

Technical Note

Arthroscopic Technique for Acetabular Labral Reconstruction Using Iliotibial Band Autograft

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Abstract: The dynamic function of the acetabular labrum makes it an important structure for both hip stability and motion. Because of this, injuries to the labrum can cause significant dysfunction, leading to altered hip kinematics. Labral repair is the gold standard for symptomatic labral tears to keep as much labral tissue as possible; however, in cases where the labrum has been injured to such a degree that it is either deficient or repair is not possible, arthroscopic labral reconstruction is preferred. This article describes our preferred approach for reconstruction of the acetabular labrum using iliotibial band autograft.

The acetabular labrum has an important and complex function within the hip joint. It is critical for preserving the suction seal (a key function in normal fluid dynamics within the hip), ensuring wider coverage of the femoral head,¹⁻³ reducing femoroacetabular joint contact pressures,¹⁻³ and providing negative intra-articular pressure that provides stability to the hip joint.⁴ Labral pathologies can lead to disruption of this seal, causing imbalances within the hip joint.⁵ This, in turn, can cause impaired lubrication and nutrition of the joint and thereby lead to an accelerated degenerative process.⁶

For the reasons aforementioned, a recent level I study demonstrated that labral repair is the gold standard for symptomatic labral tear pathology.⁷ However, in situations where the labrum has been deranged to such an extent that primary repair cannot be accomplished (irreparable complex tear with degeneration, severely

hypotrophic labrum, ossified labrum, or segmental deficiency), a labral reconstruction is warranted.

Reconstruction allows for improvement in hip stability and pressurization.^{5,8} In particular, a recent biomechanical study has demonstrated that labral reconstruction in labral-deficient hips significantly improves pressurization to a level similar to that of the intact state.⁵ The purpose of this technical note is to describe our preferred technique for arthroscopic hip labral reconstruction with iliotibial band autograft.

Surgical Technique

Our preferred surgical technique for labral reconstruction can be seen in detail in [Video 1](#). Pearls and pitfalls associated with the procedure are noted in [Table 1](#).

Patient Positioning

The patient is placed in a modified supine position on a traction-operating table (Steris/Amsco, Mentor, OH). After induction of general anesthesia, a bilateral lower extremity examination is performed to assess for hip range of motion. Traction is gently applied to the leg with 15° of internal rotation, 10° of lateral tilt, 10° of flexion, and neutral abduction. To prevent neurologic complications, an extrawide perineal post is used and lateralized toward the ipsilateral side in the perineal space to minimize pressure on the pudendal nerve and to force the femoral head laterally, shifting the vector of forces. Adequate traction is verified with the fluoroscope (confirmed with a “vacuum sign” and 1 cm of joint distraction).

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Table 1. Pearls and Pitfalls

Pearls	Pitfalls
Correct portal placement allows for improved visualization. Accessory portals such as the distal anterolateral accessory portal can be created to achieve better visualization and anchor placement if needed.	Improper visualization can lead to a defective bony bed preparation or insufficient resection of the damaged labrum.
Careful acetabular bony preparation and debridement until stable labral margins are found are key for the procedure.	Failing to secure the ends of the graft prior to fixation of the middle portion may lead to intra-articular graft fraying or radial tearing of the graft while attempting to tension the ends into position.
Attempts should be made to keep the reconstruction area as small as possible.	Failure to perform bony preparation might reduce the biological properties of the bony bed.
Meticulous preparation of the graft can save valuable time in the intraarticular procedure. Devote the necessary time to avoid graft fraying or damage.	Dynamic examination should be always performed to evaluate the suction seal after reconstruction. This can limit undesirable postoperative events that could be prevented at the time of surgery.
Insert the graft into a 3 o'clock position and then perform fixation of the lateral side. Once both ends of the graft are in place, secure the middle portion of the graft.	

