Capsular Management During Hip Arthroscopy: From Femoroacetabular Impingement to Instability

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Abstract: Advances in the ability to treat various soft-tissue and osseous pathologic conditions of the hip arthroscopically have been predicated on an improved exposure of the pathology of the central, peripheral, and peritrochanteric compartments. The management of the capsule is critical and must allow for an improved exposure without compromising stability and kinematics of the hip. Described approaches have included capsulectomy, limited capsulotomy, extensile capsulotomy, capsular plication, and capsular shift. The selected approach must consider various factors, including symptomatic complaints, underlying hyperlaxity, specific mechanical pathology, and surgical expertise. Universally using a single technique without consideration of the complex mechanical and anatomic factors unique to each patient may result in incomplete treatment of the pathoanatomy or iatrogenic instability. This article reviews the anatomy of the hip capsule and provide a diagnosis-based consideration of capsular management during hip arthroscopy. The senior author’s preferred techniques are also presented.

Hip arthroscopy has gained considerable popularity in recent years as a minimally invasive surgical approach to address various symptomatic disorders of the hip, including femoroacetabular impingement (FAI), labral tears, snapping hip syndromes, and instability. As such, there has been a rapid evolution of both instrumentation and techniques used in hip arthroscopy. Advances in the ability to treat various soft-tissue and osseous pathologic conditions of the hip arthroscopically have been predicated on an improved exposure of the pathology of the central, peripheral, and peritrochanteric compartments. In this regard, surgical management of the capsule is critical and must allow an improved exposure without compromised stability of the hip (Table 1). Described approaches have included capsulectomy, limited capsulotomy, extensile capsulotomy, capsular plication, and capsular shift. The selected approach must consider various factors, including symptomatic complaints, baseline hyperlaxity, specific mechanical pathology, and surgical expertise. Universally using a single technique without consideration of the complex mechanical and anatomic factors unique to each patient may result in incomplete treatment of the pathoanatomy or iatrogenic instability. This article will review the anatomy of the hip capsule and provide a diagnosis-based consideration of capsular management during hip arthroscopy. The senior author’s preferred techniques are also presented.
The hip capsule is a fibrous lining that provides stability, protection, and the blood supply for the hip joint. From its acetabular attachment, it extends laterally to surround the femoral head and neck and is attached anteriorly to the intertrochanteric line, superiorly to the base of the femoral neck, posteriorly superomedial to the intertrochanteric crest, and inferiorly to the femoral neck near the lesser trochanter. The anterosuperior portion of the capsule is thickest, because this is where maximal stress occurs while one is standing, whereas the posterosuperior capsule is thinner and more loosely attached. The thick anterosuperior capsule often needs to be addressed with arthroscopy for FAI, because this is a typical location for focal rim impingement and loss of femoral offset.

The capsule is composed of internal and external fibers. The internal fibers comprise the circular zona orbicularis, which forms a collar around the femoral neck. The fibers of the zona orbicularis are partially blended with fibers from the ischiofemoral ligament. The internal fibers of the capsule are lined with synovium and contact the femoral head. The external fibers run longitudinally and are made up of the iliofemoral, ischiofemoral, and pubofemoral ligaments. Each of these ligaments has distinct functions that are important to the capsule (Fig 1).

**Iliofemoral Ligament**

The iliofemoral ligament (Y ligament of Bigelow) makes up the anterior part of the capsule and is shaped like an inverted “Y.” It originates in the area between the anteroinferior iliac spine (AIIS) and acetabular rim and divides into superior and inferior branches as it crosses the joint. The superior-lateral branch has a horizontal course and inserts proximally along the intertrochanteric line anterior to the hip joint, whereas the inferior-medial branch has a more vertical course and inserts distally along the intertrochanteric line (Fig 1). The action of the iliofemoral ligament restricts extension of the hip, providing a static restraint with full hip extension, and allows upright posture to be maintained without constant muscular action. Hewitt et al. showed that the iliofemoral ligament is stiffer and withstands greater force than either the ischiofemoral ligament or the pubofemoral ligament, suggesting that its insufficiency is associated with anterior hip instability and dislocations. In this regard, preservation or repair of the iliofemoral ligament may be of critical importance during hip arthroscopy, particularly for patients with hyperlaxity, anterior instability, and/or anterior acetabular undercoverage (dysplasia).

