Return to Play in Amateur Soccer Players Undergoing Hip Arthroscopy: Short- to Mid-Term Follow-Up

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Purpose: To describe patient-reported outcomes (PROs) and return to play at any level in amateur soccer players undergoing hip arthroscopy for femoroacetabular impingement syndrome at short- to mid-term follow-up. **Methods:** Data were prospectively collected and retrospectively reviewed for patients who underwent hip arthroscopy between March 2009 and June 2014. Patients who participated in amateur soccer within 1 year prior to surgery and intended to return to their sport after hip arthroscopy for femoroacetabular impingement syndrome were considered for inclusion in our study. Patients were excluded if they had a preoperative Tönnis osteoarthritis grade of 2 or greater, previous ipsilateral hip conditions or hip surgical procedures, or Workers' Compensation status. The patients from the initial group who had preoperative and minimum 2-year postoperative measures for the modified Harris Hip Score, Non-Arthritic Hip Score, Hip Outcome Score—Sports Specific Subscale, and visual analog scale for pain were included in our final group. In addition to PROs, data regarding the patients' return to soccer, surgical complications, and secondary surgical procedures were collected. **Results:** A total of 41 patients were eligible for inclusion in our study, of whom 34 (82.9%) had a mean follow-up period of 47.4 months. Five patients were not eligible because they did not intend to return to soccer. There were 15 male hips (44.1%) and 19 female hips (55.9%). The mean age at surgery was 20.8 ± 7.4 years. All PROs and the visual analog scale score improved significantly from preoperatively to latest follow-up. Of the 34 patients, 27 (79.4%) returned to soccer. Of the patients who returned to soccer, 19 (70.4%) were competing at the same level or a higher level compared with their highest level within 1 year of surgery. Regardless of competitive level, 21 patients (77.8%) reported that their

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athletic ability was the same as or higher than it was within 1 year of surgery. **Conclusions:** Hip arthroscopy was associated with significant improvements in PROs for amateur soccer players. There was a high level of return to soccer and a high proportion of patients whose competitive level was similar or improved. As such, hip arthroscopy is a good option for soccer players, in the absence of underlying osteoarthritis, presenting with hip pathology. **Level of Evidence:** Level IV, case series.

Soccer is the most popular sport in the world, with over 265 million competitors playing the game.[1] In the United States, soccer ranks as the fourth most popular sport, with 30% of houses in the country having 1 or more soccer players.[2] Given the immense popularity and participation in the game, an evaluation of common injuries and return to play after treatment is essential. A large number of athletes at different levels of competition present with hip pain and functional disability related to femoroacetabular impingement (FAI) syndrome.[3-5] A recent radiographic study by Gerhardt et al.[6] of elite soccer players suggested that cam morphology was present in 68% of male players and 50% of female players whereas pincer deformities were present in 26.7% of male players and 10% of female players.

Hip arthroscopy has become an extremely common intervention for numerous hip pathologic conditions in athletes.[7] FAI is most commonly diagnosed in athletes participating in sports such as soccer that require repeated changes in direction causing high rotational loads across the hip joint.[5,8] Cam-type deformity has a high prevalence among athletes participating in high-impact activities, especially during adolescence.[9-12] The objectives of surgery are to reduce hip pain, improve hip function, allow athletes to return to their sporting activities, and decelerate the degenerative changes within the hip joint.[5,13]

Studies among elite athletes have shown positive outcomes both at initial follow-up and at 10-year follow-up in terms of return to play and level of play after hip arthroscopy.[14] Regarding recreational athletes, studies have shown that professional players are able to return more quickly than they are but with similar patient-reported outcomes (PROs).[15]

Given the increasing incidence of hip arthroscopy for a wide range of pathologic conditions, as well as the over 265 million soccer players worldwide, it is worthwhile to investigate outcomes in soccer players undergoing hip arthroscopy. The purpose of this study was to describe PROs and return to play at any level in amateur soccer players undergoing hip arthroscopy for FAI syndrome at short- to mid-term follow-up. Our hypothesis was that hip arthroscopy would be an effective treatment for soccer players and that the postoperative level of play would be the same as or better than the preoperative level.