Arthroscopic Technique

Access to the hip joint is accomplished through 2 arthroscopic portals: the anterolateral and midanterior portals.⁹ A 70° arthroscope (Smith & Nephew, Andover, MA) is used to perform a diagnostic arthroscopy with the purpose of evaluating the status of the labrum and assessing for associated pathologies including bony impingement, cartilage lesions, loose bodies, synovitis, or adhesions. A femoral neck osteoplasty is performed when cam type femoroacetabular impingement is present.

After confirmation of labral deficiency, acetabular bony preparation and debridement to stable labral margins are accomplished with a motorized shaver and burr, attempting to keep the reconstruction area as small as possible. Placement of a 1.5-mm Jugger-Knot anchor (Biomet, Warsaw, IN) at the 3 o'clock position on the acetabulum is performed (Fig 1).

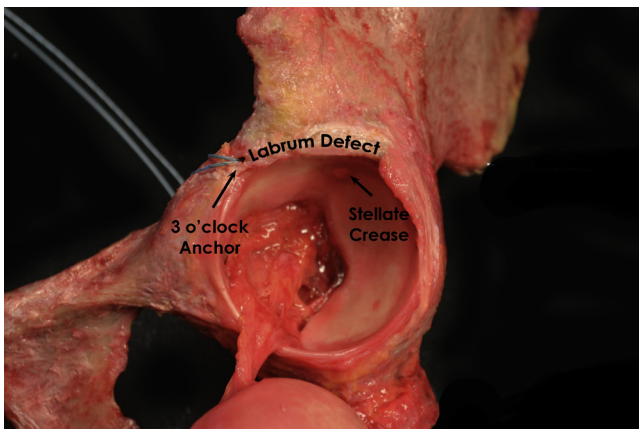


Fig 1. Photograph of a cadaveric left hip with the femoral head disarticulated demonstrating the acetabulum and a bioabsorbable anchor positioned at the anteromedial end of the labrum defect near the 3 o'clock position.

Graft Preparation

After confirmation of significant labral deficiency, autogenous iliotibial band is the graft of choice for labral reconstruction. This graft is ideal as its proximity to the arthroscopic portals makes harvesting the graft less challenging. Additionally, the technique requires minimal dissection and violation of deep tissues.

For graft harvest, traction is released, the lower extremity is straightened into full extension, and the foot is placed in internal rotation. A longitudinal incision is made just distal to the anterolateral portal directly in line with the long axis of the proximal femur. A

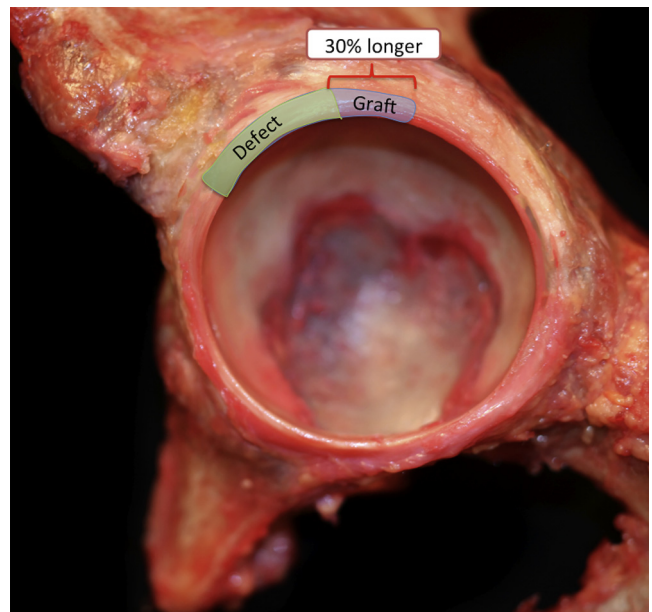
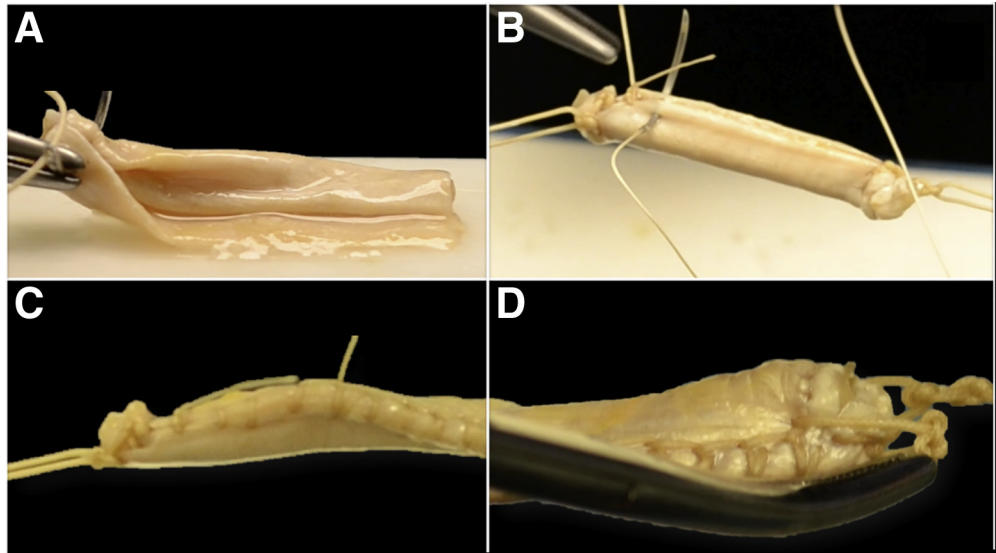


