

Hip Labral Reconstruction with Capsular Autograft Augmentation



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Abstract: Multiple treatment options are available for patients presenting with a torn or deficient acetabular labrum. Biomechanical studies have demonstrated that the acetabular labrum may play a role in decreasing the risk of osteoarthritis and in maintaining long-term hip kinematics and stability. As such, repair or reconstruction of the labrum is often preferred over resection or debridement. In instances of a hypoplastic labrum, labral reconstruction or augmentation may be necessary even in a primary setting. Although reconstruction is a technique that should be in any hip arthroscopist's toolkit, allografts can be expensive and may not always be available when needed. In this Technical Note, we describe a labral augmentation with capsular autograft that diminishes donor-site morbidity associated with fascia lata autografts. This technique enables incorporation of healthy capsular tissue that allows for the recreation of the suction seal while avoiding some of the technically challenging aspects and costs of the conventional allograft labral reconstruction.

For patients presenting with a damaged labrum of the hip, there are multiple options for management, such as conservative treatment with rest, activity modification, injections, and physical therapy; labral debridement; labral repair; and labral reconstruction.¹ The importance of the labrum with regard to maintenance of mechanical stability of the hip joint has been demonstrated with

cadaveric specimens.²⁻⁴ Biomechanical studies also suggest that the labrum prevents synovial fluid from escaping the hip joint in a phenomenon known as the "fluid seal effect," which allows for articular cartilage protection and a decreased risk of osteoarthritis.⁵⁻⁷ To restore this suction seal of the hip joint, the labrum is often attempted to be repaired or reconstructed as opposed to partially resected.

Reconstruction may be chosen if a severely deficient labrum is seen during surgery.⁸ Many techniques for reconstruction have been described with good clinical outcomes.⁹ In this Technical Note, we describe use of the hip capsule autograft in augmentation of labral repair of a severely hypoplastic labrum.

Surgical Technique

Patient Positioning and Portal Placement

After induction of general anesthesia, the patient is placed in the supine position with a distractor system table (Smith & Nephew, Andover, MD). The anterolateral (AL) and modified midanterior portals are created after joint distraction is confirmed with fluoroscopy. An interportal capsulotomy is performed between these portals with an arthroscopic blade (Samurai; Stryker, Kalamazoo, MI). Ensuing the capsulotomy, retraction is applied through suspension sutures passed with the help of a suture passer (Pivot Slingshot; Stryker, Kalamazoo, MI) via the AL and midanterior portals. Diagnostic assessment of the central

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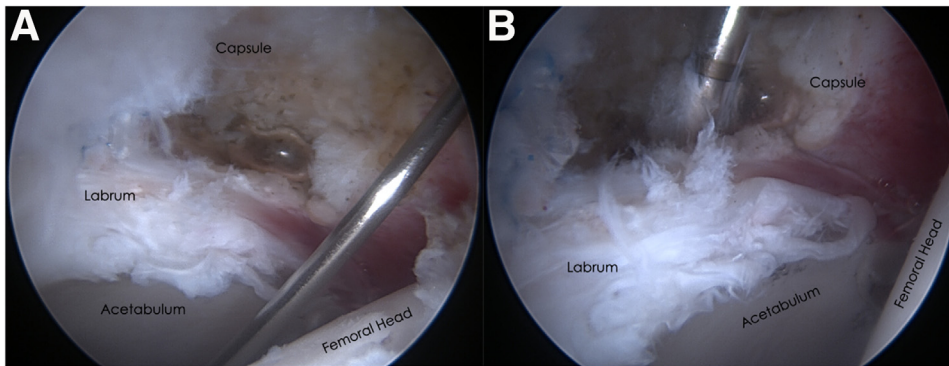


Fig 1. Diagnostic arthroscopy of right hip demonstrating extensive labral degeneration. (A) Close and (B) distant view of the labrum from the anterolateral (AL) portal. Image taken with 70° arthroscope of right hip with patient in supine position (Arthrex, Naples, FL).

compartment is performed using a 70° arthroscope (Arthrex, Naples, FL) after which the distal anterolateral (DLA) portal is created. After evaluation of the labrum, hip arthroscopy of the central compartment is continued with labral reconstruction.

