Primary and Revision Circumferential Labral Reconstruction for Femoroacetabular Impingement in Athletes: Return to Sport and Technique

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Purpose: To determine return-to-play rates and hip-specific outcomes in athlete hips with femoroacetabular impingement syndrome treated with circumferential labral reconstruction (CLR). Methods: All consecutive patients who underwent CLR from January through December 2016 performed by the senior surgeon with complete 2-year outcome scores were identified. The hips of 57 non-athletes who underwent CLR were excluded from analysis, as were 165 patients who underwent labral repair and 4 patients who underwent labral debridement. Outcome measures were completed by patients within 1 week prior to surgery and between 22 and 26 months postoperatively. Thirty patients met the inclusion criteria for this study. All 30 participated in regular, competitive athletic events and had magnetic resonance arthrogram—confirmed labral tears, and nonsurgical measures had failed. Of the 30 patients, 5 (16.7%) participated in cutting sports; 5 (16.7%), asymmetrical or overhead sports; 4 (13.3%), contact sports; 13 (43.3%), endurance sports; and 3 (10.0%), flexibility sports. Moreover, 25 of 30 (83.3%) were high-level athletes. Both primary (n = 23) and revision (n = 7) procedures were included. Results: As determined by the International Hip Outcome Tool 12 score, 28 of 30 patients (93.3%) met the patient acceptable symptomatic state whereas 30 of 30 (100%) achieved substantial clinical benefit and exceeded the minimal clinically important difference for their operative hip. In addition, 23 of 30 patients (76.6%) met the patient acceptable symptomatic state whereas 30 of 30 (100%) achieved substantial clinical benefit and exceeded the minimal clinically important difference for the operative hip as determined by the visual analog scale pain score. Of 30 patients, 26 (86.7%) were able to return to play. The mean time to return to play was 6.6 months (standard deviation, 2.4 months). Conclusions: Two-year outcomes in this population of athletes undergoing CLR for femoroacetabular impingement syndrome show a statistically and clinically significant improvement in patient-reported outcomes, a statistically and clinically significant decrease in pain, and an overall return-to-play rate of 86.7%. Level of Evidence: Level IV, therapeutic case series.

The acetabular labrum plays a key role in both the biomechanics and nociception of the hip. Through arthroscopy, orthopaedic surgeons have greatly expanded their armamentarium for treating labral damage. There have been promising reports of labral reconstruction as a surgical option for patients in whom the labrum is too damaged to be successfully repaired or prior repair or debridement has failed. Some surgeons have advocated a circumferential (or front-to-back) technique for labral reconstruction, in which the entirety of the native labrum is debrided prior to reconstruction in these patients. Although "circumferential" is technically a misnomer, the labrum is reconstructed from the transverse acetabular ligament (TAL) anteroinferiorly to just proximal to the TAL posteriorly. Proponents of the circumferential

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technique cite weak junction points and concerns regarding healing at the graft–native tissue interface as reasons to perform a complete reconstruction.\(^6\)\(^-\)\(^8\)\(^-\)\(^12\) Although no studies, to our knowledge, have directly compared outcomes of segmental labral reconstruction versus circumferential labral reconstruction (CLR), advocates of segmental reconstruction cite lower surgical cost, time, and disruption of native tissue. Additionally, Philippon et al.\(^{13}\) have reported superior results with a labral augmentation technique for hypoplastic labra compared with segmental reconstruction. Outcomes in patients treated with CLR have been favorable, with many patients showing significant decreases in pain and increases in quality of life and hip-related function as a result of surgery.\(^5\)\(^,\)\(^7\)\(^,\)\(^8\)\(^,\)\(^10\)\(^,\)\(^12\)

There remains a paucity of evidence regarding outcomes in focused populations undergoing CLR.\(^7\)\(^,\)\(^8\)\(^,\)\(^10\)\(^,\)\(^12\)\(^,\)\(^14\)\(^,\)\(^15\) Previous reports have focused on a general hip arthroscopy population, albeit with severe labral damage. Specifically, no studies have investigated the outcomes of higher-demand athletes treated with this procedure. Given the symptomatic, activity-limiting consequence of femoroacetabular impingement (FAI) in athletes (up to 90% in some groups of athletes), it is paramount that surgeons continue to search for the optimal methods of treating the sequelae of this pathology.\(^16\)\(^-\)\(^25\)