Fig 2. Photograph of the lateral aspect of a cadaveric left hip with the femoral head disarticulated to reveal the underlying acetabulum. This image demonstrates a schematic calculation for the graft size, which should be at least 30% longer than the labral defect length.

Fig 3. Iliotibial band graft preparation sequence: (A) tubularization of the iliotibial band autograft; (B) longitudinal continuous locked suture within the graft; (C) continuous nonlocked suture in the opposite direction done in the intervals of the previous suture; and (D) suture loop at one end of the graft to direct the graft into place. Of note, as depicted in the image it should exceed the graft border when tensioned.



rectangular graft is harvested along the iliotibial band at the junction of the anterior two-thirds and posterior one-third. The harvested graft should be folded 3 to 4 times and approximately 30% to 40% longer than the labrum defect, which was measured with an arthroscopic probe (Fig 2). Prior to closing the incision, a bursectomy at the iliotibial band harvest site is often performed.

Once the autograft is harvested, it is then cleared of any muscular or fatty soft tissue remnants. Hanging stitches are placed on the ends of the graft to help with tubularization. Hanging stitches help to secure the ends and prevent the anastomosis sutures from pulling out while being fixed. Tubularization of the graft is accomplished with Krackow stitches performed in a longitudinal fashion in one direction and nonlocked continuous suture in reverse direction, using no. 2-0 Vicryl (Ethicon, Somerville, NJ). Cerclage of both graft ends is then performed to avoid inadvertent loosening of the tubular shape. It is important that all the knots

are placed on the superior portion of the graft in order to preserve a smooth interface at the inferior aspect for soft tissue to bone healing. Additional reinforcing sutures should be placed at both ends to avoid graft tearing that can occur with suture passage. Finally, a suture loop is made at one end of the graft to allow for grasping during passage of the graft into the hip joint. This loop should obey the 3 Ls rule (loop, lateral, and large)—which means that the loop has to be placed in the lateral margin and it has to exceed (longer) the graft end. Of note, the loop is typically made at the thicker end of the graft, to help with natural labral contour and size progression. For detailed steps in preparation, see Figure 3.

