Arthroscopic Labral Repair in the Treatment of Femoroacetabular Impingement

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Abstract: Labral repair has become an essential technique in the arthroscopic surgical management of femoroacetabular impingement. Several clinical studies suggest that labral repair results in superior patient outcomes in comparison to labral debridement alone. The repair procedure requires accurate evaluation of labral tissue quality, precise placement of sutures and anchors, and careful re-tensioning of the labrum. We present our preferred technique for labral repair.

Femoroacetabular impingement has become a well-recognized pathologic condition. It is caused by abnormal contact between bony abnormalities of the acetabulum and femoral head-neck junction (pincer and cam lesions, respectively) and secondary injury to the articular cartilage and labrum (chondrolabral delamination and labral tears). Successful surgical management addresses all of these pathologic lesions and attempts to restore the native anatomy. Specifically, large pincer lesions (>3 mm) require labral detachment and bony resection, followed by either labral debridement or refixation. Isolated labral tears, which are uncommon, require either selective labral debridement or repair. Although early arthroscopic techniques in the hip permitted only debridement, recent advances have made labral repair more routine and practical. This is important because retrospective studies have favored labral repair over debridement at 3.5 years' follow-up, and a recent prospective, randomized study comparing selective labral debridement with labral repair confirmed these findings.

The goals of labral repair are to securely reattach the labrum to the acetabular rim, to re-create a smooth transition zone between the articular cartilage and labrum, and to restore a suction seal between the labrum and femoral head. Numerous repair techniques exist to accomplish these goals, although—to our knowledge—no studies establish the superiority of one technique over another. Our preferred technique is that of labral base refixation because it closely simulates the open repair technique of Espinosa et al. that has shown promising outcomes. In the accompanying video presentation (Video 1), we demonstrate the technique of labral base refixation after a large (>3 mm) pincer resection.

Surgical Technique

Hip arthroscopy is performed in the usual fashion. Our preference is to perform this with the patient in the supine position, using an anterolateral portal as the viewing portal and a mid-anterior portal as the working portal for the majority of the procedure. After the portals have been established and a capsulotomy has been performed, the labrum is typically detached and the pincer lesion is resected. The labrum is then evaluated for tissue quality. A labrum of poor quality may be appropriate only for debridement, whereas a small labrum (<3 mm) precludes the use of the labral base refixation technique and may necessitate the use of a simple suture configuration.

Once the labrum is deemed acceptable for repair, the size and location of the labral tear are further evaluated to plan suture anchor placement. Anchors should be placed 6 to 8 mm apart, and an average-sized tear requires 3 to 4 anchors. We prefer to begin the repair medially, then repair the lateral-most aspect of the tear, and finally, return to the anterior and anterosuperior regions. Anchors are most commonly placed through the mid-anterior portal; however, far-lateral anchors

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may need to be placed through the anterolateral portal to obtain a drilling angle that prevents both penetration of the acetabular cartilage and skiving off of the acetabular rim.

After planning of the repair, the next step is to pass a No. 2 FiberStick (Arthrex, Naples, FL) through the labrum by use of a Crescent SutureLasso (Arthrex) (Fig 1A). The goal is to pass the Crescent through the center of the labrum so that approximately 50% of the labrum will be captured by the FiberStick stitch and will be anchored to the acetabular rim. In terms of medial to lateral, the FiberStick is placed through the labrum immediately opposite the planned anchor location so that the labrum will ultimately be restored to its original location on the acetabulum without undue tension or laxity. Once the FiberStick is passed through the labrum, the camera is used to pinch the suture against the acetabular cartilage. This secures the suture while the Crescent is removed from the hip joint and prevents accidental suture pullout from the labrum. Using a KingFisher suture grasper (Arthrex) inserted between the articular cartilage and labrum, we then pull the FiberStick out of the acetabulum.

Next, a pilot hole for a 2.9 × 10.7-mm PushLock anchor (Arthrex) is drilled in the planned location. Pilot holes should be drilled 1 to 2 mm proximal to the acetabular rim, which prevents acetabular penetration but still allows for re-creation of a smooth transition between the articular cartilage and the labrum. Each pilot hole is drilled while the surgeon is directly visualizing the acetabular articular cartilage and then is double-checked for penetration (acetabular or intra-pelvic) and for correct positioning by palpation with a nitinol wire and by fluoroscopy (Fig 2). The PushLock anchor is then used to secure both limbs of the FiberStick into the predrilled pilot hole. Tensioning of each suture limb independently during PushLock placement controls the ultimate tension within the repaired labrum, as well as the orientation of the labrum on the acetabular rim (Figs 1B and 1C). It is important not to over-tension the suture because this may significantly evert the labrum and prevent formation of a suction seal once the femoral head is reduced.

