Anterior Hip Capsuloligamentous Reconstruction for Recurrent Instability After Hip Arthroscopy

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Abstract

A variety of complications, including iatrogenic anterior hip instability, have been reported after hip arthroscopy. We present a case of a patient sustaining a postoperative anterior hip dislocation after cam resection for treatment of femoroacetabular impingement. Our patient developed persistent instability and required anterior capsuloligamentous reconstruction with iliotibial autograft. We present a comprehensive review of the literature on postoperative hip instability after hip arthroscopy, including the role of capsulotomy closure, and use of postoperative orthotics and weight-bearing restrictions.

Hip arthroscopy has experienced a dramatic increase in popularity, largely resulting from improvements in techniques and technology.[1,2] As with any procedure, there are complications associated with arthroscopy of the hip. These include neurapraxia, iatrogenic cartilage and labral injuries, postoperative bleeding, perineal skin necrosis, infection, intra-articular instrument breakage, intra-abdominal fluid extravasation, avascular necrosis, and femoral neck fracture.[1-4] Many of these have been attributed to the expected learning curve seen with any new procedure, and are less likely to occur as surgeons become more familiar with the procedure.[1] One rare but serious complication is anterior dislocation of the hip.[5-7]

We present a patient who experienced an anterior hip dislocation and instability after hip arthroscopy, and was successfully treated with an anterior capsuloligamentous reconstruction. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

An otherwise healthy 37-year-old woman presented to our clinic with a 6-month history of right groin pain and an oc-casional popping sensation during activity, which was unresponsive to hip-specific physical therapy. On physical examination, she was 5 ft 10 in tall, weighed 150 lbs, and appeared in excellent physical condition. She had no signs of systemic ligamentous laxity. She had an otherwise normal musculoskeletal, neurologic, and vascular examination in her bilateral lower extremities. She had a mild antalgic gait on the right leg.

The affected right hip could be flexed painfully to 120°, extended to 0°, adducted 20°, and abducted 45°. At 90° of flexion, her right hip could be externally rotated 30° and internally rotated 20°. Internal rotation during hip flexion beyond 90° caused sharp pain in the groin. Her normal left hip could be flexed to 120°, extended to 0°, adducted 30°, and abducted 60°. At 90° of flexion, her left hip could be externally rotated 50° and internally rotated 30°. She had negative Ober tests bilaterally but had tenderness along the right iliotibial band. She had negative Patrick and Gaenslen tests bilaterally. She had no tenderness in the area of either greater trochanter.

Imaging evaluation included plain radiographs and a magnetic resonance arthrogram (MRA) of the right hip. The plain radiographs showed signs of femoroacetabular impingement, but no joint space narrowing, no dysplasia, and no retroversion of the acetabulum (**Figures 1A, 1B**). The MRA showed a

Figure 1. Preoperative (A) anteroposterior and (B) frog lateral radiographs of the right hip. The lateral view revealed an alpha angle of approximately 75° with signs of cam impingement (red arrow).
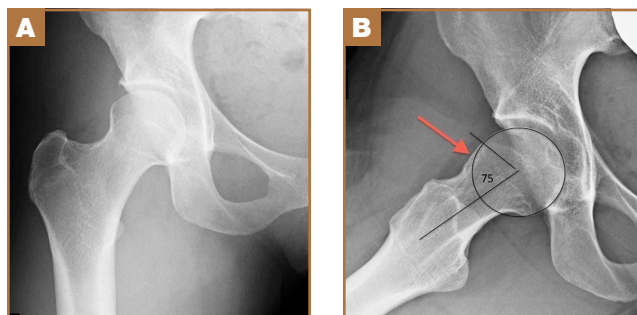
Figure 2. Preoperative coronal magnetic resonance arthrogram showing a degenerative tear of the anterolateral labrum with associated fraying of the acetabulum (red arrow).

Figure 3. Radiograph of right hip showing an anterior dislocation.

Figure 4. Axial magnetic resonance image of right hip showing large defect in anterosuperior capsule (red arrow).

degenerative peripheral tear of the anterosuperior labrum without significant cartilage wear (**Figure 2**).

