstructions and return-to-play data for 78 collegiate soccer athletes. The overall return-to-play rate was 85%. There was a statistical significance in return-to-play rates favoring athletes in earlier years of eligibility versus later years (P \ .001). Ath- letes in eligibility years 4 and 5 combined had a return-to-play rate of only 40%. Scholarship status likewise showed significance (P \ .001), demonstrating a higher return-to-play rate for scholarship athletes (91%) versus nonscholarship athletes (46%). No significant differences in return-to-play rates were observed based on surgical factors, including concomitant knee procedures, graft type, and graft fixation method. Conclusion: Collegiate female soccer athletes have a high initial return-to-play rate. Undergoing ACL reconstruction earlier in the college career as well as the presence of a scholarship had a positive effect on return to play. Surgical factors including graft type, fixation method, tunnel placement technique, concomitant knee surgeries, and revision status demonstrated no significant effect on the return-to-play rate.

Howard, J. S., et al. (2015). "Rates and Determinants of Return to Play After Anterior Cruciate Ligament Reconstruction in National Collegiate Athletic Association Division I Soccer Athletes: A Study of the Southeastern Conference." The American Journal of Sports Medicine 44(2): 433-439. https://doi.org/10.1177/0363546515614315. Publisher version of record available at: http://journals.sagepub.com/doi/full/10.1177/0363546515614315

Rates and Determinants of Return to Play After Anterior Cruciate Ligament Reconstruction in National Collegiate Athletic Association Division I Soccer Athletes

A Study of the Southeastern Conference

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Background: Factors and details regarding return to play in elite, collegiate female soccer athletes after an anterior cruciate ligament (ACL) injury and reconstruction have not been well studied.

Purpose: To evaluate return to play among collegiate female soccer players, specifically examining the effect of surgical and individual athlete characteristics on the return-to-play rate.

Study Design: Descriptive epidemiology study.

Methods: Sports medicine and athletic training staff at institutions from the National Collegiate Athletic Association Southeastern Conference (SEC) were contacted to request participation in the study. All institutions were sent a standardized spreadsheet with response choices and instructions regarding athlete inclusion criteria. Athlete, injury, surgical technique, and return-to-play data were requested for ACL reconstructions performed on female soccer athletes at the participating institutions over the previous 8 years. χ^2 analyses were used to compare the return-to-play rate by year in school, scholarship status, position, depth chart status, procedure, graft type, graft fixation, concomitant procedures, and previous ACL injuries.

Results: All 14 of the SEC institutions chose to participate and provided data. A total of 80 ACL injuries were reported, with 79 surgical reconstructions and return-to-play data for 78 collegiate soccer athletes. The overall return-to-play rate was 85%. There was a statistical significance in return-to-play rates favoring athletes in earlier years of eligibility versus later years ($P < .001$). Athletes in eligibility years 4 and 5 combined had a return-to-play rate of only 40%. Scholarship status likewise showed significance ($P < .001$), demonstrating a higher return-to-play rate for scholarship athletes (91%) versus nonscholarship athletes (46%). No significant differences in return-to-play rates were observed based on surgical factors, including concomitant knee procedures, graft type, and graft fixation method.

Conclusion: Collegiate female soccer athletes have a high initial return-to-play rate. Undergoing ACL reconstruction earlier in the college career as well as the presence of a scholarship had a positive effect on return to play. Surgical factors including graft type, fixation method, tunnel placement technique, concomitant knee surgeries, and revision status demonstrated no significant effect on the return-to-play rate.