Labral Capsular Augmentation

If there is labral tissue that can be repaired, the anchors are placed according to the localization of the labrum tear, typically within the 12- to 3-o'clock zone. The sutures of these anchors are passed through the labrum with a suture passer (NanoPass; Stryker) in a simple or horizontal mattress fashion. The anchors are placed percutaneously from the AL portal at the 12-o'clock position of the acetabulum and from the DLA portal at the 1- to 3-o'clock positions.

Labral reconstruction with a capsular autograft caused by advanced labrum degeneration (Fig 1) detected during diagnostic arthroscopy between 1- and 3-o'clock positions can be seen in Video 1 (01:00). Capsular tissue is elevated from the acetabular rim using a radiofrequency probe (Dyonics RF System; Smith & Nephew Endoscopy) (Fig 1). The capsular tissue

intended to be used for reconstruction is separated from the indirect head of the rectus femoris tendon with the help of the radiofrequency ablator (Fig 2A) and is exposed (Fig 2B). Free, nonabsorbable suture can be used to tag the capsule and provide traction to help in the dissection and isolation of the capsular tissue for later repair onto the acetabular rim.

PEEK (polyether ether ketone) suture anchors (1.4 mm) (NanoTack TT; Stryker) are evenly placed through the DLA portal at the 1- to 3-o'clock positions of the acetabulum, adjacent to the anterior border of the damaged labral tissue to be reconstructed. One thread of each anchor is passed with the help of a suture passer (Pivot Injector II; Stryker) 5 to 6 mm proximal to the capsule, where they are aligned with the anchors in a mediolateral plane (Fig 3). Then, the capsule is dissected in accordance with the size of the defect with an arthroscopic blade (Samurai; Stryker) in the direction shown in Fig 3C within a mediolateral plane, approximately 7 to 8 mm proximal to the free end of the capsule and proximal of the knots. Reconstruction is performed with the capsular tissue and reinforced with anchors placed on the acetabular rim

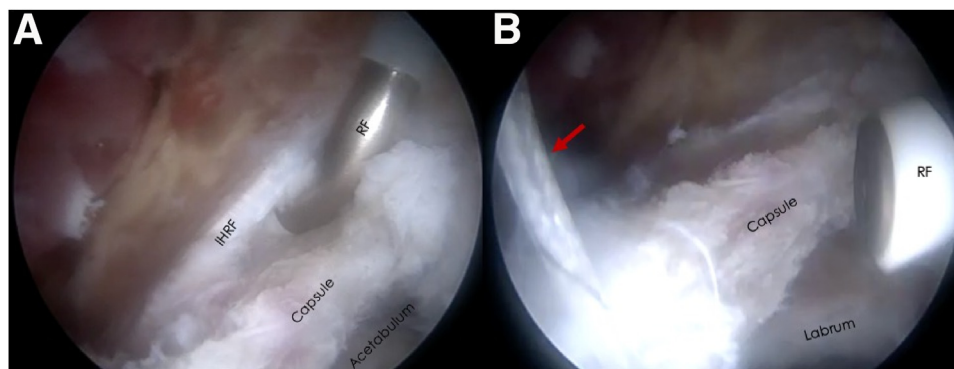


Fig 2. (A) Separation of capsular autograft to be used for reconstruction from the indirect head rectus femoris tendon (IHRF) with the help of a radiofrequency (RF) ablator. (B) Exposed capsular autograft; red arrow pointing to tagging stitch for capsular traction. Image taken with 70° arthroscope of right hip with patient in supine position viewing from the anterolateral (AL) portal (Arthrex, Naples, FL).

