A Simple Technique for Capsular Repair After Hip Arthroscopy

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Abstract: Capsulotomy is typically performed during arthroscopic treatment for femoroacetabular impingement. As the frequency of hip arthroscopy continues to expand rapidly, increased attention is being paid to the implications of interportal capsulotomy and the need for repair. To minimize the risk of postoperative instability, capsular closure has been recommended to restore the anatomy and biomechanical function of the capsule. We present a reliable, efficient, and effective method for arthroscopic closure of the interportal capsulotomy after hip arthroscopy.

When one is treating conditions of the hip through an arthroscopic approach, an interportal capsulotomy improves visualization and exposure of the central and peripheral compartments, labrum, acetabular rim, and subspine region.1,2 It is typically created between the anterolateral and midanterior (or direct anterior) portals under direct arthroscopic visualization. The interportal capsulotomy allows for protection of the surrounding soft-tissue structures such as the abductors and both heads of the rectus during pincer or subspine bony resection. It also improves access for treating labral injuries (debridement, anchor placement, and suture passage), articular cartilage defects of the acetabulum, and symptomatic psoas tendons.

Although some debate remains, indications for closure of the capsulotomy after hip arthroscopy are becoming clear, with many surgeons now performing closure routinely.1-4 A recent systematic review found that a number of factors increase the likelihood that a surgeon will perform capsular closure such as young patient age, high activity level, hip laxity, presence of dysplasia, and presence of robust capsular tissue.3 Basic science research has consistently shown the importance of capsular integrity for optimal hip stability.1 In addition, a number of case reports describe the development of hip instability after arthroscopic surgery due in part to capsular insufficiency.5-7

As the rate of hip arthroscopy continues to expand rapidly, the concern for restoration of hip stability after surgery is growing. With this, increased attention is being paid to the role of capsular closure or plication (or both). Accordingly, a safe, efficient, and reproducible technique for capsular closure is desirable. We present a simple and reproducible method for arthroscopic closure of the interportal capsulotomy. This procedure can be performed in all patients but may be particularly important in patients at risk of postoperative macroinstability or microinstability. These include patients who are young, participate in high-demand activities, show hip or generalized ligamentous laxity, meet radiographic criteria for dysplasia, or easily undergo dislocation during the application of traction.2 This technique can be used for simple closure or plication with direct passage of suture without having to use a shuttle and can be performed with absorbable or nonabsorbable suture (Video 1).

Technique

Accessing Hip Joint

Although we routinely perform hip arthroscopy with the patient in the supine position, this technique can also be used for the laterally positioned patient. After application of traction and satisfactory distraction, the anterolateral portal (ALP) is created under fluoroscopic
Capsular Closure

The midanterior portal (MAP) is then created under direct arthroscopic visualization with the camera in the ALP. A cannula (8.0-mm hip-length cannula; Arthrex, Naples, FL) is placed into the MAP, and a Samurai Blade (Pivot Medical [Stryker Sports Medicine, Greenwood Village, CO]) is introduced. Once the tip of the blade enters the joint space, the cannula is retracted superficial to the capsule to the hilt of the blade. The capsulotomy is centered between the femoral head and the labrum (Fig 1) and is initially carried as far medially as necessary. The capsulotomy is then extended laterally toward the camera and the ALP. If the surgeon is unable to complete the capsulotomy all the way to the ALP with the knife in the MAP, then the camera and blade positions can be switched. The remainder of the interportal capsulotomy is performed with the knife in the ALP while viewing from the MAP. The capsulotomy can be extended lateral to the ALP as needed. The labrum, rim, and subspine region can then be accessed and treated as indicated. Once the central compartment work is completed, the hip is reduced and femoral pathology is addressed. It is critical to maintain the integrity of the proximal limb of the capsule during the procedure to facilitate repair at the end of the case.