Keywords: anterior cruciate ligament; return to play; female athlete

An anterior cruciate ligament (ACL) tear is one of the most common injuries seen by orthopaedic surgeons. Reports indicate that approximately 130,000 ACL reconstructions are performed each year in the United States.[21] Evidence indicates that female athletes participating in high-level athletics represent a high-risk group for ACL injuries. The National Collegiate Athletic Association (NCAA) Injury Surveillance System (1990-2002) found that the rate of ACL injuries, regardless of the mechanism of injury, was significantly higher in female collegiate athletes than male athletes for both soccer and basketball.[34] Furthermore, the ACL tear rate in female athletes ranges between 2.4 and 9.7 times greater than that of male

athletes competing in similar sports.[10] Specifically, soccer represents one of the sports in which female athletes are at the highest risk for ACL injuries, with female soccer players experiencing ACL injuries at a rate of approximately 3 times that of their male counterparts.[1,9,18,27,30]

For competitive athletes, return-to-play and return-to-preinjury levels of performance are typically the main goals of surgery. Although outcomes of ACL surgery are well studied, factors influencing return to play in elite collegiate soccer players have not been thoroughly evaluated. Reports regarding return to play after ACL reconstruction show a wide range of values. A recent meta-analysis of return to play after ACL reconstruction reported return-to-play rates ranging from 22% to 100%.[8] Much of the variability in return-to-play rates may be because of a lack of standardization in the definition of "return to play" and the pooling of patients who participated in varying levels of competition before the injury. Limited research exists regarding sport-specific return-to-play rates among high-level athletes, excluding those involved in athletics only at a recreational or leisure level. Among professional athletes in the National Football League, a return-to-play rate of 63% has been reported.[32] Similar return-to-play rates have been reported among soccer athletes at multiple skill levels (72%)[11] and high school (63%) and collegiate (69%) football players.[26] However, only 43% of players felt that they returned to football at the same level as they were before the injury.[26] These findings suggest that return-to-play rates may be dependent on the level of competition and sport being examined.

Recent literature has proposed that return to play after ACL reconstruction may be strongly influenced by psychological factors, such as "not trusting the knee" or "fear of a near injury."[5,7] It is likely that athletes competing at the highest levels of collegiate athletics will have greater access to resources to address these factors and enhance psychological readiness to return to sport, resulting in a higher return-to-play rate than may be observed at lower levels of athletics. Furthermore, athletes with strong sports networks from which they obtain their identity may be more likely to accept the risks associated with returning to play.[29] Additionally, those competing at the collegiate level may be predisposed to higher levels of commitment, willingness, and interest in returning to sport. These characteristics have previously been observed to be greater among those who ultimately return to sport after ACL reconstruction.[16] Finally, individual factors such as having multiple years of eligibility remaining and having an athletic scholarship may provide external motivation for returning to sport. These factors may combine to result in a higher than typical return-to-play rate among collegiate soccer players, particularly those on scholarship with multiple years of eligibility remaining.

The primary aim of this study was to determine the return-to-play rate after ACL reconstruction surgery among NCAA Southeastern Conference (SEC) female soccer athletes. Additionally, we examined the effect of athlete and surgical technique–related factors on return to play. It was anticipated that in this specific population, the return-to-play rate after ACL reconstruction would be within the upper end of ranges reported in previously published results and that it would be independent of graft type utilized or surgical technique employed but would be influenced by individual athlete characteristics and contextual factors such as year in school or scholarship status.

METHODS

Participants

Team physicians and athletic training staff at the 14 NCAA SEC institutions participating in women's soccer in 2012 were contacted to provide data in regard to female soccer athletes who had sustained an ACL injury over the previous 8 years. They were asked to provide information only for athletes who had completed eligibility or who were no longer participating in soccer at the institution where the athlete's ACL surgery was performed. Before study initiation, approval was received by the University of Kentucky Institutional Review Board (IRB). Per IRB regulations, any identifying information was removed from data upon receipt.

Data Collection

A standardized letter requesting participation in the study was sent via email to the women's soccer athletic training staff and head team physicians of SEC collegiate institutions. Instructions were provided regarding the nature and purpose of the study and that participation was strictly voluntary. A standardized spreadsheet with standardized response choices was included with the letter for the purpose of collecting athlete preinjury demographic information, technical and surgical variables, and post-injury return-to-play information. Athlete preinjury data requested included age, date of injury, year of eligibility, playing position, depth chart status, scholarship status, date of injury, previous ACL reconstructions, and participation in an ACL injury prevention program (see the Appendix, available online at http://ajsm.sagepub.com/supplemental). Technical and surgical data requested included

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Presented at the 40th annual meeting of the AOSSM, Seattle, Washington, July 2014.
The authors declared that they have no conflicts of interest in the authorship and publication of this contribution.

date of surgery, ACL reconstruction technique, graft utilized, femoral and tibial graft fixation used, and concomitant surgical procedures performed.