Martin et al. recently studied the anatomy and quantitative contributions of the hip capsular ligaments. The medial arm of the iliofemoral ligament was...
observed to originate between the AIIS and the iliac portion of the acetabular rim. Its insertion was consistently noted to be on a bump located on the distal intertrochanteric line (Fig 2). The lateral arm originates superior to the medial arm, closer to the AIIS, and traverses more horizontally along the neck of the femur, covering the orbicular ligamentous fibers running perpendicular to the lateral arm at its distal portion. The lateral arm of the iliofemoral ligament was shown to insert on the anterior greater trochanteric crest and has dual control of external rotation in flexion and both internal rotation and external rotation in extension.

Ischiofemoral Ligament

The ischiofemoral ligament makes up the posterior part of the capsule. It originates from the ischial rim of the acetabulum, follows the spiral of the iliofemoral ligament as it crosses the joint, and inserts around the posterior aspect of the femoral neck (Fig 1).\(^1\)\(^,\)\(^2\)\(^,\)\(^5\) The ischiofemoral ligament crosses the hip capsule in 2 bands, with the more superior band arching across the femoral neck to blend with the zona orbicularis, whereas the inferior band inserts more posteriorly along the intertrochanteric crest (Fig 2).\(^4\) The main action of the ischiofemoral ligament is to resist internal rotation as well as adduction.\(^2\)\(^,\)\(^4\)\(^,\)\(^6\) The ischiofemoral ligament is significantly weaker than the iliofemoral ligament, with either the superior or inferior half of the iliofemoral ligament being stronger than the ischiofemoral ligament in its entirety.\(^5\)

Pubofemoral Ligament

The pubofemoral ligament resembles a sling, running inferior to the medial arm of the iliofemoral ligament and medial and inferior to the iliopectineal eminence, originating at the pubic portion of the acetabular rim and the obturator crest of the pubic bone and attaching distally to the femoral neck (Fig 1). Fibers from the pubofemoral ligament blend with the medial arm of the iliofemoral ligament. The sling of the pubofemoral ligament also wraps inferiorly around the neck of the femur and inserts inferior to the ischiofemoral ligament along the posterior intertrochanteric crest (Fig 2). The pubofemoral ligament controls external rotation in extension together with the medial and lateral arms of the iliofemoral ligament.\(^4\)
Unlike the longitudinally oriented fibers of the outer capsule, the inner capsule fibers of the zona orbicularis run in a circular pattern. The zona orbicularis encircles the femoral neck, comprising the narrowest area within the capsule. It provides hip stability against distraction forces, acting like a locking ring around the neck of the femur (Fig 3). The zona orbicularis is an important landmark during hip arthroscopy and may need to be divided and repaired after extensive capsulotomies that are performed to address peripheral compartment pathology that may extend distally to the level of the intertrochanteric line.

Ito et al. recently studied the contribution of the zona orbicularis to hip stability in distraction. In 7 cadaveric hip specimens from male donors, the femur was distracted from the acetabulum in a direction parallel to the femoral shaft with the hip in the neutral position. Eight sequential conditions were assessed: (1) intact specimen (muscle and skin removed), (2) capsule vented, (3) incised iliofemoral ligament, (4) circumferentially incised capsule, (5) partially resected capsule (distal to the zona orbicularis), (6) completely resected capsule, (7) radially incised labrum, and (8) completely resected labrum. The reduction of the distraction load was greatest between the partially resected capsule phase and completely resected capsule phase at 1-, 3-, and 5-mm joint distraction. The proximal to middle part of the capsule, which includes the zona orbicularis, acts like a locking ring around the neck of the femur and is a key stabilizing structure of the hip in distraction.