This study was a retrospective case series of prospectively collected demographic and outcome data for patient-athletes undergoing CLR from January through December 2016 for labral damage due to FAI. The purpose of this study was to determine return-to-play rates and hip-specific outcomes in athlete hips with FAI syndrome treated with CLR. Our hypothesis was that CLR would provide statistically significant improvements in patient-related outcomes and decreases in pain in a high hip-demand population, thereby leading to high return-to-play rates in an athletic population.

**Methods**

**Study Design**

This was a retrospective review of prospectively collected data investigating the rate of return to preoperative sport at the preinjury level in athletes after CLR for FAI. Additional outcome measures included overall hip function as measured by the International

**Fig 1.** Flowchart of patient inclusion. Of the patients who underwent circumferential labral reconstruction (CLR), 57 were not actively participating in competitive athletic events at the onset of symptoms and were therefore excluded from analysis (asterisk).

**Fig 2.** Intraoperative fluoroscopic image showing extent of labral resection along acetabulum.
Hip Outcome Tool 12 (iHOT-12); hip pain as measured by a pain visual analog scale (VAS); activity level as measured by the University of California, Los Angeles (UCLA) activity scale; and satisfaction with surgery as measured by a satisfaction VAS. Return-to-play data were collected during routine postoperative clinic visits through a standardized postoperative questionnaire. This retrospective study was determined to be exempt from continuing review by a multicenter institutional review board granted by Duquesne University (IRB No. 2018/03/9). Patients were typically seen at 1 week, 6 weeks, 3 months, and 6 months postoperatively. At each postoperative visit, patients are asked whether they had returned to sport, the level at which they competed, the duration prior to return to sport, and what, if any, limitations they had on returning to sport. With these data, the UCLA activity score was calculated for all patients. In addition, patients were classified, on returning to play, into 1 of 3 subjectively determined categories—(1) full return to play, without limitations; (2) return to play, with limitations; and (3) unable to return to play—similarly to the criteria used by Ishøi et al. Limitation was defined as any subjective operative hip-related symptom that caused decreased performance in the sport of choice. Patients who did not return to play for at least 1 complete competitive season were categorized as unable to return to play. The reporting of our findings adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations. This retrospective study was determined to be exempt from continuing review by a multicenter institutional review board granted by Duquesne University (IRB No. 2018/03/9).

**Setting**

All surgical procedures were performed by the senior surgeon (A.B.W.) at 1 of 3 outpatient surgical centers. The senior surgeon is a right-handed high-volume hip arthroscopist and labral reconstructionist who has been in practice for over 11 years and currently performs over 125 CLRs per year. These CLRs represent approximately 30% to 35% of the annual surgical volume.

**Patient Population**

After in-office assessment, the decision to proceed with operative intervention was made solely by the senior author (A.B.W.). All patients indicated and scheduled for arthroscopic hip surgery with the senior surgeon were enrolled in an outcomes collection database. This information, in addition to patient demographic data, was collected as part of the standard of care for all patients. The inclusion criteria were patients who underwent CLR from January through December.

**Fig 3.** Fascia lata allograft, measuring 110 mm in length by 6 mm in diameter, made tubular with No. 2-0 nonabsorbable braided suture. A free needle through the graft is used to pass the suture from the anteroinferior anchor for shuttling and subsequent fixation in the joint.

**Fig 4.** In a right hip, a curved drill guide is in place at the junction of the anteroinferior acetabulum and transverse acetabular ligament. The camera is in the anterolateral portal, and the drill guide is through the midanterior portal.
2016; who participated in regular competitive athletic events in a single, primary sport; and who were limited preoperatively by their operative hip in their sport. The exclusion criteria were patients undergoing labral procedures other than CLR and those who no longer participated in regular, competitive sporting events (Fig 1). As characterized by Nawabi et al.,28 50 of 30 patients (16.7%) participated in cutting sports; 5 (16.7%), asymmetrical or overhead sports; 4 (13.3%), contact sports; 13 (43.3%), endurance sports; and 3 (10.0%), flexibility sports. Of the 30 patients, 25 (83.3%) were high-level athletes whereas 5 (16.7%) were recreational athletes. Primary procedures were performed in 23 of 30 patients (76.7%), whereas 7 (24.3%) underwent revision procedures after a failed labral repair or reconstruction. Intraoperatively, 15 of 30 patients (50%) were found to have extensive, irreparable labral tearing; 10 (33.3%) had a diminutive, hypoplastic labrum; and 5 (16.66%) had extensive labral ossification or calcification.

