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FEMOROACETABULAR IMPINGEMENT/LABRAL TEARS (A ZHANG, SECTION EDITOR)

Contemporary Management of the Hip Capsule During Arthroscopic Hip Preservation Surgery

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Abstract

Purpose of Review The importance of the hip capsule and its effect on hip biomechanics, functional outcomes, and hip arthroscopy success rates has been demonstrated in recent studies. These results have led to a shift in management of the hip capsule, where an increasing number of surgeons routinely perform complete capsular closure. The purpose of this review is to highlight recent studies evaluating the hip capsule and describe contemporary capsular management and repair.

Recent Findings Biomechanical studies using cadaveric models have demonstrated that complete capsular closure restores hip distraction, rotation, and extension forces back to the native, intact state. Additionally, capsular closure by plication results in quantifiable intraarticular volume reduction, which increases hip stability, particularly in cases of patulous capsule and hypermobility. Clinical studies have demonstrated superior patient-reported functional outcomes and decreased failure rates when undergoing hip arthroscopy with comprehensive capsular management for femoroacetabular impingement surgery.

Summary Complete capsular management, including appropriate capsulotomy and subsequent closure, is critical for restoring biomechanical properties of the hip, ensuring high survivorship and improving functional outcomes. This review provides an update on the effects of contemporary capsular management as well as a detailed description of efficient T-capsulotomy and comprehensive capsule closure via plication.

Keywords Hip arthroscopy · Femoroacetabular impingement syndrome · Capsular management · Capsular plication

Introduction

The hip capsule is composed of a complex of external and internal ligaments which provide inherent stability and allow for complex biomechanical movements. Arthroscopic hip preservation surgery for the treatment of femoroacetabular impingement syndrome (FAIS) is a procedure with a high learning curve, requiring manipulation of multiple anatomic structures, including the hip capsule in order to address intraarticular hip pathology [1•]. A number of methods have been described to obtain adequate working space during hip arthroscopy, including periportal incisions, interportal capsulotomy, and T-capsulotomy (Fig. 1). Although performing a capsulotomy allows the hip arthroscopic a wide surgical view and working space, it results in an insult to the hip capsule which impairs its role in hip function. Prior studies have reported similar success rates when performing hip arthroscopy with or without capsular closure; however, limitations in these studies prevent widespread application. More recent studies have demonstrated that performing a capsulotomy without subsequent complete capsular repair

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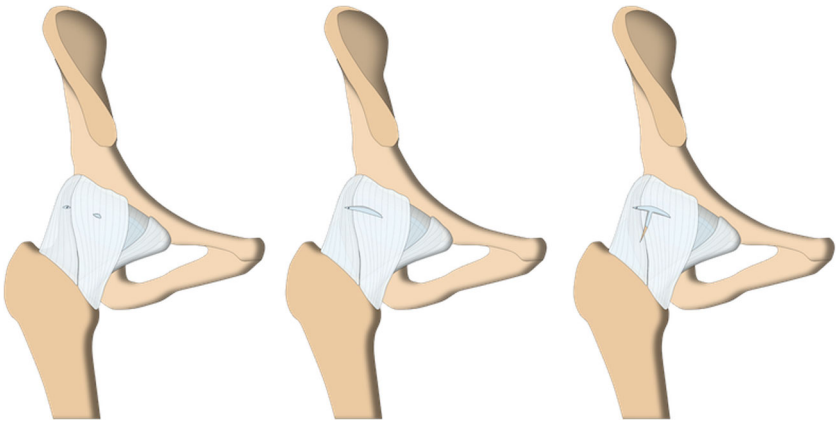

Fig. 1 Illustration demonstrating various types of capsular incisions for intraarticular access during hip arthroscopy. Capsular incision types include periportal incisions (left), interportal capsulotomy (center), and T-capsulotomy (right)

places patients at risk for subsequent implications including iatrogenic instability and the potentially need for revision hip arthroscopy [2•, 3, 4, 5•, 6••].