VASCULAR SUPPLY

In addition to providing ligamentous stability, a major function of the hip capsule is to deliver the vascular supply to the acetabulum and femoral head. A cadaveric study by Kalhor et al. showed that 4 main vessels provide the blood supply to the hip capsule in a periacetabular vascular ring: the superior gluteal artery, the inferior gluteal artery, the medial femoral circumflex artery, and the lateral femoral circumflex artery (Figs 4-6). The hip capsule receives its proximal blood supply from the superior and inferior gluteal arteries, which supply the posterior and posterior superior aspect of the hip capsule. The distal blood supply arises from the medial and lateral femoral circumflex arteries, which supply the anterior capsule. The medial femoral circumflex artery is the main supplier of the femoral head, although in 2 of 20 specimens, Kalhor et al. noted an anatomic variation in which the inferior gluteal artery was the main supplier of the femoral head. The blood supply of the femoral head therefore arises near the femoral attachment of the capsule and can sustain damage in over-
zealous, distal transverse capsulotomies (Figs 4-6).\textsuperscript{7} Capsulotomies or capsulectomies that are performed for improved exposure and instrumentation of the hip during arthroscopy must respect these vascular planes to minimize the risk of avascular necrosis or devascularized periarticular soft tissues. If an extensile capsulotomy to address peripheral compartment pathology is necessary, it should be made between the lateral femoral circumflex artery and the supra-acetabular branch of the superior gluteal artery. 1, greater trochanter; 2, vastus lateralis muscle; 3, vastus intermedius muscle; 4, tensor fasciae latae muscle (turned medially and distally); 5, lateral femoral circumflex artery; 6, iliopsoas muscle; 7, ascending branch of lateral femoral circumflex artery; 8, hip joint capsule ( femoral attachment); 9, anterior end of supra-acetabular branch of superior gluteal artery anastomosing with lateral femoral circumflex artery; and 10, inferior iliac spine ( rectus femoris tendon detached). (cran, cranial; lat, lateral.) (Reprinted with permission from Kalhor et al.\textsuperscript{7})

FIGURE 4. Anterolateral aspect of right hip after detachment of abductor, rectus femoris, and tensor muscles, showing a capsular branch and an anastomosis between the ascending branch of the lateral femoral circumflex artery and the supra-acetabular branch of the superior gluteal artery. 1, greater trochanter; 2, vastus lateralis muscle; 3, vastus intermedius muscle; 4, tensor fasciae latae muscle (turned medially and distally); 5, lateral femoral circumflex artery; 6, iliopsoas muscle; 7, ascending branch of lateral femoral circumflex artery; 8, hip joint capsule ( femoral attachment); 9, anterior end of supra-acetabular branch of superior gluteal artery anastomosing with lateral femoral circumflex artery; and 10, inferior iliac spine ( rectus femoris tendon detached). (cran, cranial; lat, lateral.) (Reprinted with permission from Kalhor et al.\textsuperscript{7})

FIGURE 5. Posterolateral aspect of right hip after retraction of gluteal muscles and short external rotators to show periosteal arteries as well as supra-acetabular branch of superior gluteal artery before capsulotomy. 1, greater trochanter; 2, hip capsule; 3, sciatic nerve; 4, short external rotators (obturator internus and gemellus muscles) detached from greater trochanter and retracted; 5, acetabular branch of inferior gluteal artery; and 6, supra-acetabular branch of superior gluteal artery. (cran, cranial; med, medial.) (Reprinted with permission from Kalhor et al.\textsuperscript{7})