Methods

Patient Selection Criteria

Data were prospectively collected and retrospectively reviewed for all patients who underwent hip arthroscopy for FAI syndrome performed by the senior author (B.G.D.) between March 2009 and June 2014. Patients were excluded from our study if they had a preoperative Tönnis osteoarthritis grade of 2 or greater, previous ipsilateral hip conditions or hip surgical procedures, or Workers' Compensation status. Patients of any age who participated in amateur soccer within 1 year prior to surgery and intended to return to their sport after surgery were considered for inclusion in our study. If patients indicated their intention not to return to play soccer when responding to the preoperative questionnaire (Appendix 1, available at www.arthroscopyjournal.org), they were excluded. The patients from the initial group who had preoperative and minimum 2-year post-operative measures for the modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score—Sports Specific Subscale (HOS-SSS), and visual analog scale (VAS) for pain were included in our final case series. This study was approved by the institutional review board.

Indications for Surgery

All surgical candidates underwent a detailed medical history, physical examination, and radiographic analysis. Gait, range of motion, strength, points of tenderness, signs of impingement, and any mechanical symptoms (snapping, catching, and locking) were noted during a clinic visit. A series of radiographs (standing and supine anteroposterior pelvis, false-profile, modified Dunn, and cross-table lateral views) were used to evaluate patients for cam or pincer morphology, acetabular version, dysplasia, and Tönnis osteoarthritis grade. Labral tears and intra-articular injuries were assessed using magnetic resonance arthrography. We recommended surgery if patients had hip pain due to labral tears and FAI interfering with the activities of daily living for at least 3 months and did not improve with rest, nonsteroidal anti-inflammatory drugs, physical therapy or cortisone injections.

Surgical Technique

All surgical procedures were performed by a single surgeon (B.G.D.) at a tertiary hip preservation center.

The patient was positioned supine on a traction table with a well-padded perineal post. After adequate subluxation was obtained, the standard anterolateral and midanterior portals were created, the joint was accessed, and a capsulotomy was performed with an arthroscopic knife. A diagnostic arthroscopy was then performed to evaluate the ligamentum teres (LT), intra-articular cartilage, and labrum using the Domb classification system; LT using the Villar classification system; intra-articular cartilage using the acetabular labrum articular disruption (ALAD) and Outerbridge classification systems; and labrum using the Seldes classification system. On the basis of preoperative imaging and fluoroscopic guidance, an acetabuloplasty was performed to address pincer impingement and a femoroplasty was performed to address femoral cam deformities. LT tears were treated with debridement, and full-thickness chondral defects of the femoral head and acetabulum were treated with microfracture. Patients with an iliopsoas impingement lesion or painful internal snapping were treated with iliopsoas fractional lengthening. Labral tears were repaired or selectively debrided when the labrum was salvageable. When the labrum was irreparable, a reconstruction was performed using a semitendinosus allograft. On the basis of the patient's Beighton score and acetabular coverage, the capsule was either released, repaired, or plicated. If indicated, the peritrochanteric space was accessed through the posterolateral and accessory distal lateral portals to address trochanteric or gluteus medius pathologic conditions.

Rehabilitation

Patients were instructed to use crutches with toe-touch weight bearing (20 lb) and a low-profile abduction brace (X-Act ROM brace; DJO Global, Vista, CA) for 2 weeks. As early as 1 day postoperatively, patients were to begin physical therapy to restore strength and range of motion. For patients who underwent labral reconstruction, gluteus medius repair, or microfracture, the postoperative treatment plan was adjusted as needed. In general, patients start running 10 to 12 weeks after surgery. Cutting and pivoting are allowed 5 to 6 months after surgery. The return-to-sport phase with full contact is generally 6 to 8 months from surgery.