Arthroscopic Labral Reconstruction

Upon completion of graft preparation, the lower extremity is then placed back into traction. The graft is then pierced with a free needle holding one arm of the sutures of the previously placed anchor. The graft is

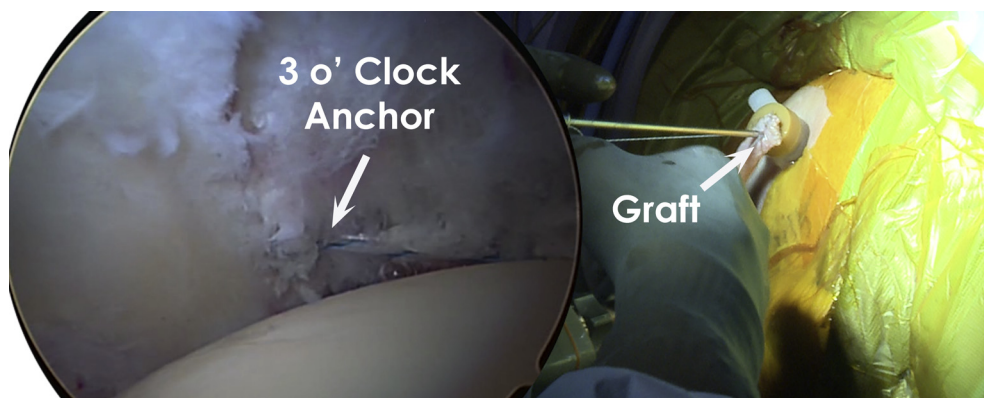


Fig 4. Left: Arthroscopic view of the right hip as viewed through the anterolateral portal demonstrating placement of an anchor into the 3 o'clock position. The free suture ends of the anchor are shuttled through a cannula in the midanterior portal. Right: Intraoperative view from outside of the right hip with the suture ends from the anchor attached to the iliotibial band autograft. The graft is being shuttled into the hip through a cannula placed in the midanterior portal.

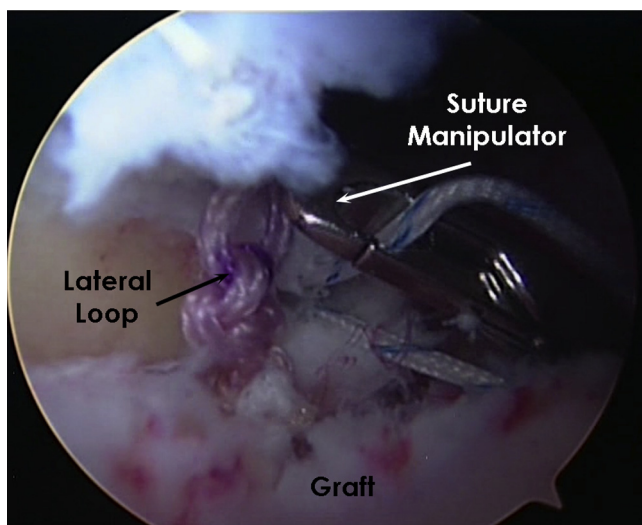


Fig 5. Arthroscopic view of a right hip as viewed through the anterolateral portal with a previously placed iliotibial band autograft and associated suture loop at its free end. The suture grasper is used to pass one limb of the suture emanating from the anchor through the loop, and arthroscopic knots are then tied to secure the graft in place.

inserted through the midanterior portal, using a plastic 7 mm × 11 cm cannula (Arthrex, Naples, FL; Fig 4).

To help accomplish graft passage, a Davis tonsil is used to pierce the medial aspect of the graft, which allows controlled delivery of the graft to the area of the defect with knot pusher guidance. The graft is then secured against acetabulum at the most medial aspect of the labral defect with half-hitch sutures, thus anchoring one end of the graft anteromedially along the acetabular rim.

Next, a second anchor (1.5 mm Juggernaut anchor; Biomet) is used to secure the lateral aspect of the graft against the labral-deficient acetabulum. Using a pointed suture passer (Arthropierce, Smith & Nephew, Andover, MA) or a regular grasper placed through the

previously created loop at the lateral end of the graft, one limb of the anchor sutures is grasped and retrieved through the loop. Arthroscopic half-hitch sutures are then used to tie the loop and graft into place. Both ends of the graft are now secured down to the acetabular rim (Fig 5).

