

The Quebec City Slider: A Technique for Capsular Closure and Plication in Hip Arthroscopy



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Abstract: Biomechanical and clinical studies have shown that the hip joint capsule plays an important role in maintaining stability and hip mechanics, including rotation and translation. The recent literature has shown that capsule closure after hip arthroscopy helps to restore stability. Without restoration of the native anatomy, the hip joint may translate when patients engage in activities that place force across the hip, leading to either microinstability or frank dislocation. The purpose of this note is to describe our preferred technique of capsular closure or plication during hip arthroscopy.

During hip arthroscopy, adequate intra-articular access and visualization are of utmost importance. Because of this, many authors have suggested the use of a limited arthrotomy or capsulotomy to improve the surgical technique and efficiency. Capsulotomy without closure has been performed for many years; however, negative results of microinstability, hip dislocation episodes, or complete capsular deficiency have been reported in a subset of patients.¹⁻⁵ Because of these complications, there has been recent interest in the use of capsular closure or plication after hip arthroscopy.⁶ This has led to an increased understanding of the interplay between the hip capsule and other static and dynamic restraints of the hip, and their respective roles in hip stability.⁷⁻⁹

The terms capsular plication and closure are poorly defined, but are often used interchangeably. Both involve a degree of capsulotomy with resection of a

small portion of capsular tissue, followed by side-to-side approximation. However, whereas closure typically does not involve the redirection of tissue, plication specifically refers to proximal advancement of the distal capsular limb caused by capsular laxity or a redundancy of tissue. Despite this difference, the technical aspects of accomplishing these interventions are similar.

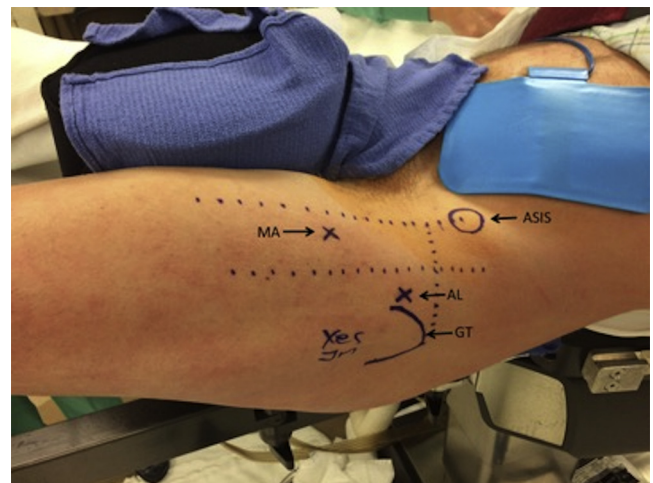


Fig 1. Intraoperative photograph of a left hip. Landmarks for portal placement during hip arthroscopy are identified and marked on the skin. The anterolateral portal (AL) is first placed slightly anterior and approximately 1 cm distal to the tip of the greater trochanter (GT). The midanterior portal (MA) is then located 45° distal and anterior to the anterolateral portal, and 2-3 cm lateral to a line drawn from the anterior superior iliac spine (ASIS) to the center of the patella.

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The authors report the following potential conflict of interest or source of funding: M.J.P. receives support from Arthrex, Ossur, Siemens, Smith & Nephew, ConMed Linvatec, Bledsoe, Slack, Elsevier, Donjoy, Arthrosurface, HIPCO, MIS, Vail Valley Surgery Center, Steadman Philippon Research Institute, Vail Health Services, ISHA, and ASIAM.

Received February 25, 2016; accepted April 25, 2016.