Based upon her findings on physical examination and imaging, we recommended arthroscopic treatment of her right hip pathology. Thirteen months after initial presentation, we performed a right hip arthroscopy with the patient in the supine position. Through modified anterior and anterolateral portals, we used electrocautery to perform a capsulotomy from the 9 o'clock to 12 o'clock positions. A central compartment diagnostic arthroscopy showed mild degenerative fraying of the labrum from the 9 o'clock to 12 o'clock positions without signs of detachment. There was grade III chondral fraying near the articular margin in that same arc. The femoral articular cartilage appeared normal, as did the ligamentum teres. We used a shaver to gently débride the torn labrum down to stable tissue. The frayed cartilage on the acetabulum was also gently débrided.

Traction was released and the hip was flexed. Minimal capsular release and débridement were performed for adequate visualization of the peripheral compartment. A diagnostic examination revealed a significant cam-type impingement lesion from the 12 o'clock to 6 o'clock positions. We performed a femoral neck resection, with a proximal-distal dimension of 15 mm and a depth of 7 mm. A dynamic fluoroscopic examination of the hip joint showed no signs of impingement. In accordance with our standard protocol, the anterior capsulotomy was not repaired.

Postoperatively, the patient was instructed to perform toe-touch weight-bearing with crutches for 2 weeks and to advance to full weight-bearing over the next 2 weeks. She did not use a hip orthosis. She was also advised to avoid combined hip extension/external rotation maneuvers for the first 4 weeks. She took part in a formal hip-specific physical therapy program for a total of 12 weeks. She was seen in clinic at 2, 6, and 12 weeks postoperatively and appeared to have had a typical, uneventful course. We advised her to gradually return to normal activities as tolerated at the 12-week visit.

Four months after the procedure, the patient returned to our clinic for evaluation after a right hip dislocation. Two days prior, she was at a school function with her child and experienced sudden pain and inability to bear weight after she extended and externally rotated her right hip in a low-energy manner. She was taken to an emergency room and found to have an anterior dislocation of the right hip (**Figure 3**), which was concentrically reduced under anesthesia.

Upon questioning, she reported having had feelings of mild instability of the right hip during demanding activities (jogging, yoga) after sustaining a low-energy fall 1 month prior to her dislocation. On examination, she had significant apprehension about the right hip during gentle external rotation maneuvers. An MRA 2 weeks after the dislocation showed a large defect of the anterosuperior capsuloligamentous complex measuring 4 cm from medial to lateral and 2.5 cm superior to inferior (**Figure 4**). No loose bodies, chondral injuries, or recurrent tears of the labrum were seen. Typical postoperative changes were observed at the femoral head-neck junction.

Initially, we recommended nonoperative management with 6 weeks of toe-touch weight-bearing and strict avoidance of hip extension–external rotation maneuvers. No hip orthosis was used. After this period, the patient advanced to full weight-bearing and continued in hip-specific physical therapy. Despite continued therapy and avoidance of provocative maneuvers, the patient reported persistent feelings of right hip instability with significant apprehension during extension and external rotation of the right hip. A repeat MRA 4 months after the hip dislocation showed a persistent defect in the anterosuperior capsuloligamentous complex and no signs of avascular necrosis. After 6 months of conservative treatment, we recommended an open capsulorrhaphy of the right hip with autograft iliotibial band reconstruction of the iliofemoral ligament and capsule.

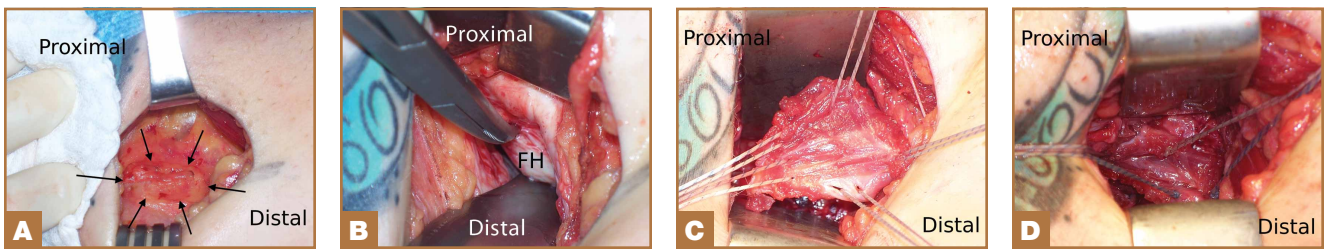Six months after the dislocation, the patient underwent