Indications for hip arthroscopy included patients who had symptoms severe enough to negatively impact the desired activity level. More specifically, in this population of competitive athletes, these symptoms limited patients’ ability to participate in their sport of choice. Although we do not use an identical conservative management protocol for all patients, these treatments typically consisted of 3 to 6 months of activity modification, structured and regular physical therapy, intra-articular corticosteroid injections, and oral nonsteroidal anti-inflammatory medications.6 Failure of nonoperative management was defined as the inability to compete in sports because of hip pain. Nonoperative management was defined as having
failed in all patients in this cohort. Candidacy for arthroscopic surgery was further assessed through imaging studies, which included anteroposterior pelvis, 45° modified Dunn lateral, and false-profile radiographs, as well as 3-T magnetic resonance arthrography. Patients with radiographic findings suggestive of significant osteoarthrosis (Tönnis grade > 1) or dysplasia (radiographic crossover sign, lateral center-edge angle < 20°) are typically not considered candidates for arthroscopic hip surgery. Although none of the patients in this cohort underwent labral repair, the decision to perform repair versus reconstruction was determined intraoperatively. Reconstructions are performed when previous repair has failed and tissue appears compromised, when there is labral base instability, or when the labrum is too diminutive to be properly repaired. In the primary setting, more tissue compromise is accepted when deciding on repair over reconstruction, particularly in a younger patient with a shorter duration of symptoms. The algorithm for this decision has been previously described.6,8

Data Collection

As components of the routine standard of care, patient demographic characteristics were collected during the initial appointment with the senior surgeon, and the patient was given the option to be enrolled in an online outcomes collection database. Patient-reported outcomes (PROs) were collected electronically through the online outcomes collection database. Outcomes were collected preoperatively and at specified postoperative intervals. The PRO used in this study was the iHOT-12.29,30 Patient satisfaction with surgery and patient pain were measured with VAS scores ranging from 0 to 10, with 10 being the most satisfied and the highest degree of pain.

Surgical Technique

All procedures were performed by the senior author. The technique that follows represents the most current evolution of a previously described surgical technique.6,8 It is our opinion, on the basis of experience and extrapolation from existing literature, that the most reproducible and effective method for CLR is built on the following premises:

1. More of the labrum may have pain-generating damaged tissue than is readily apparent.2,31
2. Removing the entirety (or vast majority) of the labrum allows for optimal access to correct any acetabular rim abnormalities without incurring labral-bone mismatch issues as are prone to occur in cases in which large acetabular resection is performed (i.e., coxa profunda).
3. Native labrum-graft interfaces are inherently suboptimal and thus are eliminated or placed far posteroinferior in areas of low stress.
4. The suction seal must be restored.3,4
5. Any graft must be situated at the rim of the acetabulum with appropriate tension such that the suction seal is restored.3,4
6. Graft length measurement is inherently inaccurate.

Fig 7. Posterior graft length assessment in a right hip, viewed with the camera in the midanterior portal. The graft is pulled taut to the area posterior to the native labral remnant posteroinferiorly—in this case, at approximately the 7:30 clock-face position. This is done to ascertain the optimal position for the posteroinferior anchor.

Fig 8. Posteroinferior anchor placement in extra-articular region of posteroinferior labral remnant in right hip.
7. Cutting the graft is undesirable because this compromises the reinforcing sutures running through the graft.