Outcome Evaluation

For each patient included in our study, PROs were recorded preoperatively and at a minimum of 2 years postoperatively. Scoring standards collected included the mHHS, NAHS, HOS-SSS, and VAS score for pain at all time points, as well as the International Hip Outcome Tool 12 (iHOT-12) score at latest follow-up; however, preoperative values for the iHOT-12 scale were not available prior to 2012, with the initiation of collection at the center. The PROs were scored from 0 (lowest possible score) to 100 (highest possible score), and the VAS was scored from 0 (no pain) to 10 (worst possible pain). Patient satisfaction was also collected at minimum 2-year follow-up and was scored from 0 (lowest satisfaction) to 10 (highest satisfaction). Statistical analysis of PROs was completed using the scores obtained at latest follow-up beyond 2 years. In addition to PROs, data were collected regarding the patients' return to soccer. Patients who were still playing soccer at minimum 2-year follow-up were evaluated based on their competitive and ability levels before and after surgery. Competitive levels were divided into recreational or fitness, high school, college, organized amateur competition, and professional. Patients were asked if they believed that their athletic ability had worsened, improved, or remained the same. Patients who did not continue playing soccer were evaluated based on their reasons for not returning. All postoperative complications, secondary arthroscopies, and conversions to total hip arthroplasty were also identified.

Statistical Analysis

Microsoft Excel (Microsoft, Redmond, WA) was used for all statistical analysis. Data were tested for normality using the Shapiro-Wilk test and for equal variance using the F test. Continuous data were compared using the 2-tailed Student test in the setting of parametric data or the Wilcoxon signed rank test in the setting of nonparametric data. The χ^2 and Fisher exact tests were used to compare categorical data.

Results

Patient Demographic Characteristics

After the application of all inclusion and exclusion criteria, 34 patients were included in this study. The average follow-up time was 47.4 ± 20.9 months (range, 24.0-83.4 months). In this case series, there were 15 male hips (44.1%) and 19 female hips (55.9%). The mean age at surgery of patients with labral tears was 20.8 ± 7.4 years, and the mean body mass index was 22.8 ± 4.1. All patient demographic characteristics are summarized in Table 1.

Table 1. Patient Demographic Characteristics

Characteristic	Data
Patients and hips included in study, n (%)	
Left hip	18 (52.9)
Right hip	16 (47.1)
Sex, n (%)	
Male	15 (44.1)
Female	19 (55.9)
Age at surgery, mean ± SD (range), yr	20.8 ± 7.4 (14.4-47.4)
BMI, mean ± SD (range)	22.8 ± 4.1 (17.0-36.9)
Follow-up time, mean ± SD (range), mo	47.4 ± 20.9 (24.0-83.4)
Follow-up, %	82.9

BMI, body mass index; SD, standard deviation.

Table 2. Intraoperative Findings

Finding	n (%)
Seldes tear type	
0	0 (0)
I	12 (35.3)
II	13 (38.2)
I and II	9 (26.5)
ALAD classification	
0	9 (26.5)
1	9 (26.5)
2	14 (41.2)
3	2 (5.9)
4	0 (0)
Outerbridge classification	
Acetabular	
0	9 (26.5)
1	9 (26.5)
2	14 (41.2)
3	2 (5.9)
4	0 (0)
Femoral head	
0	31 (91.2)
1	0 (0)
2	0 (0)
3	2 (5.9)
4	1 (2.9)
LT percentile class (Domb classification)	
0: 0%	19 (55.9)
1: >0% to <50%	9 (26.5)
2: 50% to <100%	4 (11.8)
3: 100%	2 (5.9)
Villar classification of LT	
0: no tear	19 (55.9)
1: complete rupture	2 (5.9)
2: partial tear	10 (29.4)
3: degenerated tear	3 (8.8)

ALAD acetabular labrum articular disruption; LT, ligamentum teres.