Due to more recent clinical findings, there has been a shift toward performing routine capsular closure within the field of arthroscopic hip preservation surgery [7••]. Additionally, primary closure of the capsule may decrease the need for subsequent revision surgery to manage micro/macro hip instability or capsular defects [8••]. Due to the growing evidence on the effects of capsular management, the routine closure of the hip capsule has become a common practice amongst an increasing number of hip surgeons.

The purpose of the present article is to provide an update on the effects of contemporary capsular management as well as a detailed description of efficient T-capsulotomy and comprehensive capsule closure via plication. The goal is to assist hip arthroscopists in optimizing hip capsular management techniques to provide patients with the best possible outcomes.

Hip Capsule Anatomy

The structure of the natural hip capsule enables it to contribute to the stability of the hip joint while allowing for complex movement in multiple planes. The hip capsule is composed of an arrangement of three external ligaments and one internal ligament whose interconnections provide biomechanical constraints during movement through modifying forces about the hip. The iliofemoral ligament (Y ligament of Bigelow or ILFL) is the strongest of the ligaments and primarily limits hip extension and external rotation. This external ligament is composed of two individual limbs: a medial limb that extends distally onto the distal intertrochanteric line and a lateral limb which extends obliquely along the femoral neck to insert onto the anterior aspect of trochanteric crest. Its proximal acetabular origin is at 1:26 using the clock face model [9]. The pubofemoral ligament (PFL) is another external ligament which originates at the medial aspect of the pubis and at 4:44 on the acetabular clock face and extends inferoposteriorly under the medial arm of the ILFL, at which point it gradually blends with the medial arm [9]. The primary function of the PFL is to limit excessive abduction and external rotation of the hip joint. The third external ligament is the ischiofemoral ligament (ISFL) which originates posteriorly at the ischium and proximally at 10:15 on the acetabular clock face and extends superolaterally to insert at the greater trochanter [9]. The primary function of the ISFL is to prevent excessive hip extension. The zona orbicularis (ZO) is a synovium-lined internal ligament composed of circumferentially oriented fibers, which aid in resisting hip distraction, thereby stabilizing the femoral head and neck [10•].

Clinical Evidence on Capsular Closure

There is growing evidence in the literature that routine capsular closure after capsulotomy directly results in improved patient-reported outcomes including hip function, quality of life, satisfaction, and pain, as well as a decreased rate of revision surgery [7••, 8••]. Using a national hip arthroscopy registry, Mygind-Klavsen et al. compared outcomes in 247 hips surgically treated with hip arthroscopy for FAIS with routine capsular closure to 247 treated FIAS hips with the capsule left unrepaired [11]. At a 2-year follow-up, the group with routine capsular closure displayed higher average outcome score averages in HAGOS subscales and VAS. Similarly, Philippon and associates compared a smaller cohort composed of 50 patients with FAIS who underwent hip arthroscopy and capsular closure to 50 patients without capsular closure [12•]. At an average follow-up time of 5 years, the group with capsular closure had higher Hip Outcome Score (HOS)-Activity of Daily Living (HOS-ADL), HOS-Sports Subscale (HOS-SS), and modified Hip Harris Score (mHHS) averages when compared with the matched group without capsular closure (Table 1). Furthermore, twice the number of patients in the group without closure required conversion to total hip arthroplasty (THA) when compared with the capsular closure group (8 vs 16%). At our own institution, a study assessed outcome differences in 64 FAIS patients who underwent

Table 1 Midterm follow-up outcome scores in the closure and nonclosure groups

	Without closure	With closure	*p* value
SF-12 PCS	50.0 ± 10.0	54.2 ± 5.9	*0.040*
SF-12 MCS	50.9 ± 9.7	54.3 ± 7.3	0.110
HOS-ADL	83.9 ± 14.0	90.4 ± 8.8	*0.020*
HOS-SS	72.4 ± 26	86.0 ± 18.0	*0.006*
WOMAC	11.6 ± 16.2	7.1 ± 8.4	0.067
mHHS	81.5 ± 16.6	90.1 ± 11	*0.016*