Extra suture anchors are then placed sequentially along the midportion of the graft, where one limb of each suture of the anchor can be looped around the graft (everts the graft) or go through the graft (inverts the graft) to recreate the suction seal and anatomic function of the labrum (Fig 6).

Depending on how the graft fits in the segment, an absorbable suture can be used to anastomose the end of the graft to the native labrum. When finished, the graft should be well fixed to the acetabulum and resemble the native labrum (Fig 7).

Traction is released, and the reconstruction is evaluated dynamically in all planes of motion to assess the fixation, position of the graft, and recreation of a seal on the femoral head.⁹ If the graft is unstable or does not create the seal, more sutures may be required to stabilize the graft (Fig 8).

Capsular Closure

Once the desired intra-articular result has been achieved, the hip is brought into flexion to relax the anterior capsule and facilitate the closure. An intra-articular cannula (Arthrex) is inserted through the midanterior portal. A suture-shuttling device (SutureLasso; Arthrex) is used to approximate the proximal leaf of the capsule to the distal leaf passing a no. 2 Vicryl in a suture relay technique. The bird-beak penetrator (Arthropierce) is then used to retrieve the lasso through the capsule on the distal side of the capsulotomy. The lasso is used to pass a permanent suture, achieving a side-to-side anastomosis. This is tied arthroscopically with racking half-hitch knots outside of the capsule. A total of 2 to 4 side-to-side sutures are placed to complete the capsular closure.

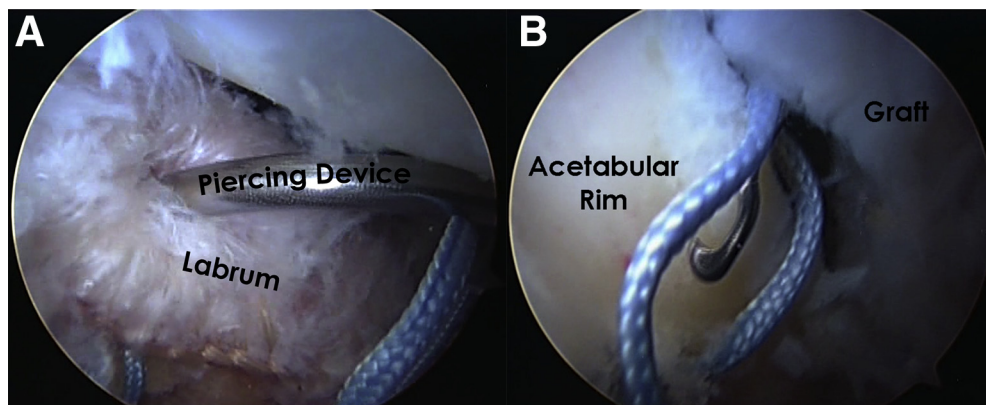
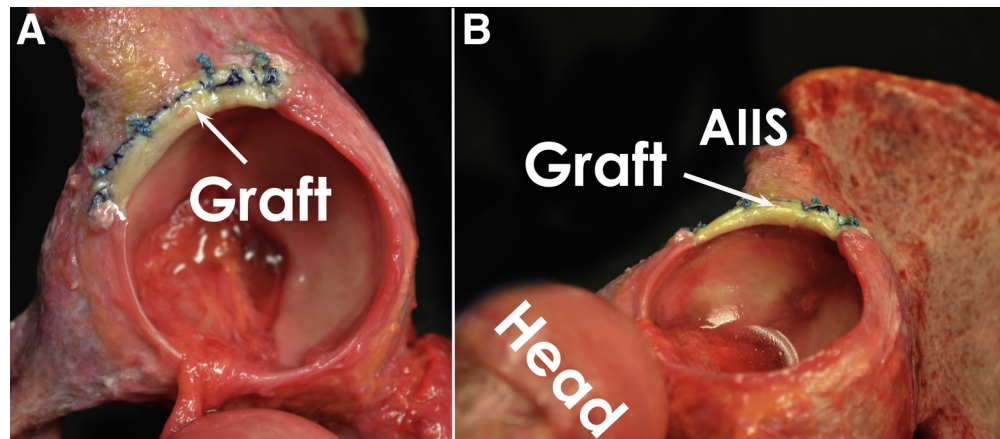


Fig 6. Arthroscopic view of a right hip as viewed through the anterolateral portal with the associated graft for labral reconstruction. After placing an arthroscopic anchor in the acetabular rim, a piercing device is used to shuttle the suture either (A) through or (B) around the labrum. Arthroscopic knots are then tied to secure the graft.