Athlete postinjury data requested included ability to return to play, date of clearance to practice, date of unrestricted return to play, playing position, depth chart status, ability to play through eligibility, graduation status, and ability to play at some level after collegiate career, if known. Data were requested for any ACL injuries occurring between 2005 and 2012 for which the involved player was no longer an active member of the soccer team. Return to play was defined as the ability to return to collegiate soccer competition.

Statistical Analysis

All injury information from all participating institutions was compiled into a single spreadsheet for analysis using IBM SPSS Statistics (v 20; IBM Corp). Descriptive frequencies or medians and ranges were calculated for documented variables. χ^2 tests for independence were used to compare the return-to-play rate by year in school, scholarship status, depth chart status, procedure, graft type, graft fixation, concomitant procedures, and previous ACL injuries. An a priori α level was set as $P \leq .05$. For those variables with more than 2 categories, post hoc z tests were used to identify proportional differences between categories. To protect against multiple comparisons, z test results were only considered if χ^2 test results were significant.

RESULTS

All 14 SEC institutions chose to participate and provided athlete data. No formal records were kept of who provided the requested information, but responders included both athletic trainers and team physicians. A total of 80 ACL injuries were reported, with 79 ACL reconstructions performed and return-to-play data available for 78 female soccer athletes. The median age of injured athletes was 19.3 years (range, 17-22 years). A history of ACL reconstruction on either knee was reported for 24 athletes. Overall, 85% (n = 66) of athletes returned to play after undergoing ACL reconstruction, and 73% of athletes played through their remaining collegiate eligibility, while 75% returned to the same or a higher position on the depth chart. Twenty-three athletes (32% of the 71 athletes for whom these data were reported) were reported to have continued soccer participation on some level (recreational, semiprofessional, or professional) after college. The median time for clearance to return to practice was 5.5 months (range, 3.8-12.7 months), and the median time for clearance to return to unrestricted game play was 6.1 months (range, 3.9-33.2 months). The frequency of ACL injuries and reconstructions decreased with increasing year of eligibility, with 31 ACL injuries in the first year, 20 in the second year, 19 in the third year, 9 in the fourth year, and 1 in the fifth year.

Athlete preinjury characteristics and return-to-play rates are summarized in Table 1. The return-to-play rate varied significantly based on year of eligibility ($P < .001$).

TABLE 1
Preinjury Characteristics and Return-to-Play Rates in Collegiate Female Soccer Players[a]

ACL Reconstructions (n = 78)	n	Returned to Play, n (%)	*P*
Eligibility			<.001
Year 1	30	28 (93)	
Year 2	20	18 (90)	
Year 3	18	16 (89)	
Years 4 and 5	10[a]	4 (40)[b]	
Scholarship status			<.001
Yes	67	61 (91)	
Year 1	26	25 (96)	
Year 2	18	18 (100)	
Year 3	15	14 (93)	
Years 4 and 5	8	4 (50)	
No	11	5 (46)[b]	
Year 1	4	3 (75)	
Year 2	2	0 (0)	
Year 3	3	2 (67)	
Years 4 and 5	2	0 (0)	
Depth chart status			.11
Starter	38	34 (90)	
Utility/utilized	20	18 (90)	
Rarely played	20	14 (70)	
Participation in a knee injury prevention program			.09
No	36	27 (75)	
Preseason/off-season only	18	17 (94)	
Continuous	24	22 (92)	

[a]Six of the year 4 and 5 players were injured in October or later in the season, suggesting that they may not have had the opportunity to return to collegiate soccer. All 6 of these players were reported as having not returned to play. ACL, anterior cruciate ligament.
[b]Significantly different from other categories.