Capsular Closure

To close the capsule, the hip is gently flexed to 40° to relax the anterior capsule and iliofemoral ligament. With the camera in the ALP, 8-mm cannulas (Arthrex) are inserted into the MAP, as well as the distal anterolateral accessory portal (DALAP) if one has been created. The 70° Pivot Slingshot suture passer (Pivot Medical [Stryker Sports Medicine]) is then loaded with a No. 1 absorbable Vicryl suture (Ethicon, Somerville, NJ), No. 2 Orthocord suture (DePuy Synthes, Warsaw, IN), or other similar suture. This is inserted into the MAP, and the closure proceeds from medial to lateral. The suture passer sharply penetrates the superior capsule about 3 mm from the edge near the medial corner of the capsulotomy (Fig 2A). Care should be taken not to injure the underlying cartilage or labrum. The suture is then deployed on the articular side of the capsule, and the suture passer is retracted from the superior capsular limb. Without exiting the cannula, the empty suture passer is translated inferiorly toward the distal limb of the capsule. It then penetrates the inferior capsule 3 mm from its edge and grabs the free suture (Fig 2B). Again, care should be taken not to injure the underlying cartilage. The suture is pulled through the inferior limb of the capsule and out of the cannula in the MAP. To prevent tangling, the suture strands are retrieved through the DALAP if one has been created. If not, they can be left in the MAP or tied sequentially. In this instance, great care must be taken to prevent entanglement of sutures. The next suture is passed from the MAP in the same fashion approximately 1 cm lateral to the first stitch. It is helpful to pass sutures of alternating colors. This aids in identifying their locations later during knot tying. After the second suture is passed, it is also retrieved through the DALAP. Traveling from medial to lateral, additional sutures are passed until the lateral edge of the capsulotomy is reached (Fig 2C), and all sutures are retrieved through the DALAP. The capsulotomy can typically be closed securely with 3 well-spaced sutures. Suture tying then begins from medial to lateral.

The medial-most suture strands are retrieved from the DALAP through the MAP and tied arthroscopically under direct visualization. This suture is cut, and the next is retrieved and tied through the MAP. This continues laterally until all sutures are tied and cut (Fig 2D). To prevent entanglement and add clarity during this stage, it is helpful if sutures of alternating colors are passed. We typically perform tying after all sutures have been passed, but they can be tied individually after passing each suture. Tying sutures in the latter manner may reduce the closure time, but it runs the risk of boxing the surgeon out and making passage of the lateral-most sutures difficult as the capsule closes down. For standard closures, sutures are passed directly across the capsulotomy from one another. If there is concern for postoperative instability, the capsule can be plicated or advanced using this technique by altering the location at which the sutures are passed through the capsule.

Postoperative Rehabilitation

Postoperative restrictions and rehabilitation are determined primarily by the surgical procedure performed inside the capsule rather than by the closure itself. However, we recommend restricting hip
extension and external rotation for the first 4 weeks for patients undergoing capsulotomy closure.

Discussion
As our understanding of hip instability after arthroscopy continues to grow, increased attention is being paid to the role of the capsule, capsulotomy, and capsular closure after treatment for femoroacetabular impingement.1,3,4 Biomechanical data have shown that optimal hip stability is achieved when the capsule remains intact or is repaired.3,4 Additional study has suggested that patients with capsular insufficiency or those undergoing capsulotomy without repair may be at increased risk of postoperative pain in addition to instability.1 This may be particularly true for those with pre-existing joint laxity, high activity levels, or hip dysplasia.1 This increased body of knowledge is leading more surgeons to perform capsular closure or plication in appropriately selected patients.3,4 Accordingly, a reliable, efficient, and effective method for capsular repair is desired. To date, a few techniques have been reported in the literature,2,4,9 and as our experience and understanding progress, these techniques continue to evolve.

Our technique for arthroscopic capsular closure can be performed in a safe and efficient manner when precise surgical steps are followed (Table 1). Minimal equipment is required (Table 2). The technique has the distinct advantages of allowing closure to be performed through a single portal, allowing for plication when necessary, and minimizing the risk of suture entanglement. It is performed with a single suture passer without the use of separate shuttles, graspers, or tissue penetrators. Depending on surgeon preference, either

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**Table 1. Key Points for Arthroscopic Closure of Interportal Capsulotomy**

- Interportal repair begins with an interportal capsulotomy.
- Preservation of the capsular limbs is critical.
- The technique can be performed through a single working portal, but an accessory portal is helpful for suture management.
- Flexing the hip will relax the anterior capsule and increase the working space.
- The Slingshot suture passer is available in 45° and 70° angulations.
- Passing all sutures before tying preserves the working space. The sutures can be tied as they are thrown, but this may close down the work space and reduce visualization.

**Table 2. Equipment Required**

- Standard arthroscopy equipment including a cannula or cannulas
- Pivot Samurai Blade
- Pivot Slingshot suture passer
- Permanent or absorbable suture
absorbable or nonabsorbable suture can be used to simply close, shift, or plicate the capsule as indicated. We use this technique routinely in patients who are young or participate in high-demand activities, show signs of hyperlaxity, or show dysplastic changes in the hip.

References