8. The graft should not be too short because this leaves a gap that may compromise the labral suction seal.

The patient is placed supine on the operative table. This is currently performed using a post-less distraction table attachment (Pivot Guardian; Stryker Sports Medicine, Sunnyvale, CA) with the patient in the Trendelenburg position at 0° to 15° depending on ease of distraction. The outcomes reported in this study were from operations performed on a table with a post (Hana table [Mizuho OSI, Union City, CA] or Hip Positioning System [Smith & Nephew Endoscopy, Andover, MA]) without Trendelenburg positioning. The hip is distracted 8 to 10 mm. The native labrum is resected from the TAL anteroinferiorly to the 8-o’clock position posteroinferiorly through the midanterior and anterolateral (AL) portals (Fig 2). Typically, a total of 3 portals are used for this procedure: AL, midanterior, and distal anterolateral (DALA) portals. Occasionally, a postero-lateral portal is also used. Anteroinferior work is performed in a careful fashion to avoid cutting the iliofemoral ligament more than necessary—if possible, the psoas should not be visualized because, in our experience, this leads to an increased incidence of postoperative psoas tendinitis. Alternatively, the anteroinferior labrum and acetabular rim can be easily accessed with the hip out of traction in approximately 40° of flexion without violating more inferior portions of the iliofemoral ligament. An interportal capsulotomy is necessary for this technique with extension posteriorly. A T-capsulotomy is not used. The capsulotomy is closed at the end of the case. The rim of the acetabulum is burred throughout the length of the proposed reconstruction. Acetabular osteoplasty is performed if pincer-type FAI is present. Posteroinferiorly, the rim is burred behind the labrum to about the 7:30 clock-face position. If undamaged, approximately 1 cm of the posteroinferior labral remnant is left intact in this area. This allows fixation of the graft to the labrum in an area of low stress and obviates the cutting of excess graft because any excess is minimal and is fixedated outside the native labrum. In our experience, the posteroinferior labrum is usually undamaged. If this is not the case, the labrum should be resected to the TAL posteroinferiorly. In this unusual situation, graft length estimation should be longer, and in rare circumstances, excess graft may need to be excised.

After resection of the native labrum, the hip is taken out of traction and the peripheral compartment work is performed while the graft is prepared. The traction time for the initial central compartment work is typically approximately 15 minutes but can be longer if multiple sutures need to be removed or a large pincer resection is needed.

A labral graft is prepared on the back table. This is a frozen tensor fascia lata allograft (Allosource, AlloSource).
Centennial, CO) thawed and soaked in antibiotic solution for 10 minutes that is then made tubular with multiple No. 2-0 nonabsorbable braided sutures (Ethibond [Johnson & Johnson], New Brunswick, NJ) to a typical size of 100 mm in length by 6 mm in diameter. We have a graft available for all cases because the decision to proceed with reconstruction in lieu of repair is made intraoperatively. For smaller acetabula, 90 mm may be sufficient; for larger acetabula, up to 110 mm may be necessary (Fig 3). The length can be adjusted as described later with a length-independent graft management anchor (LIGMA).

The first suture anchor (NanoTack Flex; Stryker Sports Medicine, Sunnyvale, CA) is placed through a cannula in the anteromedial (AM) portal anteroinferiorly adjacent to the TAL (Fig 4). One limb of the suture from this anchor is passed 3 times through the end of the graft and is shuttled by pulling the other end of the suture into the joint and tied (Fig 5). The next anchor is then placed through the AM portal approximately 1 cm from the first anchor. The graft is held by the assistant using an atraumatic grasper through the DALA portal in the correct position with appropriate tension (Fig 6). The suture is then looped around the graft and tied into place. This process is repeated 3 to 4 times with the suture anchors placed through the AM portal and the graft held through the DALA portal until the graft is secured back to approximately the 11-o’clock position posterior-superiorly. All anchors should be positioned as close to the articular surface as possible while one ensures that the articular surface is not penetrated to achieve restoration of the suction seal by the labral graft.

At this point, the length and tension can be fine-tuned to account for inevitable graft length inaccuracies while avoiding cutting the graft, which would cut the reinforcing sutures that run through it. This is accomplished by positioning of the posterosuperior (PI) anchor and by placement of the LIGMA anchor. Placement of the anchors and sutures through the graft with the PI and LIGMA anchors can adjust up to 20 mm of length inaccuracy.