Fig 7. Photograph image of a left cadaveric hip with the femoral head disarticulated to visualize the acetabulum. A labral reconstruction image demonstrating (A) a frontal view of the reconstruction resembling the native labrum and the (B) posteroinferior view of the labral reconstruction depicting a smooth transition between the graft and the native labrum. Of note, 4 anchors are displayed, 2 with a loop (borders) and 2 with a pierced mattress suture (central) configuration.



Postoperative Rehabilitation Protocol

Postoperatively, patients are allowed 20 pounds of foot-flat weight bearing for 21 days, followed by 1 week of weaning off crutches. A continuous passive motion machine is used for 4 weeks for 6 to 8 hours per day. This period of time increases to 8 hours per day for 8 weeks if microfracture is performed. An antirotation bolster to prevent hip external rotation is used for 21 days after surgery. A hip brace is used to restrict extension and external rotation for 21 days postoperatively. Physical therapy is used to first restore passive motion, followed by active motion and, lastly, strength. Passive hip circumduction motions to prevent adhesions are also performed 4 times daily.⁸ Endurance strengthening is commenced after motion is maximized and good stability in gait and movement is shown.

Discussion

This labral reconstruction technique using iliotibial autograft has demonstrated excellent subjective and objective patient outcomes,¹⁰ and a recent systematic review¹¹ reinforced that a subset of patients may be

considered eligible candidates for labral reconstruction. The typical patients considered for these procedures are young, active individuals with an irreparable or degenerative labrum, patients with prior labral resection, and patients with preserved joint space with a minimum width of 2 mm.⁹ In this population, hip labral reconstruction has demonstrated short-term improvement in patient-reported outcomes and functional scores postoperatively.¹¹

Nepple and colleagues⁸ reported a significant increase in hip distractive stability with a partial labral resection state as compared with labral reconstruction. Furthermore, recently published cadaveric biomechanical studies have reported improvements in the joint contact area, intra-articular pressures,¹² and pressurization with both labral repairs and labral reconstructions.⁵

Likewise, good results have been reported for labrum reconstruction using ligamentum teres capitis or fascia lata autograft in patients undergoing open surgical hip dislocation.¹³ In this study, the investigators reported on 19 patients (20 hips) with a minimum follow-up of 12 months. Three patients were converted to total hip arthroplasty within 36 months of the primary surgical