Intraoperative Findings

All findings from the diagnostic arthroscopy are documented in Table 2. The Seldes classification system was used to characterize labral tears. In this patient case series, there were 12 type I tears (35.3%), 13 type II tears (38.2%), and 9 type I and II tears (26.5%). The integrity of the cartilage was assessed using the ALAD and Outerbridge classification systems. A total of 16 hips (47.1%) had defects with an ALAD classification of 2 or greater, 16 hips (47.1%) had acetabular defects with an Outerbridge classification of 2 or greater, and 3 hips (8.8%) had femoral head defects with an Outerbridge classification of 2 or greater. LT tears were evaluated using the Domb and Villar classification systems. Of the hips, 15 (44.1%) had LT tears.

Table 3. Intraoperative Procedures

Procedure	n (%)
Labral treatment	
Repair	27 (79.4)
Debridement	6 (17.6)
Reconstruction	1 (2.9)
Capsular treatment	
Repair or plication	27 (79.4)
Release	7 (20.6)
Acetabuloplasty	27 (79.4)
Femoroplasty	21 (61.8)
Iliopsoas fractional lengthening	21 (61.8)
Ligamentum teres debridement	9 (26.5)
Acetabular chondroplasty	6 (17.6)
Femoral head chondroplasty	2 (5.9)
Synovectomy	3 (8.8)
Removal of loose body	3 (8.8)
Trochanteric bursectomy	1 (2.9)
Gluteus medius or minimus repair	0 (0)
Acetabular microfracture	1 (2.9)
Femoral head microfracture	1 (2.9)

Table 4. Patient-Reported Outcomes

Outcome Measure	Preoperative	Minimum 2-yr Follow-Up	*P* Value
mHHS	68.4 ± 12.0	87.9 ± 12.1	< .001
NAHS	67.5 ± 15.4	89.6 ± 11.3	<.001
HOS-SSS	46.5 ± 19.9	81.9 ± 19.8	<.001
iHOT-12 score		81.8 ± 18.1	
VAS score	5.4 ± 2.3	1.6 ± 1.7	<.001
Patient satisfaction		8.3 ± 1.4	

NOTE. Data are presented as mean ± standard deviation.

HOS-SSS, Hip Outcome Score—Sports Specific Subscale; iHOT-12, International Hip Outcome Tool 12; mHHS, modified Harris Hip Score; NAHS, Non-Arthritic Hip Score; VAS, visual analog scale.

Arthroscopic Procedures

Labral tears were repaired in 27 hips (79.4%), debrided in 6 (17.6%), and reconstructed in 1 (2.9%). Of the 15 LT tears, 9 (60.0%) were treated with debridement whereas the other 6 (40%) were observed. Acetabuloplasty was performed in 27 hips (79.4%), and femoroplasty was performed in 21

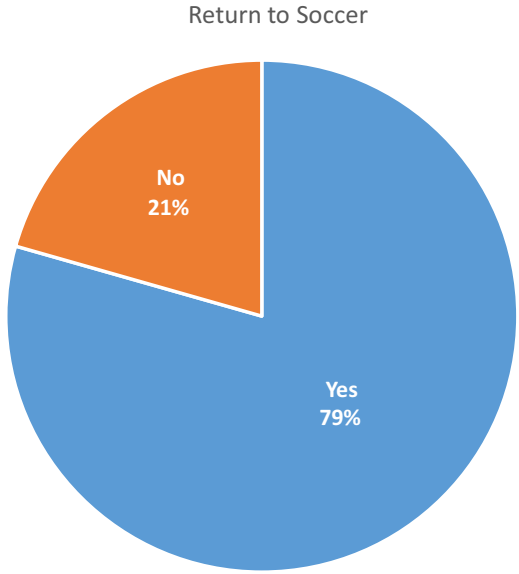

Fig 1. Return-to-sport statistics for patients who tried to play soccer after surgery.