Prior to placement of the PI anchor through the AL portal, the posterior aspect of the graft is placed in its desired position (Fig 7). If the graft is relatively long, the PI anchor is placed a bit more inferiorly behind the native labrum down as far as the TAL. If the graft is relatively short, the PI anchor can be placed at the 8-o’clock position behind the labral remnant (Fig 8). The other adjustment point with the PI anchor is where the suture from this anchor is placed through the graft. This is done to approximate the correct length and tension. To pass this suture, the graft is held with a grasper through the AL portal while the suture is shuttled through with a penetrating suture retriever. It is important that this suture goes through the graft and that there are nonabsorbable rip-stop sutures within the graft to maintain the tension. At this point, the length of the graft is set and any remaining graft is maintained behind the native labral remnant (Fig 9).

Next, the LIGMA anchor is placed to fine-tune the tension. It is placed approximately 5 to 7 mm proximal to the PI anchor through the AL portal. While the post suture limb is maintained, the leading suture limb is placed through the graft (again catching the rip-stop sutures) and then around the graft under the post

Fig 11. In a right hip, the posterosuperior and length-independent graft management anchors have been placed and tied. The gap is filled with additional anchors to complete fixation.

Fig 12. View of posterior graft from midanterior portal in right hip.

CLR FOR FAI IN ATHLETES
suture limb (Fig 10). This locks in the tension. If more tension is needed, the leading suture limb is passed through the graft a bit more proximally; if less is needed, the leading suture limb can be passed a bit more distally.

At this point, the entire front half of the labral graft, as well as the posteroinferior portion of the graft, is fixed. Typically, 1 to 3 more anchors need to be placed to close the gap (Fig 11). These are placed through the AL portal and tied with a simple loop suture technique. The graft is then probed throughout its length to ensure good fixation (Figs 12-14). The hip is taken out of traction, and a dynamic examination is performed to ensure restoration of the suction seal and lack of impingement. The traction time for this portion of the procedure is typically 45 to 60 minutes.

Postoperatively, patients are allowed range of motion and weight bearing as tolerated but are strictly instructed to use crutches for at least 1 month and to avoid painful positions or activities for the duration of their recovery. Our patients do not use a brace or continuous passive motion machine. Activities are permitted in a graduated fashion depending on concomitant procedures performed (i.e., slower for chondral restoration or gluteal repair procedures), discomfort, and time from surgery. Typically, biking with resistance is permitted at 1 month; jogging, at 3 months; and full unrestricted activity, at 6 months.

Statistical Analysis

All statistical analyses were performed using RStudio (version 1.1.463; RStudio, Boston, MA), and $P < .05$ was considered statistically significant. Preoperative to postoperative PROs were compared within groups using the paired Student $t$ test. The Fisher exact test was used for categorical data.

Results

Overall, the senior surgeon performed 261 hip arthroscopies during the study period. Of these 261, 169 were procedures other than CLR, including 165 labral repairs and 4 labral debridements. Of note, none of the 261 patients underwent a segmental labral reconstruction. Of the patients who underwent CLR, 57 were not actively participating in competitive athletic events at the onset of symptoms and thus were excluded from further analysis, leaving a population of 35 patients who participated in regular, competitive athletic events and who were limited preoperatively by their operative hip in their sport. Of those 35 identified, 30 had complete 2-year follow-up data (Table 1). As a result, the total study population was composed of 30 hips belonging to 30 patients, or 85.7% of the initial study population identified (Fig 1).

The mean length of follow-up was 24.3 months (range, 23.0-25.9 months). The mean patient age was 30.4 years (median, 26.5 years; range, 16-56 years). None of the hips belonged to patients who used tobacco products. There were 13 male and 17 female patients. The average patient body mass index was 23.4. There were 7 revision procedures and 23 primary procedures. Radiographically, the average alpha angle as measured on a modified Dunn view was $64.6^\circ$ (standard deviation, $17.4^\circ$), and the average lateral center-edge angle was $37.3^\circ$ (standard deviation, $8.1^\circ$) as measured on the anteroposterior pelvis radiograph. Seven hips belonged...
to varsity-level collegiate athletes (2 soccer athletes, 2 lacrosse athletes, and 3 long-distance runners), and one belonged to a professional athlete (ballet). The rest belonged to competitive athletes across varying levels of competition. Of the 30 patients, 25 (83.3%) were high-level athletes as described by Nawabi et al. All patients were limited by their hip with respect to their sport of choice. Preoperatively, the average iHOT-12 score was 24.3 and the average VAS pain score was 5.7. Concomitant procedures performed varied, with 90% of patients undergoing femoroplasty and 50% undergoing acetabuloplasty. Two patients underwent ligationamentum teres tear debridement at the time of CLR. One patient underwent excision of heterotopic ossification, and one underwent loose body removal.