SF-12 PCS Short Form (12 questions) Physical Composite Scale, *SF-12 MCS* Short Form (12 questions) Mental Health Composite Scale, *HOS-ADL* Hip Outcome Score-Activity of Daily Living, *HOS-SS* Hip Outcome Score-Sport Subscale, *WOMAC* Western Ontario and McMaster Universities Osteoarthritis Index, *mHHS* modified Hip Harris Score

The italicized numbers indicate a statistical significance of $p < 0.05$

complete vs partial T-capsulotomy closure. Patients with complete capsular closure had superior sports-specific outcomes compared with patients with partial capsular repair [8••] (Fig. 2). Additionally, there was a 13% revision rate in the group with partial repair vs 0% in the complete repair group.

On the contrary, prior studies have reported that capsulotomy without repair confers similar outcomes to complete capsule closure after capsulotomy. Domb et al. compared 5-year outcomes of patients undergoing hip arthroscopy with capsular repair vs patients without capsular repair. Their study found that patients have significant short-term improvement whether the capsule is closed or left unrepaired. Both groups were also found to have a similar rate of patients achieving minimal clinically important difference (MCID) and patient acceptable symptomatic state (PASS) [13•]. However, as noted in an editorial commentary by Dr. Abrams, there were significant differences in hip pathology between the groups, which likely affect outcomes [14]. Furthermore, the senior author determined who received capsular repair vs nonrepair in a nonrandomized fashion, introducing an additional confounding factor. In another study, Strickland et al. compared 15 hips with capsular closure of interportal capsulotomies to 15 hips without closure using postoperative MRIs. Their study demonstrated that both groups demonstrated healing with a contiguous appearance at 24 weeks after surgery [15•]. However, their study was limited by small sample size and likely underpowered analysis. Additionally, analysis based purely on radiographic evidence is unlikely to capture the clinical function of capsule postoperatively and differences in patient outcomes [16•].

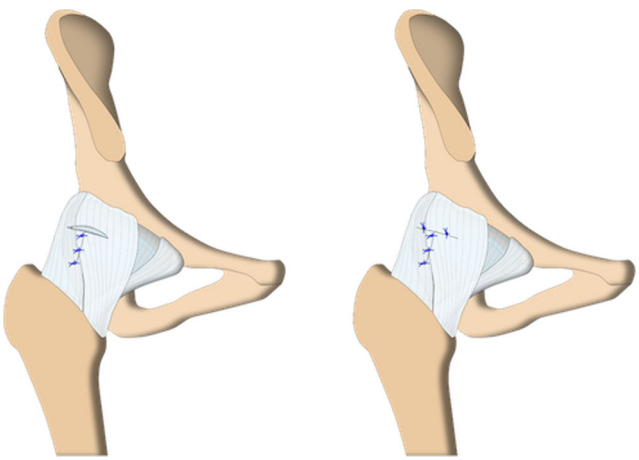

Fig. 2 Illustration demonstrating partial (left) vs complete (right) repair of a T-capsulotomy

Although it is our belief that most patients benefit from complete capsular closure following hip arthroscopy, there are exceptions. The vast majority of patients who are candidates for hip arthroscopy at our institution have very minimal or no arthritic changes (Tonnis grade < 1) and are of young age. However, in older patients with particularly stiff hips or moderate arthritis, there may be a role for capsulotomy without capsule closure. This theory was shared in an editorial stating that an unrepaired capsule or a partial repair in the setting of a T-capsulotomy has been part of a successful treatment algorithm when performing hip arthroscopy in patients with stiff hips and borderline arthritic changes [14].