Figure 5. (A) Intraoperative photograph during deep dissection via the Smith-Petersen approach of the right hip with the patient in the supine position. Note the ovoid-shaped defect in the capsular tissue outlined by arrows. (B) Intraoperative photograph during deep dissection via the Smith-Petersen approach of the right hip with the patient in the supine position. The thin pseudocapsule overlying the femoral head (FH) has been removed. (C) Intraoperative photograph of the right hip with the patient in the supine position with the iliotibial band autograft being used to reconstruct the anterior capsular defect. Sutures from the suture anchor placed in the supra-acetabular region have been passed superiorly (top of picture), and free sutures have been passed medially (right side of picture), inferiorly, and laterally. (D) Intraoperative photograph of the right hip with the patient in the supine position showing the iliotibial band autograft in position.

the recommended procedure. After induction of general anesthesia, she was placed in the supine position on a standard operating table. A Smith-Petersen approach was used to visualize the anterior hip structures. During deep dissection, we observed a large defect, measuring 2.5×4 cm (**Figure 5A**), in the anterior hip capsule, with only a thin pseudocapsule covering the femoral head. Extensive mobilization of the anterior capsule was unsuccessful.

The decision was made to harvest a graft from the patient's ipsilateral iliotibial band. A skin incision was made over the iliotibial band in the distal midthigh region, and a 2.5×4-cm graft was harvested from the central portion of the iliotibial band. An arthrotomy was performed on the hip joint (**Figure 5B**). The labrum appeared healthy without recurrent tearing or fraying, and other than focal thinning on the superior acetabulum, the cartilage appeared healthy. A double-loaded anchor was placed in the supra-acetabular region, and the sutures were passed through the graft. Then, No. 2 nonabsorbable sutures were sequentially placed between the capsular remnant and the graft medially, inferiorly, and laterally. The graft was placed into position (**Figure 5C**) and the sutures were tied (**Figure 5D**).

Postoperatively, the patient was allowed toe-touch weight-bearing for 6 weeks, with strict avoidance of extension–external rotation maneuvers. She participated in a 12-week course of physical therapy with gradual advancement of activities. About a year after the capsulorrhaphy, she was able to resume all previous activities with only occasional low-level discomfort. She returned to the clinic 16 months after the capsulorrhaphy complaining of increased pain with long-distance running but denied feelings of instability. We performed an intra-articular hip injection under ultrasound guidance, which provided 100% relief of her symptoms. We obtained an MRA to
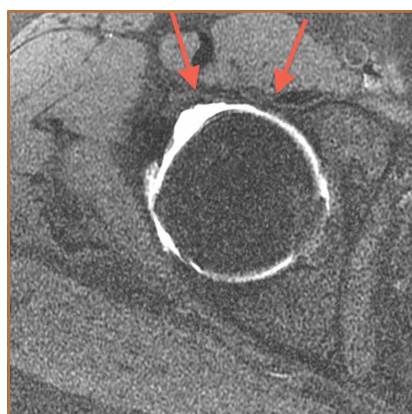

Figure 6. Postoperative axial magnetic resonance arthrogram of the right hip. Note that the previous anterosuperior capsular defect has been completely closed (red arrows).

evaluate for any recurrent capsular or labral injury (**Figure 6**). The previous anterosuperior capsular defect was not visible, and no signs of recurrent labral or cartilage injury were seen.