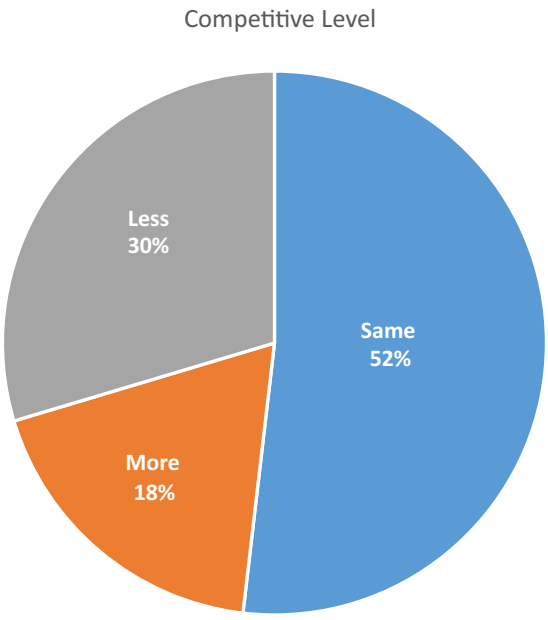

Fig 2. Competitive level of 27 patients who returned to soccer at latest follow-up.

(61.8%). The iliopsoas was fractionally lengthened in 21 cases (61.8%). The capsule was repaired or plicated in 27 hips (79.4%) and released in 7 (20.6%). Table 3 details all of the arthroscopic procedures performed.

Outcomes at Latest Follow-Up

All PROs and the VAS score improved significantly ($P < .001$) from preoperatively to latest follow-up and are summarized in Table 4. At latest follow-up, the mean mHHS was 87.9 (vs 68.4 preoperatively), the mean NAHS was 89.6 (vs 67.5 preoperatively), the mean HOS-SSS was 81.9 (vs 46.5 preoperatively), and the mean VAS score was 1.6 (vs 5.4 preoperatively). The mean patient satisfaction rating was 8.3.

At latest follow-up, all 34 patients reported that they tried to return to soccer, of whom 27 (79.4%) were successfully able to do so (Fig 1). Of the patients who returned to soccer, 19 (70.4%) were competing at the same level or a higher level compared with their highest level within 1 year of surgery (Fig 2). Regardless of competitive level, 21 patients (77.8%) reported that their athletic ability was the same as or higher than it was within 1 year of surgery (Fig 3). Of the 34 patients who tried to return to play soccer, 19 (55%) ended up playing at a level of soccer at least as high as that before surgery.

We compared the outcome scores for the patients who were still playing soccer at latest follow-up and those who were not (Table 5). The patients in the return-to-soccer group showed significant improvements from preoperatively to latest follow-up in all PRO scores and the VAS score.

The patients who did not return to soccer showed significant improvements from preoperatively to latest follow-up in the mHHS (from 67.9 to 83.6), NAHS (from 63.5 to 84.8), and HOS-SSS (from 38.0 to 71.0). However, the VAS score did not significantly improve (3.6 preoperatively to 2.3 at latest follow-up). The latest HOS-SSS (71.0 vs 85.1) and iHOT-12 score (67.4 vs 86.0) were significantly lower in the group of patients who did not return to soccer. Although no other significant differences were noted between groups, the latest follow-up and delta scores were consistently lower in patients who did not return to soccer.

Complications, Secondary Arthroscopies, and Conversions to Total Hip Arthroplasty

Of the 34 patients included in our study, 4 underwent secondary arthroscopies at an average of 10.5 months after their initial surgical procedures: 3 because of adhesions and 1 because of a retear of the labrum. One patient reported numbness in the toes as a postoperative complication. No patients required a total hip arthroplasty up to their latest follow-up.