However, this significance may be influenced by the availability of the opportunity to return to play as 6 of the 10 injured athletes in years 4 and 5 were injured in October or later in the season and may have exhausted all collegiate eligibility. All 6 of these players were reported as having not returned to play. A significant difference in the return-to-play rate based on scholarship status was observed, with scholarship athletes demonstrating a higher return-to-play rate ($P < .001$). The return-to-play rate did not differ based on player position, depth chart status, or utilization of a knee injury prevention program. The mean time to return to practice (5.6 $\pm$ 1.5 vs 6.0 $\pm$ 1.8 months, respectively; P = .874) or games (6.5 $\pm$ 1.2 vs 7.8 $\pm$ 4.6 months, respectively; P = .396) was not significantly different between those who did and did not return to play. No surgical factors were observed to have a significant effect on the return-to-play rate. Surgical and technical factors with regard to return-to-play rates are summarized in Table 2.

DISCUSSION

The purpose of this study was to describe the return-to-play rate among high-level female soccer athletes and

TABLE 2
Surgical and Technical Characteristics and Return-to-Play Rates in Collegiate Female Soccer Players[a]

ACL Reconstructions (n = 78)	n	Returned to Play, n (%)	*P*
Previous ACL reconstruction[b]			.499
Yes	22	17 (77)	
No	55	48 (87)	
Graft type			.314[c]
Autograft	66	58 (88)	
Patellar tendon	52	47 (90)	
Hamstring tendon	13	10 (77)	
Quadriceps tendon	1	1 (100)	
Allograft	8	6 (75)	
Patellar tendon	1	1 (100)	
Tibialis anterior tendon	2	2 (100)	
Achilles tendon	3	3 (100)	
Peroneal tendon	1	0 (0)	
Hamstring tendon	1	0 (0)	
Mixed hamstring autograft/allograft	2	1 (50)	
Unknown	2	1 (50)	
Femoral tunnel technique			.725
Transtibial	35	30 (86)	
Accessory anteromedial portal	19	15 (79)	
Outside-in, 2-incision	13	11 (85)	
Flip cutter	4	3 (75)	
Unknown	7	7 (100)	
Tibial fixation			.784[d]
Cross pin	2	2 (100)	
Interference screw (bioabsorbable)	46	37 (80)	
Interference screw (metal)	4	2 (50)	
Post/screw	11	9 (82)	
Staple	3	2 (67)	
Suspensory button (ie, Endobutton)	2	0 (0)	
Unknown	10	8 (80)	
Femoral fixation			.053
Cross pin	6	5 (83)	
Interference screw (bioabsorbable)	35	33 (94)	
Interference screw (metal)	11	10 (91)	
Post/screw	3	2 (67)	
Suspensory button (ie, endobutton)	9	5 (56)	
Unknown	14	12 (86)	
Concomitant procedures			.192[e]
Yes	54	48 (89)	
Meniscal involvement	49	43 (88)	.457[e]
No	22	17 (77)	
Unknown	2	1 (50)	

[a]ACL, anterior cruciate ligament.
[b]Not reported for 1 athlete.
[c]Comparison between autograft versus allograft.
[d]Comparison between interference screws versus other tibial fixation techniques.
[e]Comparisons between concomitant procedure versus no concomitant procedure and meniscal involvement versus no meniscal involvement.

identify what factors may influence return to play. Overall, a high return-to-play rate was observed among SEC female soccer players, with most able to return to the same depth chart position or higher after an injury. After surgical reconstruction, the majority of players were able to resume soccer at around the 6-month time point. Return-to-play rates were higher for players in their earlier years of eligibility (years 1-3) as well as scholarship athletes. Among this sample, return to play did not differ based on surgical factors such as graft selection, femoral tunnel drilling method, graft fixation, or concomitant knee procedures. These findings suggest that pre-existing personal factors regarding individual skill level and scholastic standing may be stronger determinants of return to play than surgical or other physical factors.