Discussion

With the increasing popularity of hip arthroscopy, more complications are being reported as well, including postoperative hip instability. Three separate cases of anterior hip instability have been published in the past several years.[5-7]

Ranawat and colleagues[5] were the first to report a case of postoperative anterior hip dislocation after arthroscopy. Their patient was a 52-year-old woman with right hip pain and generalized ligamentous laxity. Her preoperative radiographs showed no evidence of degenerative changes, dysplasia, or femoroacetabular impingement. An MRA showed a peripheral tear of the anterosuperior labrum. At arthroscopy, her right hip was easily distracted 2 to 3 cm with what they described as "minimal traction." A small 1- to 2-cm capsulotomy was performed about the anterior portal. A detached labral tear was identified and repaired with an anchor, and no rim resection was performed. To improve visualization of the peripheral compartment, they extended the previous capsulotomy 1 to 2 cm and débrided the edges. A cam-type lesion was identified and resected. Lastly, they performed an anterior capsular plication, specifically including the iliofemoral ligament. Postoperatively, the patient wore a hip orthosis for 6 weeks to prevent extension and external rotation of the hip as well as a foot brace at night for 3 weeks. The patient was allowed to partially bear weight for the first 6 weeks with use of crutches. Approximately 2 months postoperatively, she slipped and fell down a short flight of stairs. She was diagnosed with an anterior hip dislocation. After successful closed reduction, she was treated conservatively with the

same regimen used earlier. She remained symptomatic over the next several months with signs of instability and apprehension, and she eventually underwent a repeat hip arthroscopy. A 1- to 2-cm tear of the anterior capsule and iliofemoral ligament was treated with a revision arthroscopic capsular plication. A postoperative regimen similar to that used at the index procedure was instituted and, at most recent follow-up, she was found to have occasional pain without instability.

Matsuda[6] reported a case of acute iatrogenic hip dislocation after arthroscopic surgery. His patient was a 39-year-old woman with a mildly retroverted acetabulum leading to impingement about the hip. She had no signs of generalized ligamentous laxity. A hip arthroscopy in the lateral position was performed, with no comment about the extent of the capsulotomy. During the procedure, about 5 mm of anterosuperior acetabulum were removed as part of arthroscopic rim trimming for treatment of the pincer lesion. A femoral osteochondroplasty was also performed (unspecified size) to restore more normal anterolateral offset. One confounding factor was that supranormal hip distraction was needed for 20 minutes to aid in removal of a metallic piece from a radiofrequency ablator, which inadvertently detached. The patient experienced an anterior hip dislocation in the recovery room and was found to be unstable during closed reduction under general anesthesia. A mini-open capsular repair was performed, which showed a 1×1.5-cm defect in the anterolateral capsule. After closure of the defect, the hip was found to be stable under fluoroscopic examination. Postoperatively, the patient was allowed to perform partial weight-bearing in a hip-knee-ankle-foot orthosis for 2 months and then a flexible hip brace for 1 month. At 15-month follow-up, her hip was stable and she was pain-free.

Benali and Katthagen[7] highlighted the significant contribution of the labrum to hip stability in a dysplastic hip. Their patient was a 49-year-old woman with mild hip dysplasia and a degenerative bucket-handle tear of the ventrolateral labrum. The patient underwent a near-complete labral resection and rim trimming at an outside institution. The patient began full weight-bearing at 3 weeks postoperatively and noticed considerable groin and back pain (no hip orthosis use was mentioned). After failed treatment for suspected lumbar pathology, she was referred to the authors' clinic for further evaluation. Plain radiographs showed subluxation of the left hip with degenerative changes. The patient had an uneventful left total hip arthroplasty (THA).

After reviewing the 3 reported cases of hip instability after arthroscopy, we suggest that surgeons fully recognize and appreciate the delicate balance of stability and motion provided by the static and dynamic stabilizers of the hip joint, and be cognizant of potential imbalance created by surgical intervention.[8,9] Postarthroscopic hip instability appears to be multifactorial in nature, because all of the reported cases detailed different factors, both patient- and surgeon-related, contributing to instability.