Discussion

In this case series, all the PROs in the patients who returned to play soccer showed significant improvements and the return-to-play rate was 79.4% at latest follow-up. In the group that was able to return to play, the latest HOS-SSS and iHOT-12 were significantly higher than those in the group of patients who did not return to soccer. These findings are consistent with our hypothesis that a high number of patients with short- to

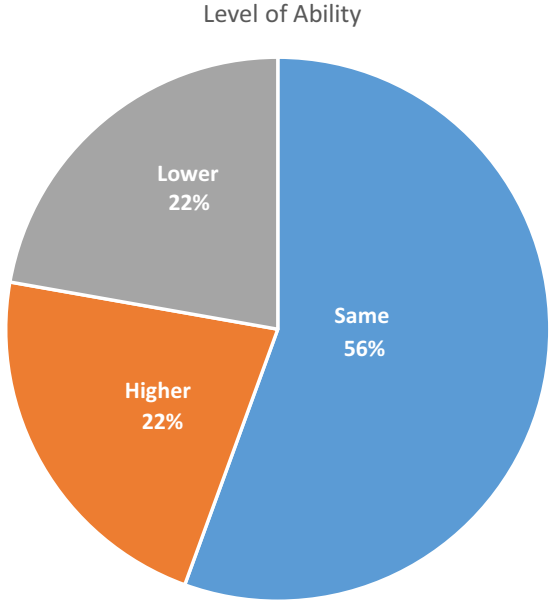

Fig 3. Level of ability of 27 patients who returned to soccer at latest follow-up.

Table 5. Comparison of Patient-Reported Outcomes Between RTS and NRTS Groups

	RTS (n = 27)	NRTS (n = 7)	*P* Value
mHHS			
Preoperative	69.0 ± 13.5	67.9 ± 11.9	.854
Latest follow-up	88.9 ± 12.5	83.6 ± 8.5	.111
P value (preoperative vs. postoperative)	<.001	.036	
Change	19.9 ± 17.5	15.7 ± 15.4	.862
NAHS			
Preoperative	69.2 ± 15.5	63.5 ± 9.9	.388
Latest follow-up	90.8 ± 11.3	84.8 ± 9.7	.085
P value (preoperative vs. postoperative)	<.001	.008	
Change	21.8 ± 16.3	21.4 ± 14.6	.889
HOS-SSS			
Preoperative	48.1 ± 20.0	38.0 ± 16.1	.246
Latest follow-up	85.1 ± 20.2	71.0 ± 12.1	.018
P value (preoperative vs. postoperative)	<.001	.015	
Change	37.1 ± 27.1	33.0 ± 25.9	.278
VAS score			
Preoperative	5.7 ± 2.3	3.6 ± 3.2	.082
Latest follow-up	1.3 ± 1.6	2.3 ± 1.7	.116
P value (preoperative vs. postoperative)	<.001	.402	
Change	−4.4 ± 2.8	−1.3 ± 4.2	.494
iHOT-12 score	86.0 ± 16.7	67.4 ± 15.8	.009
Patient satisfaction	8.6 ± 1.3	7.6 ± 1.4	.088

NOTE. Data are presented as mean ± standard deviation.

HOS-SSS, Hip Outcome Score—Sports Specific Subscale; iHOT-12, International Hip Outcome Tool 12; mHHS, modified Harris Hip Score; NAHS, Non-Arthritic Hip Score; NRTS, no return to sport; RTS, return to sport; SD, standard deviation; VAS, visual analog scale.

mid-term follow-up after hip arthroscopy would be able to return to play soccer.

A common motivation to undergo hip arthroscopy is to regain the capacity to play sports and improve athletic ability.[16] During recent years, multiple case series have been published about professional players' return to play after arthroscopic hip surgery.[7,14,17-23] Their results have been encouraging. Naal et al.[23] found a 96% rate of return to play (21 of 22) in professional athletes at 3.8 years' follow-up after surgical hip dislocation. Philippon et al.[20] reported that 93% of 45 arthroscopically treated athletes initially returned to professional competition and that 78% were still professionally active 1.6 years after surgery.