While the 85% return-to-play rate observed in the present investigation is consistent with other high-level soccer and football data,[12,20,36] this value is substantially higher than much of what has been reported in the literature for return to competitive sport. In a systematic review, Ardern et al[8] examined postoperative return-to-sport outcomes after ACL reconstruction for 5570 athletes from 48 studies with a mean follow-up of 41.5 months; this review reported that 82% of athletes returned to some kind of sport participation. However, among those athletes who returned, only 63% returned to their preinjury level of participation, and the overall rate of return to competitive sport, specifically, was only 44%.[8] These numbers suggest that in a general population, return-to-sport rates may be much lower than those observed among high-level athletes in which future income, scholarship status, and personal identity may be closely linked to sport participation.

Surgical factors influencing return to play have previously been proposed.[4,16,28] Anteromedial portal femoral tunnel drilling has previously demonstrated a higher return-to-play rate than transtibial drilling for return to soccer participation in male soccer players utilizing a patellar tendon autograft at 2- to 5-year follow-up, with 54% of those with anteromedial portal ACL reconstructions and only 24% of those with transtibial reconstructions returning to competitive soccer.[4] In the present series, there was no difference in return-to-play rates between players undergoing the transtibial technique (86%) or the accessory anteromedial tunnel technique (79%), with both groups demonstrating much higher return-to-play rates than those previously reported. In the previous study, all transtibial procedures were performed in 2004 or before, while anteromedial procedures were performed between 2004 and 2006 because of concerns over anatomic alignment of the transtibial procedure.[4] Therefore, it is difficult to separate the effect of changes in the surgical technique from advances in surgeon experience and rehabilitation practices. In the present study, there were no apparent associations between year of reconstruction and tunnel drilling technique. The differences in the return-to-play rate observed between studies may be caused by differences in the level of the soccer athlete being included ("active male soccer players" aged 16-35 years vs NCAA Division I female soccer players).[4] Additionally, results regarding effects of the surgical technique on return to play from this study should be interpreted with caution. Given the variety of surgical techniques used, there is limited statistical power to identify return-to-play differences, and therefore, these numbers should largely be considered simply descriptive and not definitive findings.

In the current series, no differences in return-to-play rates were observed between the 2 most commonly used grafts: patellar tendon autograft and hamstring autograft. There was no statistically significant difference observed between autografts or allografts as a whole. These findings are consistent with those of other investigations, which have failed to demonstrate an effect for graft choice on return to play.[¶] Notably, a Cochrane review of randomized and quasi-randomized controlled trials with a minimum 2-year follow-up has shown no difference in return to activity between a patellar tendon autograft and hamstring autograft.[28] In contrast, a recent report regarding return to play among NCAA Division I football players observed a higher return-to-play rate among athletes undergoing reconstruction with an autograft compared with those receiving an allograft.[12] Although there appears to be a similar trend in this sample of Division I soccer players, the relatively small sample of patients with allografts (n = 8) limits these values from achieving statistical significance.

Differences in return-to-play rates were observed for scholarship status. This result, suggesting that nonsurgical factors may largely influence return-to-play rates, is similar to that observed for Division I football players among whom differences in return to play were observed based on year in school, scholarship status, and depth chart status.[12] These results demonstrate the important role that psychosocial factors may play in an athlete choosing to return to play. Numerous psychosocial factors, unrelated to physical impairment, have been identified as contributing to the success or failure of an athlete returning to sport. These factors may include changes in lifestyle, occupational demands, loss of motivation or interest, perception of self-efficacy, change in competition level, patient age, individual talent, or fear of reinjury.[6,12,13,15,16,23,26,35] In the present study, those athletes without a scholarship or nearing or at the end of their collegiate careers were less likely to return to sport. In these patients, internal and external pressures and priorities, along with the environmental factor of limited eligibility, may have been insufficient to overcome those psychosocial factors associated with not returning to sport, regardless of their physical outcomes after ACL reconstruction.

In the present study, whether year in school influences return to play or simply the reporting of return-to-play data is unclear. All 6 athletes who were reported to have not returned to play after an ACL injury in year 4 or 5 of eligibility underwent ACL reconstruction on November 13th or later, and none were reported to have utilized a redshirt for the injured season. This timing suggests that these players may have postponed surgery until the conclusion of the soccer season and, as a result, may not have been eligible to return to play at the collegiate level (as evidenced by the fact that all were reported to have played through their eligibility). In contrast, among the 4 athletes who were reported to have returned to play, 3 were reported to have utilized a redshirt. Furthermore, while only 40% of year 4 or 5 players were reported to return to play based on data-reporting sheets, 60% were reported to have participated in either recreational or semiprofessional soccer after graduation. These results suggest that even in this subsample of patients, return-to-play rates for some level of soccer activity may remain relatively high after ACL reconstruction.