The process of suture passage through the labrum and anchor placement is repeated for each of the planned anchor locations. Because the labrum may be quite tightly opposed to the acetabular rim before placement of the last anchor, suture retrieval for this anchor may need to be performed by use of a hip-specific, arthroscopic probe (Arthrex) or a BirdBeak suture passer (Arthrex) because they are narrower than the KingFisher.

Once the labral repair is complete, the traction is released and the apposition between the repaired labrum and the femoral head is evaluated while the surgeon is viewing from the peripheral compartment.
Table 1 reviews the key points of the labral base refixation technique.

**Discussion**

Recent clinical studies have shown favorable results of labral repair in comparison to labral debridement, whether performed arthroscopically or by open techniques. Larson et al.² and Espinosa et al.³ have reported that, at a mean of 3.5 years' follow-up, 68% and 76% of labral debridement patients, respectively, had good to excellent results compared with 92% and 94% of labral refixation patients, respectively. Larson et al. also reported significantly higher modified Harris Hip Scores and Short Form 12 scores and significantly lower visual analog scale scores for pain in the refixation patients. More recently, a prospective, randomized study comparing selective labral debridement (rather than complete labral resection as used in the previous studies) with labral repair also found superior Hip Outcome Scores and better patient subjective outcomes with labral repair.⁴ These studies suggest that, when possible, labral repair should be performed over labral debridement.

Currently, no clinical studies have compared the efficacy of different labral repair techniques. Described techniques include the cinch stitch, the looped simple stitch,⁶ and labral base refixation.¹ All of these techniques attempt to accomplish the same goals: to securely reattach the labrum to the acetabular rim and to restore a suction seal between the labrum and femoral head. The looped simple stitch has been criticized because it may bunch the labrum and distort the

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**Fig 2.** Anteroposterior fluoroscopic images of a right hip showing the nitinol wire, placed through the PushLock drill guide, in the pilot holes for the most medial (A) and the most lateral (B) PushLock anchors. (a, arthroscope; b, nitinol wire; c, PushLock drill guide.)

**Fig 3.** Arthroscopic view of the right acetabulum and labrum as viewed through the anterolateral portal showing the final labral repair (A) and the re-creation of the suction seal after release of traction (B). (a, bony acetabular rim after pincer resection; asterisk, acetabular articular cartilage; plus sign, labrum; pound sign, femoral head.)
normal triangular cross-sectional anatomy. It has been proposed that this may pull the labrum away from the femoral head at the suture site and decrease the suction seal. Numerous studies, however, with good clinical outcomes have been published using this technique. In addition, Philippon and colleagues suggest that the triangular configuration of the labrum is not lost with this technique because of the small width of the suture (0.5 mm) and have published magnetic resonance images showing a triangular-shaped labrum as early as 3 weeks after surgery.

The labral base refixation technique, in contrast, has been criticized because of the inherent risk of tearing the labrum during suture passage. As such, the technique may not be appropriate for repair of a labrum less than 3 mm thick, and the technique should also be performed with a narrow suture-passing device, such as the SutureLasso. By following these recommendations, we have had no difficulties with labral tearing during suture passage.

Arthroscopic labral repair is a valuable technique in the treatment of femoroacetabular impingement. Emerging clinical results suggest that repair procedures may provide additional benefit in comparison to labral debridement. This article and the accompanying video have described our preferred technique of labral base refixation for labral repair. Accurate evaluation of labral tissue quality and size, precise suture and anchor placement, and careful re-tensioning of the labrum are important factors in the restoration of labral anatomy.

Table 1. Key Points of Labral Base Refixation Technique

| The labral tissue must be of good quality and greater than 3 mm in width. |
| PushLock anchors should be placed 6 to 8 mm apart, and an average tear requires 3 to 4 anchors. |
| Begin the repair medially, then repair the lateral-most aspect of the tear, and finally, return to the anterior and anterosuperior regions. |
| Use a Crescent SutureLasso to pass a No. 2 FiberStick through the center of the labrum, and use a KingFisher suture grasper to retrieve the suture from between the labrum and articular cartilage. |
| Drill a pilot hole for the PushLock anchor 1 to 2 mm proximal to the acetabular rim and directly opposite the FiberStick suture in the labrum. |
| Check for penetration and appropriate drill hole placement using palpation with a nitinol wire and fluoroscopy. |
| Tension each suture limb independently during PushLock anchor placement to control the orientation of the labrum and the ultimate tension within the labral repair. |
| Once the repair is complete, release the traction and check for a suction seal between the labrum and femoral head while viewing from the peripheral compartment. |

References