At 2 years postoperatively, the average iHOT-12 score was 86.5 (range, 65.8-100), the average VAS pain score was 1.2 (range, 0.4-4.7), and the average VAS score for satisfaction with surgery was 8.5 (range, 2.3-10). The average UCLA activity score was 9.5 postoperatively versus 9.83 preoperatively ($P = .05$). Overall, this group of athletes showed increased hip function as measured by the iHOT-12 score (86.5 vs 24.3, $P < .001$) and decreased pain (VAS score, 1.2 vs 5.7; $P < .001$) at 2 years’ follow-up (Table 2). In addition, 28 of 30 patients (93.33%) met the patient acceptable symptomatic state (PASS), achieved substantial clinical benefit (SCB), and exceeded the minimal clinically important difference (MCID) for their operative hip as determined by the iHOT-12 score. Moreover, 23 of 30 patients (76.6%) met the PASS whereas 30 of 30 (100%) achieved SCB and exceeded the MCID for the operative hip as determined by the VAS pain score.

Overall, 4 patients were unable to return to play, of whom 3 cited contralateral hip pain as the main reason for not returning to play. Outside of failure to return to play, no additional complications were reported. Of the 26 patients who returned to play, 11 (42.3%) did so with some degree of subjective limitation regarding their preoperative level of competition. Of the 15 patients who did not return to their previous level of performance or did not return to play, 6 (40%) cited contralateral hip pain as their major limiting factor. Only 1 of 30 patients was unable to return to play because of ipsilateral hip pain, which corresponds to a return-to-play rate of 97% for the involved hip (Table 3). The mean time to return to play was 6.6 months (Fig 15). According to the most recent follow-up data, none of the hips presented in this study showed signs or symptoms of treatment failure at 4.3 years (range, 3.8-4.7 years) of follow-up.

### Table 1. Study Population Characteristics

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients (hips), n</td>
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</tr>
<tr>
<td>Mean age (range), yr</td>
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<tr>
<td>% Tobacco use</td>
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</tr>
<tr>
<td>% Female</td>
<td>56.6</td>
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<tr>
<td>% Right hip</td>
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<td>Mean BMI (range)</td>
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<td>% Revision (n)</td>
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<td>Mean alpha angle (range), °</td>
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<td>Mean lateral center-edge angle (range), °</td>
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<td>Intraoperative findings with respect to labral tissue, n (%)</td>
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<tr>
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<tr>
<td>Hypoplastic</td>
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<tr>
<td>Calcified or ossified</td>
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</tbody>
</table>

BML, body mass index.

*Revision patients included 3 lacrosse athletes, 1 tennis athlete, 1 soccer athlete, and 1 tactical athlete. Prior labral repair had failed in all of them. None had undergone prior reconstruction.

The tactical athletes were 2 special operations active-duty service members routinely taking part in high-demand combat operations.

### Table 2. Outcome Measures

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Preoperative, Mean (SD)</th>
<th>Postoperative, Mean (SD)</th>
<th>Difference*</th>
<th>95% CI</th>
<th>P Value</th>
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<tr>
<td>iHOT-12 score</td>
<td>24.3 (4.7)</td>
<td>86.5 (9.5)</td>
<td>62.1</td>
<td>58.3 to 65.9</td>
<td>&lt;.001</td>
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<td>Pain VAS score</td>
<td>5.7 (1.6)</td>
<td>1.2 (1.2)</td>
<td>−4.5</td>
<td>−5.2 to −3.8</td>
<td>&lt;.001</td>
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<td>Satisfaction VAS score</td>
<td>NA</td>
<td>8.8 (2.2)</td>
<td>NA</td>
<td>6.2 to 10.7</td>
<td>NA</td>
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<td>UCLA activity score</td>
<td>9.83</td>
<td>9.5</td>
<td>0.33</td>
<td>0.01 to 0.65</td>
<td>.05</td>
</tr>
</tbody>
</table>

CI, confidence interval; iHOT-12, International Hip Outcome Tool 12; NA, not applicable; SD, standard deviation; UCLA, University of California, Los Angeles; VAS, visual analog scale.