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2212-6287/16169/\$36.00

<http://dx.doi.org/10.1016/j.eats.2016.04.024>

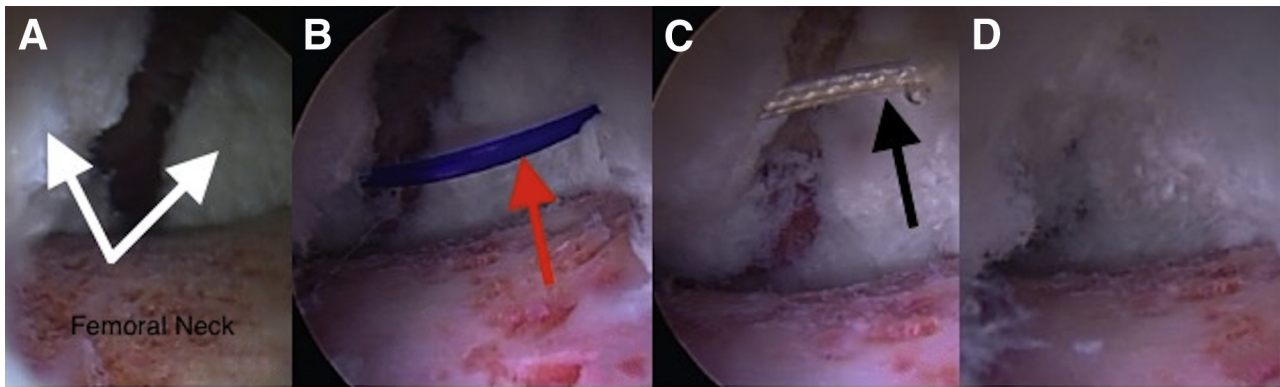


Fig 2. Intraoperative arthroscopic images of a right hip as viewed through the midanterior portal. (A) After completion of the intra-articular procedures, the capsulotomy can be seen (white arrows) and closure begun, (B) a No. 2 nylon lasso (red arrow) is passed through the proximal and distal leaflets, (C) the suture lasso is then used to shuttle a double-limb No. 2 vicryl suture through the proximal and distal capsular leaflets (black arrow), and (D) completion of capsular closure with the Quebec City Slider knot tied beneath the capsule.

To prevent iatrogenic instability after hip arthroscopy, we recommend closure of the capsule in all patients. We present our preferred method for arthroscopic capsular closure or plication using “The Quebec City Slider” (QCS) knot technique.

Surgical Technique

Operative Indications

Capsular management is becoming an important component of hip arthroscopy as our knowledge and surgical techniques continue to evolve. Capsulotomies are useful for adequate intraoperative exposure of the central and peripheral compartments, especially for challenging cases where greater exposure is required. In the past, little attention was paid to closure of the capsule at the conclusion of the procedure. The concern for postoperative instability due to capsular laxity or deficiency, however, has led many surgeons to institute a judicious use of capsular repair

techniques.³ Although debate remains regarding the optimal role for capsular closure or plication, we perform capsular closure in all patients using the QCS technique to avoid concerns of iatrogenic instability after surgery.

Portal Placement and Arthroscopic Treatment of Intra-articular Pathology

After routine preparation and draping of the affected hip, the arthroscopic procedure is performed with the patient in the supine position (Video 1). Anterolateral and midanterior portals are established to allow access to the central compartment (Fig 1). A diagnostic arthroscopy is performed using a 70° arthroscope to evaluate for intra-articular pathology. An interportal capsulotomy is performed with a beaver blade (Arthrex, Naples, FL) approximately 1 cm distal to the labrum. The capsule is incised parallel to the acetabular rim from the 12 o'clock to 3 o'clock position, connecting the midanterior and anterolateral portals. All



Fig 3. Intraoperative images of a right hip with a cannula placed into the anterolateral portal (AL) with sutures within the cannula. The sutures have been previously passed through the proximal and distal limbs of the capsulotomy. (A) Two fingers from each hand are placed within the looped end of the No. 2 vicryl (arrow), (B) each hand is then pronated to form 2 separate loops (arrows), and (C) both loops are placed around the fingers of one hand, while 1 free end of the suture is then passed through both loops (arrow). The 2 free ends are then pulled to tighten the Quebec City Slider knot and secured with alternating half-hitch knots.