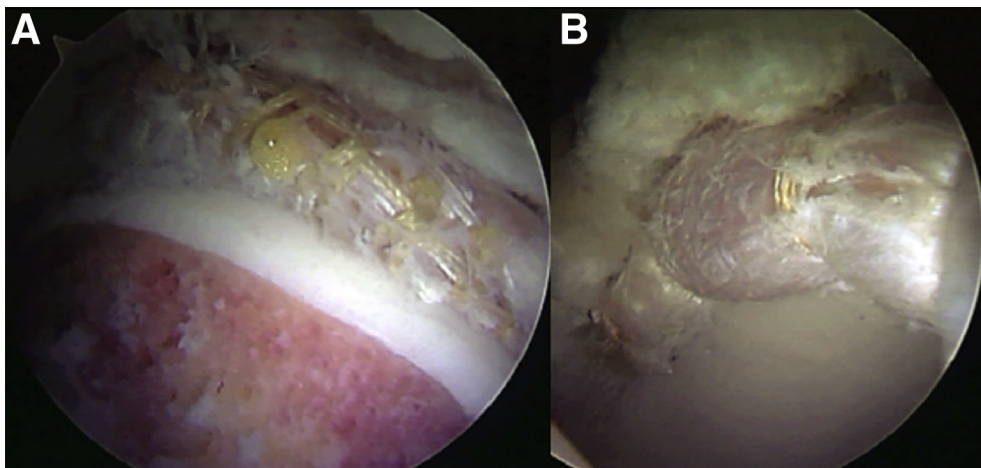


Fig 8. Intra-articular arthroscopic image of a right hip demonstrating the final result of the iliotibial band autograft labral reconstruction as viewed through the midanterior portal. These images show the autograft from the (A) lateral and (B) central compartment, after fixation, demonstrating the graft position on the rim.

Table 2. Advantages and Limitations

Advantages	Limitations
When a repair cannot be accomplished because of a complex labral tear with tissue degeneration, severely hypotrophic labrum, ossified labrum, or segmental deficiency for a previous surgery, labral reconstruction can help restore anatomy and function to the injured hip.	This procedure is technically demanding and requires advanced hip arthroscopy skill and experience.
Reestablishes the hip fluid seal and the contact areas of the joint and allows for improved hip stability.	The use of autograft necessitates a separate incision and harvesting of the iliotibial band. This could potentially induce soft-tissue complication in the harvest area.
It has demonstrated good outcomes at short and medium term follow-up.	This technique does have significant long-term follow-up, and therefore there may be long-term complications that have not yet been determined.
Several grafts including autografts have been reported to produce good outcomes.	

procedure. Of the remaining 17 hips, 15 reported improved pain and function with an average UCLA score of 8.5 (5 to 10) with no associated complications. The other 2 patients reported mild pain. They concluded that the majority of patients undergoing labral reconstruction demonstrated improvement in hip pain and function after surgery.

In regard to the graft source, the first description of this technique used ligamentum teres capitis autograft in an open surgical hip dislocation.¹⁴ No intraoperative or postoperative complications related to the reconstruction were reported.¹⁴ The iliotibial band autograft has a number of advantages that may make it a superior choice¹⁰ (Table 2). The advantages of using an iliotibial band autograft are the relative proximity to the portals and that one can adjust the graft's diameter during tubularization.¹⁰ In addition, the iliotibial band autograft has been used in a population of elite athletes, demonstrating successful return to sport after labral reconstruction.¹⁵ Despite our preference, a recently published biomechanical study of different graft choices including acetabular labrum, iliotibial band, semitendinosus, gracilis, indirect head of the rectus femoris, and anterior tibialis tendons displayed similar cyclic elongation behavior in response to simulated physiologic forces.¹⁶ Domb et al.¹⁷ also reported on the benefits of gracilis tendon autograft for labral reconstruction because of the concern that disrupting iliotibial band fibers might alter the mechanics of the hip and complicate recovery from hip arthroscopic surgery.¹⁸ However, no complications were found in our series, likely due to the meticulous closure of the remnant iliotibial band (6 to 8 interrupted no. 0 Vycril sutures). Local capsular autograft¹⁹ and quadriceps tendon autograft²⁰ can also be used.

Allograft tissue has also been reported for labral reconstruction. Advantages of the allograft are the possibility to control the thickness, length, and consistency of the graft and the lack of donor site morbidity. Furthermore, allograft tissue is aneural, and it has been suggested that this is a potential benefit in pain

reduction.²¹ Despite the potential advantages, allograft does carry a small risk of disease transmission and can create a host response to the foreign material.²²

The iliotibial band autograft labral reconstruction is an established technique that, when indicated in the appropriate patient (where a repair cannot be performed), can result in excellent outcomes and return to activity. Although technically demanding, this technique reestablishes the hip fluid seal and the contact areas of the joint and allows for improved hip stability. A drawback when using an autograft is the need of a separate incision and harvesting of the iliotibial band, which adds morbidity of the harvesting site and time to the surgery. This could potentially induce soft-tissue complication in the harvest area.

We recommend this technique for labral reconstruction and encourage further studies by other groups to evaluate our surgical technique and long-term subjective and objective patient outcomes.

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