Ranawat and colleagues[5] identified several factors that may have contributed to the anterior hip dislocation sustained by their patient, including the patient's generalized ligamentous laxity, performance of a capsulectomy (with repair of iliofemoral ligament), and a traumatic fall. Benali and Katthagen[7] (although they did not perform the index procedure) described the disastrous complication of overzealous labral resection and rim trimming in a patient with hip dysplasia. Matsuda[6] performed a labral resection and rim trimming, an extended (unspecified size) capsulotomy, and also used supranormal traction for 20 minutes to remove an iatrogenic foreign body. Surgeons performing hip arthroscopies should be aware of all these factors, because many are directly controlled by the surgeon.

The only factor we feel may have contributed to hip instability in our patient was the performance of a capsulotomy without closure. Our patient was an otherwise healthy woman with no signs of ligamentous laxity, hip dysplasia, or retroversion of the acetabulum. We did not perform a labral resection or rim trimming. We use modified anterior and anterolateral portals, and electrocautery to connect the portals. This typically leads to a release of a thin strip (less than 5 mm wide) of 3 cm of capsule. Based upon findings at rare second-look arthroscopy for recurrent symptoms, Dr. Guanche has observed that the capsulotomy from the initial procedure heals with normal-appearing tissue. Also, during peripheral compartment arthroscopy, we do not routinely release the iliofemoral ligament, and the orbicular ligament is left intact. Instead, we prefer to flex the hip and débride only enough capsular tissue to allow for adequate visualization.

Little has been published on capsulotomy closure after hip arthroscopy, and no consensus exists. Our standard practice is to not close the capsulotomy, which accords with the practice of other surgeons.[9] There is concern, however, that extensive capsulotomy leading to injury or disruption of the iliofemoral ligament may cause anterior hip instability, driving other prominent hip arthroscopists to routinely close the capsulotomy.[9,10] Myers and colleagues[10] published a recent biomechanical study on the role of the labrum and the capsular ligaments in hip stability. They concluded that the iliofemoral ligament plays a significant role in limiting external rotation and anterior translation of the femoral head, and recommended closure of the capsulotomy after arthroscopy. Of note, Dr. Guanche has performed more than 1500 hip arthroscopic procedures in the past 5 years, and we are aware of only 2 patients who have sustained anterior hip dislocations, in spite of our not closing the capsulotomy defect. This highlights an important clinical question in need of further investigation.

Our case also raises questions about the ideal postoperative regimen after standard hip arthroscopy. Although we do not routinely prescribe hip orthoses for our patients, others do.[5] We are unaware of any proven benefit to the standard use of hip orthoses, and are concerned over the possible lack of patient compliance and of adequate restraint. We prefer to educate our patients on avoiding the "at-risk" position of hip extension and external rotation and to counsel them on gradual return to activities. Studies are needed to determine the role of these devices in hip arthroscopy, as well as the ideal postoperative activity regimen.

Our patient failed 6 months of conservative treatment after

her dislocation and continued to have feelings of hip instability even during light activities. As a result of this failure and given an anatomical defect in the anterior capsuloligamentous complex, we decided our patient would be best treated with reconstruction of the defect. We did not think a revision capsular plication, as done by Ranawat and colleagues,[5] was a reasonable option for our patient because of a large defect in the capsular tissue. Even in smaller defects, plication could potentially lead to overtightening of the capsule and subsequent overconstraint of the joint. Also, plication of defects may place excessive strain on the suture, which may fail if the repair is even mildly stressed.

Recurrent anterior hip dislocations, although rare in their own right, are much more common after THA than after hip arthroscopy.[11] Fujishiro and colleagues[12] described a similar technique to ours developed to treat a patient with recurrent anterior hip instability from anterior capsular insufficiency after multiple revision THA procedures. They used a Leeds-Keio artificial ligament to reconstruct the iliofemoral ligament, and this successfully treated their patient's instability.

Conclusion
We believe this is the first report of recurrent instability after hip arthroscopy, necessitating reconstruction of the anterior capsuloligamentous complex. This case shows that reconstruction of the iliofemoral ligament with iliotibial band autograft is safe, restores hip stability without compromising function, and should be considered by any hip arthroscopist encountering a similar scenario. It also highlights the importance of the capsuloligamentous complex surrounding the hip joint for its stability and the need for further research to better delineate the indications for capsular repair/closure after capsulotomy.

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