MUSCULAR ATTACHMENTS

Of the many muscles that span the hip joint, there are a select few that play a critical role in the function of the hip capsule. The first is the iliocapsularis, a lesser-known muscle overlying the anteromedial hip capsule.\textsuperscript{10,11} The iliocapsularis originates from the inferior border of the AIIS and the anteromedial hip capsule and inserts just distal to the lesser trochanter\textsuperscript{10,11} (Fig 7). Research has shown that contraction of the iliocapsularis muscle tightens the hip capsule and can help to stabilize the femoral head.\textsuperscript{10,11} Ward et al.\textsuperscript{11} observed a more prominent iliocapsularis muscle in dysplastic hips compared with nondysplastic hips during surgery. This finding was recently supported by Babst et al.,\textsuperscript{10} who found less fatty infiltration and hypertrophy of the iliocapsularis muscle in dysplastic hips compared with hips with excessive acetabular coverage. Apart from its function as a dynamic stabilizer of the joint, the iliocapsularis is an important landmark intraoperatively in that its anterolateral border is described as the ideal location for the capsulotomy in anterior total hip arthroplasty\textsuperscript{12} and its anteromedial border can be used during a modified Smith-Peterson approach to periacetabular osteotomy to identify the joint capsule.\textsuperscript{13} In addition, the iliocapsularis is helpful in identifying the iliopsoas tendon during anterolateral or direct lateral approaches.\textsuperscript{14}
Similarly, arthroscopic visualization in the peripheral compartment is of paramount importance to guide placement of an ideal T-capsular incision in the intermuscular plane between the inserting fibers of the gluteus minimus and iliocapsularis (Fig 7).

The iliopsoas consists of the psoas muscle and the iliacus muscle. The psoas muscle originates at the transverse processes of T12 to L5. The iliacus muscle originates at the superior two-thirds of the iliac fossa. The muscle belly of the iliopsoas is formed from the combined psoas and iliacus, and the attachment of the iliopsoas is to the lesser trochanter. The iliopsoas muscle functions as a hip flexor and plays a role in maintaining erect posture. The iliopsoas tendon is located lateral to the iliopsoas bursa when the hip is in full flexion. When the hip is extended, the tendon is displaced medially and is intimately associated with the anteromedial joint capsule.

During hip arthroscopy, the iliopsoas tendon is found in the space between the anterior zona orbicularis and anterior labrum proximal and anterior to the medial synovial fold. Understanding this anatomy can help to guide an accurate psoas tendon lengthening through a transcapsular approach in the central compartment or in the peripheral compartment.

The gluteus minimus muscle originates from both the external surface of the ilium and the inside of the pelvis at the sciatic notch. It inserts on the anterosuperior hip capsule, as well as its main insertion on the greater trochanter (Fig 7). Depending on the position of the hip, the gluteus minimus can act as a flexor, internal rotator, external rotator, or abductor. The inserting fibers of the gluteus minimus muscle on the anterosuperior hip capsule are an important landmark that can be reproducibly visualized in the peripheral compartment during arthroscopy. Identification of the intermuscular plane between the inserting fibers of the minimus and the iliocapsularis is routinely performed by the senior authors and allows for precise capsular incision that avoids iatrogenic injury to these muscle-tendon units and the underlying vascular supply to the hip (Fig 7). This T-capsulotomy provides an excellent view of the head-neck junction as distal as the intertrochanteric line and allows for circumferential restoration of femoral offset. Furthermore, it is easily reparable with side-to-side stitches to restore the anatomy and stability to the joint.

CAPSULAR MANAGEMENT IN FAI

The successful arthroscopic treatment of FAI is predicated on accurate diagnosis as well as a complete intraoperative exposure and correction of the soft-tissue and osseous pathology. Recent studies have established that an incomplete correction and the persistence of residual deformity comprise the most common cause of failed arthroscopic surgery. Inadequate capsulotomy and retraction are frequently contributory to the inadequate correction. In this regard, capsular management during hip arthroscopy is critical to allow for complete exposure without compromise of postoperative hip stability and kinematics.