The ability of soccer players to continue playing soccer at an elite level long term after an ACL injury is not clear. Among this sample, participation status after college was reported for 71 players, of whom 23 (32%) were reported to have continued playing soccer after college. With a longer term follow-up of 7 years, an investigation of 97 Swedish league female soccer players with an ACL injury showed that just 12% were still involved in competitive soccer at a lower level. However, among this sample, only 50 underwent surgical reconstruction. Regardless of the treatment strategy, none of the elite players continued at the same level at 7-year follow-up.[31] In another study of strictly league-level female Swedish soccer players with 84 respondents, more than 50% were unable to return to competitive soccer, and at 12 years, just 8% still participated in organized soccer.[24] Again, a number of these athletes underwent nonoperative treatment, with only 62% of this group having undergone ACL reconstructive surgery at a mean of 3 years after the injury.[24] Long-term return-to-play rates after ACL injuries are difficult to evaluate based on geographical differences in treatment strategies, poor documentation of comparison groups, and limited control of other confounding factors, such as patient age, skill level, access to participation opportunities, and other life factors. Despite these challenges, it appears that initial return-to-play rates may be high but consistently decline with advancing time after surgery. Future research should examine what, if any, surgical or individual factors may place athletes at risk for early retirement from physical activity, despite an initially successful return to play.

Limitations

The strengths of the current study include that it investigates return to play after ACL reconstruction in a large homogeneous group of elite female soccer athletes over the course of several seasons in one collegiate athletic conference with all member institutions participating. Although this is a large series investigating elite female athletes undergoing ACL reconstruction, it is still a small population with decreased statistical power for subanalyses, particularly for the heterogeneous categories related to the surgical procedure, and therefore, these findings should only be considered descriptive and not definitive. Other weaknesses include the lack of stratification of reasons explaining the inability to return to play such as physical, scholastic, or psychological factors as well as the lack of uniform criteria for return to play. A soccer-specific return-to-sport definition has been suggested for Major League Soccer.[14] This consisted of return to play in a Major League Soccer game after surgery, a definition consistent with the one applied here. A comparison of functional evaluations and outcome instruments with the ability to return

[¶]References 2, 3, 16, 17, 19, 22, 25, 28, 33, 37.

to play, likewise absent in the present study, could potentially be useful in identifying factors both protective and detrimental for return to play and could be a focus of future research. Additionally, the retrospective, cross-sectional nature of this study does not allow for any assessment of long-term ability to play at an elite level or the ability to standardize factors such as postoperative evaluations, rehabilitation protocols, or patient characteristics (body mass index, fitness level, etc). We encourage these factors to be considered in future prospective studies examining return to play. Finally, because of an oversight in the development of the data collection sheet, we failed to have responders clarify which knee, involved or uninvolved, had previously undergone ACL reconstruction.

CONCLUSION

High-level, collegiate female soccer players have a high initial return-to-play rate (85%) after ACL reconstruction. No statistically significant differences in return-to-play rates were observed based on surgical factors or concomitant knee injuries. However, return-to-play rates did vary based on scholastic variables pertinent to the athlete such as year of eligibility and scholarship status. Further investigation and identification of factors that can have a significant effect on the ability to return to athletics at the same level are important to improve care of the ACL-injured athlete.

ACKNOWLEDGMENT

The authors thank the medical staff of all SEC member institutions for their assistance with this study.