To a lesser extent, there are studies that have evaluated the return to sport in professional as well as amateur patients. Malviya et al.[15] followed up 80 athletes (40 professional and 40 recreational; mean age, 35.7 years) who underwent hip arthroscopy for FAI with a mean follow-up period of 1.4 years. They measured the time to return to sport, training time, time in competition, mHHS, and NAHS. Their data suggest that professional athletes may show a quicker return to sport than recreational athletes but the hip scores and rates of return to sport are similar.

In our case series, all PROs and the VAS score improved significantly from preoperatively to latest follow-up. Brunner et al.[24] reported a similar NAHS (86.7) at 2.4 years in 53 patients who participated regularly in sports, of whom 82% returned to sport. Our study's slightly lower return-to-sport percentage (79.4%) may be explained by the fact that we only analyzed soccer players and soccer involves more cutting and a higher impact than sports such as biking or swimming.

We also compared the PROs for the group that was able to return to play versus the group that was not. The latest HOS-SSS and iHOT-12 score were significantly lower in the group of patients who did not return to soccer. Although no other significant differences were found between groups, the latest follow-up and delta scores were consistently lower in the patients who did not return to soccer. Domb et al.[25] found similar results in their study comparing patients who returned versus those who did not return to sport at 2 years, with significant differences in the HOS-SSS at latest follow-up. Although not statistically significant in both studies, the preoperative HOS-SSS was lower in the patients who did not return to sport.

This study included only amateur-level athletes and, thus, may better represent the patient population that a typical hip arthroscopic surgeon will encounter in his or her practice. Our study showed that 79.4% of the patients returned to play soccer after hip arthroscopy. It has been shown that factors such as self-motivation, aging, pain, encouragement from other persons, and adaptation to physical limitations can largely affect a patient's decision to return to sport after arthroscopic hip surgery.[26]

A consensus statement has previously reported the following[27]: "An athlete's psychological traits may influence decision-making regarding treatment and may

substantially impact post-illness and injury and post-operative treatment, rehabilitation, and outcomes. The team physician and the athletic care network need to be aware of these factors and develop effective treatment protocols for identification of and intervention for possible harmful factors. Three prominent psychological factors that have been shown to be important in illness and injury treatment and outcomes are pain perception, optimism/self-efficacy, and depression/stress."

Furthermore, the motivation to return to sport may differ based on the level at which the athlete competes. Athletes who compete at the professional level may be more inclined to return to sport because of a limited window of opportunity in their careers, in addition to monetary considerations. On the other hand, recreational athletes do not have these same motivations and, therefore, may decide not to return to sport for the sake of prolonging hip longevity.[14,21,25,28] This may help to explain the difference between the return-to-play rate in our study, which included mainly recreational players, and the return-to-play rates reported in previous studies that analyzed only professional players.

Limitations

There were several limitations to this study. The level-of-ability data were self-reported and therefore may suffer from reporting bias. Another limitation results from the fact that there are many factors influencing an individual's decision to return to sport after surgery, which makes it difficult to discern whether a patient's hip is the limiting factor in returning to soccer. Along these same lines, there was significant heterogeneity in the patient population and pathologic conditions treated. Furthermore, some limitations stem from the questions on our questionnaire. We did not ask about the specific time at which patients returned to soccer, only whether they had returned by the latest follow-up. We also did not ask patients about the frequency with which they played soccer both before and after surgery. In addition, our data do not clearly reflect whether the patients who did not return to soccer are now playing other sports that require less impact. Finally, this was a retrospective study in which there was no matching group with which to compare our subjects.

Conclusions

Hip arthroscopy was associated with significant improvements in PROs for amateur soccer players. There was a high level of return to soccer and a high proportion of patients whose competitive level was similar or improved. As such, hip arthroscopy is a good option for soccer players, in the absence of underlying osteoarthritis, presenting with hip pathology.

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