A capsulectomy is one described approach for visualization in the peripheral compartment. With this technique, standard arthroscopic portals are used to access the central compartment in traction. Labral tears, chondral defects, loose bodies, and synovitis are addressed, and areas of focal rim impingement are identified and confirmed based on the location of labral and chondral injury. A limited, interportal capsulotomy may be performed to expose the extracapsular side of the rim to allow for recession and anchor placement for labral repair under direct visualization. After central compartment pathology is treated, the traction is removed and the hip flexed to create po-
potential space in the peripheral compartment. With an oscillating shaver blade or radiofrequency probe, the anterior and/or superior capsule overlying the cam deformity is resected. The amount of resected capsule is variable and is the minimum required to fully visualize and correct the osseous deformity. Capsulectomy offers the benefit of reasonable exposure of the cam deformity without the need to retract capsular tissue. Furthermore, it eliminates pathologic capsular tissue that may generate pain and contribute to soft-tissue impingement or stiffness of the hip in certain cases. However, capsulectomy does irreversibly alter the anatomy and integrity of the ligaments. As discussed in the previous review of the capsular anatomy, compromised integrity of the iliofemoral ligament may result in iatrogenic pain or instability in certain terminal positions of hip range of motion, particularly in patients with underlying hyperlaxity or dysplasia.

**OUR PREFERRED APPROACH: CAPSULOTOMY**

We have used a controlled and reproducible sequence of capsulotomy followed by capsular repair to thoroughly expose and address all pathology of the central and peripheral compartment while preserving the anatomy and integrity of the ligaments. We typically use a standard anterolateral portal and modified anterior portal to safely access the central compartment in traction. Whereas preoperative imaging (including 3-dimensional computed tomography) is used to define the precise location and geometry of rim and femoral impingement lesions, intraoperative findings of synovitis as well as chondral and labral injury are used to confirm the location of symptomatic osseous pathology (Video 1, available at www.arthroscopyjournal.org). By use of a beaver blade, an interportal capsulotomy is created with meticulous attention to remain in the plane between the labrum and femoral head. We prefer to use a beaver blade rather than radiofrequency ablator, because this minimizes the risk of iatrogenic injury to the labrum and chondral surfaces and preserves full-thickness capsular edges for repair. The length of the interportal capsulotomy is adjusted by the findings of the central compartment and can be extended as posteriorly as the piriformis tendon and as anteromedially as the psoas tendon as needed. The indirect head of the rectus tendon is visualized through the capsulotomy, with insertion directly lateral at the 12-o’clock position on the rim. The indirect head is a very important arthroscopic
landmark to guide rim resection, with most lesions located anterosuperiorly in the 12-o’clock to 2-o’clock location (Fig 8).

The interportal capsulotomy offers several advantages. Primarily, it allows for exposure of the extra-articular side of the labrum, rim, and/or pathologic impingement lesions related to the AIIS (“subspin” impingement). This allows for controlled and precise resection under direct visualization and protection of the periarticular soft tissues (including abductor musculature and direct and indirect heads of the rectus tendon) from iatrogenic injury associated with limited access from portals or entrapment within the bur. Furthermore, the interportal capsulotomy allows for anchor placement and suture passage for labral repair under direct visualization, confirming a safe trajectory for drilling and allowing for a non-everting stitch that preserves labral function (Fig 8). The approach also allows for precise psosas or piriformis tendon lengthening through a transcapsular approach in select, symptomatic cases.

After the central compartment pathology has been addressed, the traction is removed and the camera is positioned in the modified anterior portal for viewing distally along the head-neck junction. The hip is flexed to enlarge the potential space of the peripheral compartment. The anterior and anterosuperior capsule overlying the cam deformity and loss of offset can be directly visualized. A distal anterolateral portal is subsequently established, and a Wissinger rod is introduced to identify the plane immediately superficial to the capsule. There is a fat plane that separates the medial and lateral limbs of the iliofemoral ligament that represents the separation between the inserting fibers of the iliocapsularis tendon medially and the gluteus minimus tendon laterally. Once the fat plane is identified, a clear separation between the 2 muscle planes can be developed. There is a broad attachment of the iliocapsularis tendon onto the capsule, and the initial cut is made with a radiofrequency probe to simultaneously define the intercapsular plane and achieve hemostasis, because the capsule can be inflamed and erythematous particularly in the setting of severe impingement. If the plane is accurately identified, the medial capsule translates medially from the pull of the iliocapsularis, and the lateral capsule translates laterally from the gluteus minimus to further facilitate separation of the 2 limbs of the iliofemoral ligament. The final cut is made sharply with a beaver blade knife (Video 2, available at www.arthroscopyjournal.org). It is important to avoid medial or lateral deviation of the cut to avoid inadvertent muscle trauma, and the cut should stop proximal to the zona orbicularis as long as the crossing vessel of the lateral femoral circumflex artery is visualized and avoided.