Biomechanical Evidence on Capsular Closure

The hip and its supporting muscle and ligamentous structures are thought to provide an inherent stability. However, hip pathology in the form of FAI can produce anterior impingement which may lead to posterior hip subluxation [17•] (Fig. 3). Although recent studies have demonstrated that thorough femoral cam resection can eliminate bony impingement and subsequent posterior hip instability [18••], incomplete capsular management can lead to continued macro and microinstability of the hip [19•]. Using cadaveric models, several studies have analyzed the biomechanical properties of hip rotation, translation, and distraction in relationship to capsulotomy type and capsular closure. Abrams et al. assessed the effect of different capsulotomy types and closures on external hip rotation. The results demonstrated that T-capsulotomy leads to increased external rotation when compared with the intact and interportal capsulotomy states. Furthermore, complete repair of the T-capsulotomy restored the rotational profile of the hip to the native state [20••]. Using a cadaveric model, Myers et al. assessed the effect of capsular tear on hip translation. The authors demonstrated that the capsule plays an important role in the stability of the joint by showing increased anterior translation when the iliofemoral ligament is torn, with subsequent restoration of translation after repair [21••]. Lastly, Khair et al. similarly used cadaveric models to identify the effect of capsulotomy and capsular repair on hip distraction. They concluded that the force required for hip distraction is

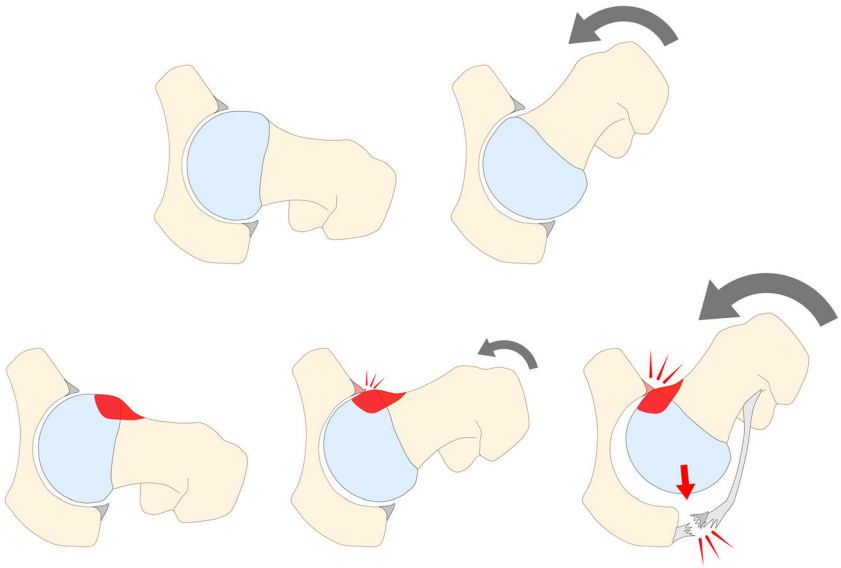

Fig. 3 Illustration demonstrating the circle model of the hip joint. The top two illustrations depict a hip without a femoral cam lesion, which can go through full range of motion without impingement and subsequent subluxation. In the bottom illustration, an anterior cam lesion causes anterior hip impingement resulting in posterior subluxation and microinstability of the hip

reduced in a dose-dependent manner as the capsulotomy size increases, and complete closure returns the biomechanical properties after hip closure [22•].

More recently, hip arthroscopists have transitioned to capsular plication as a routine method of capsular closure, in order to prevent hip microinstability, particularly, in the cases of patulous capsule, and the hypermobile patient [23]. Waterman et al. performed a cadaveric study in order to quantify the difference in intraarticular volume between an intact capsule, capsular plication of T-capsulotomy, and capsular shift of interportal capsulotomy. The authors demonstrated that capsular plication of T-capsulotomy and capsular shift of interportal capsulotomy resulted in statistically significant reductions in intraarticular volume reduction when compared with the intact hip [24•].