*The difference was calculated as the mean postoperative score minus the mean preoperative score; a positive value indicates a higher postoperative value, on average.

### Discussion

In our population of 30 athletes, only 1 did not return to play because of the operative hip. Of the 15 patients who either did not return to play or returned with limitations, 6 (40%) cited contralateral hip pain as their limiting factor. Of the 4 patients who did not return to play, 3 cited pain in the contralateral hip as their...
primary reason for not returning to play. All 3 of these patients went on to undergo contralateral hip arthroscopy performed by the senior author. Outcomes for the contralateral hip are not yet available for analysis. According to the most recent follow-up data, none of the hips presented in this study showed signs or symptoms of treatment failure at 4.3 years (range, 3.8-4.7 years) of follow-up.

Numerous studies have shown the applicability of labral debridement, repair, and segmental reconstruction in athletes.26,35-43 Recently, surgeons have postulated that the native labrum-graft interface in reconstructed labra creates a weak junction point that is susceptible to reinjury, especially in high hip-demand athletes.6,9 As a result, these surgeons have advocated a CLR, in which the most of the load-bearing native labrum is debrided prior to reconstruction.6-9,12 Short-term outcomes of this method have been promising, with patients showing significant decreases in pain and increases in hip-specific outcome scores at follow-up.5,8,10 There remains, however, a paucity of data regarding the outcomes of this procedure in higher-demand patients.

Our results are encouraging for a number of reasons. In 2019, Nwachukwu et al.44 established the PASS for the iHOT-12 score as 63.0. In their study, they set the threshold for the MCID for the iHOT-12 score as 13.0. Recently, Kivlan et al.,33 using a much larger cohort of patients than the 2019 study by Nwachukwu et al., determined the PASS for the iHOT-12 score to be 75.2; in addition, the same group of authors found the MCID for the iHOT-12 score to be 13.0. Recently, Kivlan et al.,13 using a much larger cohort of patients than the 2019 study by Nwachukwu et al., determined the PASS for the iHOT-12 score to be 75.2; in addition, the same group of authors found the MCID for the iHOT-12 score to be 13.0. The 2 patients who did not meet the PASS for their hip used the value determined by Kivlan et al. did meet the PASS determined by Nwachukwu et al.

Postoperatively, patients were restricted to protected weight bearing with crutches for 4 weeks.6 It is our experience that patients who undergo CLR experience pronounced pain relief and often have substantially diminished pain within a week of surgery. Furthermore, in all patients undergoing arthroscopic hip surgery, but particularly those who are highly motivated athletes, it is imperative to consistently reinforce that they are not to do anything that causes them pain throughout their postoperative course. Thus, it is mostly their hip symptomatology that dictates their pace of progression, supplemented by guidelines provided by our team. In general, our patients are instructed to not expect to return to full sporting activity until 4 to 6 months postoperatively, a restriction we believe to be especially applicable and important for high hip-demand sports such as football, lacrosse, soccer, ballet, and wrestling. The rehabilitation protocol used in this study is comparable to many other published protocols.47 A previously frozen tensor fascia lata allograft was used in all patients. Systematic reviews have failed to identify a consistently superior graft choice, although there is a trend toward allograft over autograft, with many authors citing decreased surgical time and no donor-site morbidity as reasons to use allograft tissue.48-50 Our experience has been that other graft choices (tibialis anterior, tibialis posterior, and hamstring tendon allograft and iliotibial band autograft) have been less consistent in terms of uniformity of