The T-capsulotomy affords several advantages. The exposure is extensile and allows for complete defni-
tion of the medial-lateral and proximal-distal margins of the femoral deformity without irreversibly compromising ligament integrity (Fig 9). Elevation of the lateral flap and internal rotation of the hip allow for direct visualization of the superior and posterosuperior head-neck junction, whereas external rotation and elevation of the medial flap allow access to the anteromedial and inferior head-neck junction. In this regard, the exposure and correction of femoral and acetabular deformity that can be achieved are not dissimilar to those which can be achieved through an open surgical dislocation (Fig 9). Recently, Bedi et al.19 compared the efficacy of arthroscopic osteoplasty using this technique with open surgical dislocation to treat FAI dysmorphology in a consecutive series of 60 patients. Arthroscopic osteoplasty was found to restore head-neck offset and achieve depth, arc, and proximal-distal resection with equivalent efficacy to open surgical dislocation for anterior and anterosuperior cam and focal rim impingement lesions.

At the conclusion of the procedure, the medial and lateral capsular flaps are anatomically reduced. By use of a suture passer through the distal anterolateral portal and a tissue penetrator through the proximal anterolateral portal, anatomic side-to-side stitches are placed from distal to proximal until a complete closure is achieved (Fig 9, Video 3 [available at www.arthroscopyjournal.org]). Typically, 3 to 4 stitches are required. This preserves the integrity and structure of the iliofemoral ligament. Furthermore, in cases of underlying hyperlaxity, overlapping stitches can be placed to perform a functional capsulorrhaphy at the time of repair. The degree of overlap is defined for each individual patient based on symptoms and desired restriction of external rotation (Fig 9).

### CAPSULAR MANAGEMENT OF HIP INSTABILITY

Hip instability from both traumatic and atraumatic causes is a recognizable source of pain and disability. The traumatic type can occur from high-energy injuries such as motor vehicle accidents or sporting injuries in rugby, American football, soccer, biking, and skiing. Traumatic hip instability in athletes with associated capsular injury has been well documented and...
illustrated in the literature. Moorman et al.\textsuperscript{20} identified the triad of hemarthrosis, posterior acetabular rim fracture, and iliofemoral ligament injury in a series of American football players who had undergone hip dislocation events. Atraumatic hip instability has a less discrete onset and may be associated with developmental hip dysplasia or generalized hyperlaxity conditions, such as Ehlers-Danlos syndrome, Down syndrome, and arthrochalasia multiplex congenita. Although the hip generally relies less on the soft tissue and more on bony constraints to maintain stability, deviation from the normal osseous anatomy, as occurs in dysplasia, may place greater demands on the capsule and labrum. A hypertrophic labrum, enlarged ligamentum teres, and thickened capsule are frequently encountered in the setting of underlying dysplasia.\textsuperscript{21} Compromised collagen architecture in the setting of generalized ligamentous laxity and microtrauma from repetitive external rotation and axial loading can produce capsular redundancy over time.\textsuperscript{22,23} In addition, injury to the soft tissues surrounding the hip may lead to persistent capsular redundancy resulting in recurrent instability.\textsuperscript{24,25} Recent studies have also suggested that FAI may predispose patients to instability in certain cases, because osseous impingement in positions of terminal motion may precipitate levering of the femoral head, chondral shear injury (“contrecoup” injury), and secondary subluxation or dislocation.