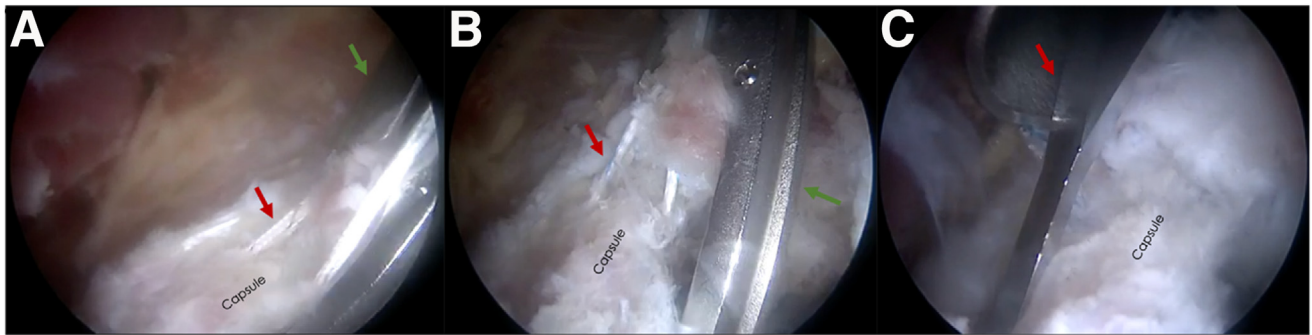


Fig 3. (A, B) One thread of each suture anchor is passed with the assistance of a suture passer (*green arrows*) 5 to 6 mm proximal to the capsule; *red arrows* pointing to suture. (C) Capsule is dissected in accordance with the size of the defect with the help of an arthroscopic blade (*red arrow*) in the direction shown. Image taken with 70° arthroscope of right hip with patient in supine position viewing from anterolateral (AL) portal (Arthrex, Naples, FL).

from the DLA portal. Additional primary knots are passed through the capsule using the threads of these anchors (*Fig 4*). Anchors are sequentially tied fully, reducing the capsule to the acetabular rim. Final debridement is performed as necessary. Steps of the labral reconstruction using capsular autograft are summarized in *Table 1*.

Peripheral Compartment Arthroscopy

Peripheral compartment arthroscopy is initiated after releasing traction. While the hip is in flexion, a T-capsulotomy is performed parallel to the femoral neck using a radiofrequency probe (Dyonics RF System; Smith & Nephew Endoscopy, Andover, MA), arthroscopic blade (Samurai; Stryker), or both. The view is enhanced by applying retraction through suspension sutures passed via the medial and lateral leaflets of the capsulotomy using a suture passer (Pivot Injector II; Stryker). Cam deformity of the femoral head-neck junction is resected with a 5.5-mm arthroscopic burr (Arthrex). The adequacy of the cam resection is assessed through the HipCheck (Stryker) guidance system and dynamic hip examination.

Capsular Management

The part of the T-capsulotomy parallel to the femoral neck is closed side-to-side primarily by passing the suture through both capsulotomy sides with the aid of a suture passer (Pivot SlingShot; Stryker) and is tied. With attention turned to the interportal capsulotomy, capsule closure is performed with sutures passing through the intact capsule and the indirect head of the rectus femoris tendon in the part used for reconstruction.

Rehabilitation

The patient is initially restricted to 20-pound flatfoot weightbearing with the use of crutches and uses a derotational boot for the first 3 postoperative weeks. In the immediate postoperative period (postoperative day 1), physical therapy focuses on passive and low-intensity active range of motion with circumduction. At postoperative week 3, the patient should be weaned from crutches and should advance weightbearing. At this time, focus is to restore normal gait. At postoperative week 6, open- and closed-chain exercises are begun. Range of motion should also be advanced at this point. Activities focusing on return to sport are begun at

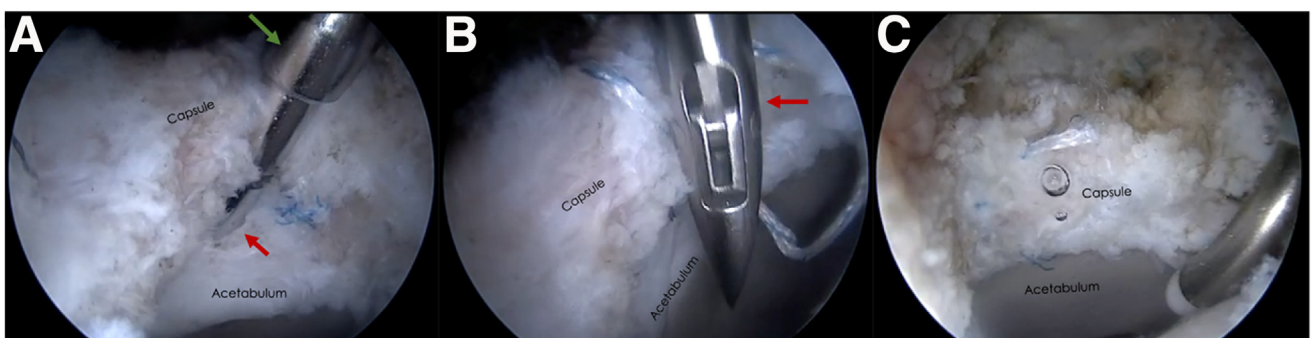


Fig 4. (A) Anchors placed from distal anterolateral (DLA) portal on the acetabular rim for reinforcement of capsular reconstruction. Red arrow points to the anchor placement point at the rim; *green arrow* indicates drill guide. (B) Passing the suture through the capsule with a suture passer (*red arrow*). (C) Final construct of labral reconstruction with capsular autograft. Image taken with 70° arthroscope of right hip with patient in supine position viewing from anterolateral (AL) portal (Arthrex, Naples, FL).