REFERENCES

1. Agel J, Arendt EA, Bershadsky B. Anterior cruciate ligament injury in National Collegiate Athletic Association basketball and soccer: a 13-year review. *Am J Sports Med*. 2005;33(4):524-531.
2. Aglietti P, Buzzi R, Zaccherotti G, De Biase P. Patellar tendon versus doubled semitendinosus and gracilis tendons for anterior cruciate ligament reconstruction. *Am J Sports Med*. 1994;22(2):211-218.
3. Aglietti P, Giron F, Buzzi R, Biddau F, Sasso F. Anterior cruciate ligament reconstruction: bone-patellar tendon-bone compared with double semitendinosus and gracilis tendon grafts. A prospective, randomized clinical trial. *J Bone Joint Surg Am*. 2004;86(10):2143-2155.
4. Alentorn-Geli E, Samitier G, Álvarez P, Steinbacher G, Cugat R. Anteromedial portal versus transtibial drilling techniques in ACL reconstruction: a blinded cross-sectional study at two-to five-year follow-up. *Int Orthop*. 2010;34(5):747-754.
5. Ardern CL, Österberg A, Tagesson S, Gauffin H, Webster KE, Kvist J. The impact of psychological readiness to return to sport and recreational activities after anterior cruciate ligament reconstruction. *Br J Sports Med*. 2014;48(22):1613-1619.
6. Ardern CL, Taylor NF, Feller JA, Webster KE. Return-to-sport outcomes at 2 to 7 years after anterior cruciate ligament reconstruction surgery. *Am J Sports Med*. 2012;40(1):41-48.
7. Ardern CL, Taylor NF, Feller JA, Whitehead TS, Webster KE. Psychological responses matter in returning to preinjury level of sport after anterior cruciate ligament reconstruction surgery. *Am J Sports Med*. 2013;41(7):1549-1558.
8. Ardern CL, Webster KE, Taylor NF, Feller JA. Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play. *Br J Sports Med*. 2011;45(7):596-606.
9. Arendt E, Dick R. Knee injury patterns among men and women in collegiate basketball and soccer: NCAA data and review of literature. *Am J Sports Med*. 1995;23(6):694-701.
10. Beynnon BD, Johnson RJ, Abate JA, Fleming BC, Nichols CE. Treatment of anterior cruciate ligament injuries, part I. *Am J Sports Med*. 2005;33(10):1579-1602.
11. Brophy RH, Schmitz L, Wright RW, et al. Return to play and future ACL injury risk after ACL reconstruction in soccer athletes from the Multicenter Orthopaedic Outcomes Network (MOON) group. *Am J Sports Med*. 2012;40(11):2517-2522.
12. Daruwalla JH, Greis PE, Hancock R, ASP Collaborative Group, Xerogeanes JW. Rates and determinants of return to play after anterior cruciate ligament reconstruction in NCAA Division 1 college football athletes: a study of the ACC, SEC, and PAC-12 Conferences. *Orthop J Sports Med*. 2014;2(8):2325967114543901.
13. Dunn WR, Spindler KP. Predictors of activity level 2 years after anterior cruciate ligament reconstruction (ACLR). *Am J Sports Med*. 2010;38(10):2040-2050.
14. Erickson BJ, Harris JD, Cvetanovich GL, et al. Performance and return to sport after anterior cruciate ligament reconstruction in male Major League Soccer players. *Orthop J Sports Med*. 2013;1(2):2325967113497189.
15. Feller J, Webster KE. Return to sport following anterior cruciate ligament reconstruction. *Int Orthop*. 2013;37(2):285-290.
16. Gobbi A, Francisco R. Factors affecting return to sports after anterior cruciate ligament reconstruction with patellar tendon and hamstring graft: a prospective clinical investigation. *Knee Surg Sports Traumatol Arthrosc*. 2006;14(10):1021-1028.
17. Gorschewsky O, Klakow A, Riechert K, Pitzl M, Becker R. Clinical comparison of the tutoplast allograft and autologous patellar tendon (bone–patellar tendon–bone) for the reconstruction of the anterior cruciate ligament: 2- and 6-year results. *Am J Sports Med*. 2005;33(8):1202-1209.
18. Gwinn DE, Wilckens JH, McDevitt ER, Ross G, Kao TC. The relative incidence of anterior cruciate ligament injury in men and women at the United States Naval Academy. *Am J Sports Med*. 2000;28(1):98-102.