Arthroscopic techniques for addressing the capsule in patients with hip instability have been described in the literature.\textsuperscript{26} To reduce the volume of the capsule, thermal capsulorrhaphy and/or capsular plication may be performed. Thermal capsulorrhaphy uses radiofrequency energy to increase the temperature of collagen in the capsule. The collagen fibers in the capsule are denatured and restructured by the high temperatures and produce a smaller capsule with unchanged mechanical strength.\textsuperscript{27} There is a short-term loss of mechanical properties of the capsule that is ideally restored through the tissue’s healing response.\textsuperscript{28} Philippon\textsuperscript{29} reported good results using thermal capsulorrhaphy to reduce capsular volume in patients with hip capsular laxity, with an 82% return to preinjury, high-level athletics with minimal or no pain. Currently, the senior authors do not use thermal capsulorrhaphy because of concerns about high failure rates and iatrogenic chondrolysis that have been reported in the shoulder literature.\textsuperscript{30–34}

**OUR PREFERRED APPROACH:**
**CAPSULAR PPLICATION**

Capsular plication is the careful placement of sutures to remove redundant capsular tissue and decrease the volume of the joint capsule. Currently, most authors advocate arthroscopic suture capsular plication to treat hip instability.\textsuperscript{26,35,36} Our preferred technique for anterior capsular plication is to perform the standard interportal capsulotomy as well as the vertical limb of the T-capsulotomy as described earlier. The vertical and the horizontal limbs can then be overlapped with the repair to restore tension in the iliofemoral ligament. We typically use a curved suture-passing device to penetrate 1 flap and grasp the passing suture loop with a penetrator through the other end. The side-to-side stitches are retrieved and tied arthroscopically in a standard fashion. Typically, 3 or 4 sutures are placed in the vertical limb and 2 or 3 in the horizontal. Care should be taken to not over-tighten the capsule, because this can limit external rotation postoperatively. This arthroscopic “capsular shift” not only restores tension to the iliofemoral ligament but also allows for augmentation in cases of modest tissue quality by overlapping of the medial and lateral capsular flaps.

**COMPLICATIONS**

Poor capsular management may predispose patients to certain complications after hip arthroscopy. Heterotopic ossification (HO) around the hip joint is not uncommon after the open treatment of acetabular fractures as well as after hip arthroplasty. It occurs as new bone formation in the capsule and musculature surrounding the hip as a response to trauma from injury or surgery.\textsuperscript{37} Randelli et al.\textsuperscript{38} observed an overall HO rate of 1.6% in a series of FAI patients who underwent hip arthroscopy. In addition to postoperative chemical prophylaxis with indomethacin, avoiding iatrogenic muscle trauma with passage of instruments and performing capsulotomy in the intermuscular planes can help to minimize the risk of HO with hip arthroscopy (Fig 10).

Overzealous capsulotomy without repair or capsulectomy can result in iatrogenic hip instability after arthroscopy. Several case reports exist in the literature on postoperative hip instability after arthroscopy.\textsuperscript{23,39,40} The first case involved an immediate dislocation after FAI surgery that required supranormal traction intraoperatively for retrieval of a broken probe.\textsuperscript{23} In this case a capsulotomy with partial cap-
sulectomy had been performed, and the hip was stabilized only after mini-open capsular repair. The author concluded that he would proceed with selective capsular repair in the future. The second case of postoperative instability occurred in a patient with recognized capsular laxity that had undergone capsulorrhaphy at the index procedure. Benali and Katthagen reported a case of postoperative hip subluxation after labral and lateral acetabular rim resection that actually required conversion to a total hip arthroplasty. The importance of the labral “suction seal” and zona orbicularis in restraining against axial distraction should be recognized, highlighting the importance of capsular preservation and repair.

This review is by no means exhaustive; additional information on these topics may be found in the recent literature.

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