Table 1. Pearls and Pitfalls

Pearls	Pitfalls
Adequate capsular tissue from the proximal and distal leaflets should be retained throughout the procedure to allow for proper closure.	Excessive resection or ablation of the capsule may result in overtightening or inability to perform an adequate closure.
Placement of a working cannula through the anterolateral portal prevents formation of a soft-tissue bridge while passing sutures.	Taking small bites of the capsular tissue can result in tearing of the repair construct in the early postoperative period.
Dynamic examination with the hip in extension after closure ensures that the capsule is not overtightened.	Taking big bites of the capsular tissue can result in overtightening of the capsule, resulting in joint stiffness.

indicated procedures are then performed based on previous diagnosis and intraoperative findings, including treatment of labral tears, femoroacetabular impingement, chondral damage, and any other pathology.

Capsular Closure

After completion of all intra-articular procedures, capsular closure using a double-limb QCS knot is performed. The knee is flexed to approximately 45° to allow slight relaxation of the capsule for an adequate repair. The camera is placed into the midanterior portal, and a disposable cannula (Arthrex) is introduced into the anterolateral working portal. A SutureLasso (Arthrex) is placed through the cannula to pierce the proximal leaflet of the capsule, and a looped No. 2 nylon suture lasso is shuttled through the tissue. A 35° sharp-pointed grasper (Arthropierce, Smith & Nephew, Andover, MA) is then used to retrieve the nylon lasso through the distal side of the capsulotomy near the zona orbicularis. The lasso has now been placed through both the proximal and distal capsular leaflets, and is used to shuttle a double-limb No. 2 vicryl suture (Fig 2). Two fingers from each hand are placed within the looped end of the No. 2 vicryl; each hand is then pronated to form 2 separate loops. Next, both loops are placed around the fingers of one hand, while 1 free end of the suture is then passed through both loops. Both free ends are then pulled to tighten the QCS knot, and secured with alternating half-hitch knots. After the QCS knot is tied, 5 to 6 alternating half-hitch knots are performed for a secure side-to-side closure (Fig 3). The process is repeated 2 additional times, for a total of a 3-suture capsular closure construct. Once capsular closure is complete, the hip is brought into extension while the surgeon arthroscopically visualizes the repair to ensure that the capsule has not been overtightened.

Pearls and pitfalls of this technique are outlined in Table 1.

Discussion

This technical note details our preferred technique to perform capsular closure after a hip arthroscopy procedure. Although hip arthroscopy has experienced an exponential growth in the past 3 decades, it has not been until recently that surgeons have started to recognize the importance of the integrity of the hip capsule for its proper functioning.

The hip capsule is composed of 3 main ligaments, in which the iliofemoral ligament constitutes the most important stabilizer for hip extension and external rotation.¹⁰ However, during hip arthroscopic procedures, this ligament is commonly incised when performing a standard capsulotomy (from 12 to 3 o'clock) to gain access to the joint. If left unrepaired, the capsular defect can become symptomatic and lead to instability, anterior hip pain, and in rare cases, subluxation or dislocation.¹¹ The magnitude of iatrogenic instability may be underestimated, because surgeons may fail to diagnose this relatively new entity. A previous study reported that 35% of patients who underwent revision hip arthroscopy were found to have undiagnosed direct observational instability.³ As a result, this could ultimately lead to progressive labral and chondral injury over time.²

For the reasons mentioned above, a mindful management of the capsule should be performed throughout the entire procedure taking into account certain contemplations to facilitate later closure such as follows: (1) leave at least a 1-cm proximal leaflet when performing the capsulotomy, (2) avoid capsular thinning when using the shaver, and (3) prevent soft tissue bridging with the use of a cannula.

We recommend this technique for capsule closure after hip arthroscopy procedures, as it is reproducible, readily performed, and limits the risk for inadvertent locking of the knot before closure of the capsule (Table 2). However, further studies are needed to better define the biomechanical properties of our capsular closure construct.

Table 2. Advantages and Disadvantages

Advantages	Disadvantages
The technique is easily reproducible	There is an initial learning curve to master the technique
The Quebec City Slider knot is a sliding construct, thus preventing inadvertent locking of the knot before secure closure	Requires additional intraoperative time for adequate capsular closure
Can be performed with readily accessible instrumentation	

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