Table 1. Steps of Labral Reconstruction With Capsular Autograft

Capsular tissue is elevated from the acetabular rim using a radiofrequency ablator.
The capsular tissue intended to be used for reconstruction is separated from the indirect head rectus femoris (IHRF) tendon with the help of the radiofrequency ablator and is tagged and exposed.
Suture anchor is placed from the DLA portal at the 1- to 3-o'clock positions of the acetabulum, adjacent to the anterior border of the damaged labral tissue to be reconstructed.
Capsule is dissected in accordance with the size of the defect with an arthroscopic blade.
Reconstruction performed with the capsular tissue is reinforced with anchors placed on the acetabular rim.

postoperative week 12. Patients generally return to sport after 4 to 6 months beginning with activities such as golf and swimming and then transitioning to impact-loading activities and exercises.

Discussion

Biomechanical studies have demonstrated that the acetabular labrum may play a role in decreasing the risk of osteoarthritis by providing a "fluid seal" effect.⁵⁻⁷ As such, repair or reconstruction of the labrum is preferred in instances of a tear. Labral repairs have become a leading treatment option for most patients, regardless of injury etiology.¹⁰ However, in the event that the labrum is deficient, a labral augmentation or reconstruction is needed to restore normal hip kinematics and suction seal.

Initially described by Phillippon et al.,¹¹ labral reconstruction has become a fundamental tool in the armamentarium of an experienced hip arthroscopist. Multiple techniques using autografts and allografts, including circumferential and segmental approaches, have been reported.¹²⁻¹⁴ Both circumferential and segmental techniques have demonstrated good to excellent outcomes.¹⁵⁻¹⁷ Nevertheless, in a cadaveric model, labral repair has been shown to more effectively reestablish the joint fluid seal when compared to reconstruction.⁵ Therefore, in instances of an intact chondral labral junction, a labral augmentation in which

Table 2. Advantages and Disadvantages of Surgical Technique

Advantages
Incorporation of healthy capsular tissue for reconstruction as opposed to allograft tissue
Less technically challenging compared to allograft techniques involving suture shuttling
No donor-site morbidity compared to fascia lata autograft
Disadvantages
Limited literature reporting outcomes after capsule use for autograft with regard to joint stability
Intra-articular suture management can be challenging for surgeons new to this technique
Arthroscopic sizing of the graft may be inexact compared to measuring a graft during open surgery or on the back table

Table 3. Pearls and Pitfalls of Surgical Technique

Pearls
Separation of capsular tissue intended to be used for reconstruction with arthroscopic blade
Tagging stitches in the intended capsular autograft allows for countertraction during arthroscopic sectioning of the graft
Use of IHRF tendon for closure of interportal capsulotomy
Pitfalls
Inability to dissect the capsule fully may lead to inadequate augmentation
Improper countertraction during graft dissection can lead to an asymmetric or truncated graft
Failure to close the capsule can result in ongoing hip pain and microinstability

native tissue can be preserved is preferred over a reconstruction.¹⁰ In a comparison of labral augmentation and reconstruction, Phillippon et al.¹⁸ concluded that patients with labral augmentations more frequently reached the minimum clinically important difference for Harris Outcome Score-Activities of Daily Living and Sport than those with labral reconstruction.

We have described a labral reconstruction augmented with the patient's hip joint capsule. Advantages of this technique include (1) minimized donor-site morbidity compared to other autograft techniques (fascia lata), (2) incorporation of healthy autograft tissue, and (3) less challenging technique compared to the more established labral reconstruction involving graft shuttling (Table 2). Pearls and pitfalls of our technique are described in Table 3. Limited literature currently exists on outcomes following our technique. Because the capsule may play a role in hip joint stability, further studies assessing clinical and biomechanical outcomes of our technique are warranted.

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