19. Harner CD, Olson E, Irrgang JJ, Silverstein S, Fu FH, Silbey M. Allograft versus autograft anterior cruciate ligament reconstruction: 3-to 5-year outcome. *Clin Orthop Relat Res*. 1996;324:134-144.
20. Kamath GV, Murphy T, Creighton RA, Viradia N, Taft TN, Spang JT. Anterior cruciate ligament injury, return to play, and reinjury in the elite collegiate athlete: analysis of an NCAA Division I cohort. *Am J Sports Med*. 2014;42(7):1638-1643.
21. Kim S, Bosque J, Meehan JP, Jamali A, Marder R. Increase in outpatient knee arthroscopy in the United States: a comparison of National Surveys of Ambulatory Surgery, 1996 and 2006. *J Bone Joint Surg Am*. 2011;93(11):994-1000.
22. Krych AJ, Jackson JD, Hoskin TL, Dahm DL. A meta-analysis of patellar tendon autograft versus patellar tendon allograft in anterior cruciate ligament reconstruction. *Arthroscopy*. 2008;24(3):292-298.
23. 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(5):393-397.
24. Lohmander LS, Östenberg A, Englund M, Roos H. High prevalence of knee osteoarthritis, pain, and functional limitations in female soccer players twelve years after anterior cruciate ligament injury. *Arthritis Rheum*. 2004;50(10):3145-3152.
25. Marder RA, Raskind JR, Carroll M. Prospective evaluation of arthroscopically assisted anterior cruciate ligament reconstruction: patellar tendon versus semitendinosus and gracilis tendons. *Am J Sports Med*. 1991;19(5):478-484.
26. 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(11):2523-2529.
27. Mihata LCS, Beutler AI, Boden BP. Comparing the incidence of anterior cruciate ligament injury in collegiate lacrosse, soccer, and basketball players: implications for anterior cruciate ligament mechanism and prevention. *Am J Sports Med*. 2006;34(6):899-904.
28. Mohtadi NG, Chan DS, Dainty KN, Whelan DB. Patellar tendon versus hamstring tendon autograft for anterior cruciate ligament rupture in adults. *Cochrane Database Syst Rev*. 2011;(9):CD005960.
29. Nixon HL. A social network analysys of influences on athletes to play with pain and injuries. *J Sport Soc Issues*. 1992;16(2):127-135.
30. 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(12):1320-1325.e6.
31. Roos H, Ornell M, Gardsell P, Lohmander LS, Lindstrand A. Soccer after anterior cruciate ligament injury: an incompatible combination? A national survey of incidence and risk factors and a 7-year follow-up of 310 players. *Acta Orthop Scand*. 1995;66(2):107-112.
32. 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(11):2233-2239.
33. Shaieb MD, Kan DM, Chang SK, Marumoto JM, Richardson AB. A prospective randomized comparison of patellar tendon versus semitendinosus and gracilis tendon autografts for anterior cruciate ligament reconstruction. *Am J Sports Med*. 2002;30(2):214-220.
34. Siegel L, Vandenakker-Albanese C, Siegel D. Anterior cruciate ligament injuries: anatomy, physiology, biomechanics, and management. *Clin J Sport Med*. 2012;22(4):349-355.
35. Tripp DA, Stanish W, Ebel-Lam A, Brewer BW, Birchard J. Fear of reinjury, negative affect, and catastrophizing predicting return to sport in recreational athletes with anterior cruciate ligament injuries at 1 year postsurgery. *Rehabil Psychol*. 2007;52(1):74.
36. Walden M, Hagglund M, Magnusson H, Ekstrand J. Anterior cruciate ligament injury in elite football: a prospective three-cohort study. *Knee Surg Sports Traumatol Arthrosc*. 2011;19(1):11-19.
37. Zaffagnini S, Marcacci M, Lo Presti M, Giordano G, Iacono F, Neri M. Prospective and randomized evaluation of ACL reconstruction with three techniques: a clinical and radiographic evaluation at 5 years follow-up. *Knee Surg Sports Traumatol Arthrosc*. 2006;14(11):1060-1069.