Table 3. Return to Play

<table>
<thead>
<tr>
<th>Data</th>
<th>Mean (SD; range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return-to-play rate, n (%)</td>
<td>26 of 30 (86.7)</td>
</tr>
<tr>
<td>Time to return to play, mo</td>
<td>Mean, 6.6 (SD, 2.4; range, 3-9)</td>
</tr>
<tr>
<td>Level of return to play, n (%)</td>
<td></td>
</tr>
<tr>
<td>Full, without limitation</td>
<td>15 of 26 (57.7)</td>
</tr>
<tr>
<td>With limitations</td>
<td>11 of 26 (42.3)</td>
</tr>
<tr>
<td>Did not return to play</td>
<td>4 of 30 (13.3)</td>
</tr>
<tr>
<td>Did not return to play because of operative-sided hip pain</td>
<td>1 of 30 (3.3)</td>
</tr>
</tbody>
</table>

SD, standard deviation.

Fig 15. Time to return to play across 5 sport types. The dashed black line represents the mean time for the cohort (6.6 months).
diameter and tissue quality, thereby affecting final reconstruction structure.

The mean time from surgery until return to play was 6.6 months (range, 3-9 months) (Table 3). This period is comparable to much of the published hip arthroscopy data.47 A study of professional and recreational athletes undergoing arthroscopy for FAI revealed an average return-to-play duration of 5.4 months for all athletes.31 Professional athletes, however, returned to play in less time, with a mean return-to-play time of 4.2 months, whereas recreational athletes returned to play at an average of 6.8 months. In addition to a shorter recovery period, return-to-play rates for professional, amateur, and adolescent athletes have been observed to be higher than those seen in recreational athletes.42 Although previous reports have observed recovery and return to full activity in most patients by 6 months postoperatively, there is a paucity of literature regarding return to play in patients undergoing circumferential (or front-to-back) labral reconstruction.8,57 Overall, CLR does not appear to require a longer rehabilitation protocol than other arthroscopic procedures in the hip. It does appear on the basis of our patient population, however, that patients who participate in cutting-type sports (mean time to return to play, 8.2 months) require a longer rehabilitation period than endurance athletes (mean time to return to play, 5.5 months) (Fig 15). In a similar vein, Jack et al.41 found that National Hockey League athletes performed worse postoperatively compared with matched National Football League, Major League Baseball, and National Basketball Association athletes. Additionally, lack of failure, defined as the need for further surgery, among all patients at a mean follow-up of 4.3 years suggests a durability of CLR in high hip-demand patients that merits ongoing clinical evaluation.

For surgeons interested in using this technique in their practice, we suggest that hip arthroscopy be a primary focus of their practice with several hundred cases performed prior to attempting a CLR.50 Further experience in the laboratory and observational setting with high-volume hip labral reconstruction surgeons is also recommended. Although it our belief that CLR is generally superior to segmental labral reconstruction, there are many cases in which segmental labral reconstruction may be an appropriate and successful procedure. In cases in which the labral defect is smaller and in a readily accessible portion of the acetabulum (anterosuperior), a segmental reconstruction may be an appropriate treatment modality that will allow a developing hip labral reconstruction surgeon to refine his or her technical expertise.

Limitations

Although our results are promising, there are some limitations to this study. Because not every patient participates in physiotherapy at the hands of the same therapist, there exists the possibility for small yet potentially confounding differences in the postoperative rehabilitation protocol. Outcomes were not stratified regarding concomitant procedures performed. There was no control group against which to compare outcomes, a limitation in all therapeutic case series. All procedures were performed by a single surgeon, which limits generalizability. The results are a retrospective review of prospectively collected data, and therefore, there exists the risk of selection bias inherent to case series. In addition, there is no objective, validated metric by which to measure return to play, a limitation faced by all studies investigating return to play.47 Finally, the learning curve for this technique is significant; these outcomes may not initially be reproducible for all surgeons.

Conclusions

Two-year outcomes in this population of athletes undergoing CLR for FAI syndrome show a statistically and clinically significant improvement in PROs, a statistically and clinically significant decrease in pain, and an overall return-to-play rate of 86.7%.

Acknowledgment

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References


arthroscopy in competitive athletes. *Arthroscopy* 2017;33:1521-1529.