Surgical Capsular Management

After the patient is positioned, the operative limb is distracted manually. The optimal operative position of the limb is in neutral adduction, internal rotation to 45°, and extension parallel to the operating floor. Next, arthroscopic portals are established. Specifically, the anterolateral portal (ALP) is established under fluoroscopic guidance which penetrates the hip capsule at the 12 o'clock position on the acetabular clock face. The use of standard cannulation using a 70° arthroscopic allows for intraarticular visualization. Once direct visualization has been established, the modified anterior portal (MAP) is then created at the 2 o'clock position to minimize the size of the interportal capsulotomy. The arthroscope is then switched to the MAP to view the position of the ALP and ensure atraumatic entry and appropriate distance between the portal and the labrum. This allows an adequate cuff of tissue to repair after capsulotomy.

Interportal Capsulotomy

After establishment of the first two arthroscopic portals, an interportal capsulotomy is performed. This capsulotomy allows for visualization of central compartment pathology, providing access for acetabuloplasty and labral debridement or repair. The interportal capsulotomy consists of a transverse incision between the MAP and ALP, beginning approximately 1 cm from the acetabular rim and continuing parallel to the acetabular labrum. The incision is started with an arthroscopic blade in the ALP used to cut half way toward the MAP. Next, the arthroscope is switched to the AL portal, and the arthroscopic blade is inserted in the MAP cutting toward the ALP until the capsulotomy is complete. The size of the interportal capsulotomy varies depending on the location of the intraarticular pathology but generally between 2 and 4 cm (Fig. 4). A diagnostic arthroscopy is performed to evaluate the condition of the labrum and associated intraarticular pathology in the central compartment.

Capsulotomy: Vertical T-limb

In order to access the proximal femoral cam deformity in the peripheral compartment, traction of the operative limb is released, and the hip is rotated in the neutral position and flexed to approximately 20°. The arthroscope is placed in the MAP, and an arthroscopic blade is introduced through the distal accessory anterolateral portal (DALA). The intermuscular plane is identified between the iliocapsularis muscle medially and the gluteus minimus muscle laterally. A perpendicular incision is then made from the center or the interportal capsulotomy (between the 12 and 2 o'clock positions) toward the intertrochanteric line (Fig. 5). A suture passing device is then used to reflect the medial and lateral limbs of the T-capsulotomy using no. 2 high-molecular weight polyethylene

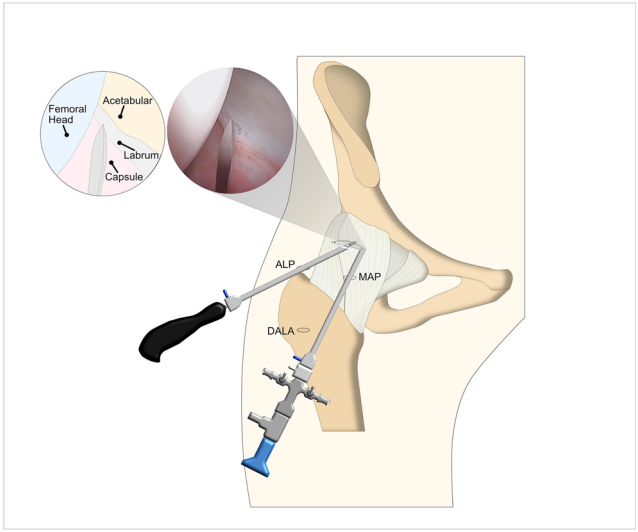

Fig. 4. Illustration demonstrating an interportal capsulotomy created in order to access the central compartment of the intraarticular hip joint. This incision allows for improved access and direct visualization of acetabular pathology

sutures. A suture is placed in the medial limb retrieved via the DALA portal and tensioned outside the skin with a hemostat. Another suture is placed in the lateral limb retrieved via the ALP and tensioned outside the skin with a hemostat. The suspension technique provides effective retraction of the capsule and allows for adequate visualization of the peripheral compartment while allowing for a less complex capsular repair. Failure to repair the vertical T-limb capsulotomy may confer excessive external rotation by up to 9.5%, while closure of the capsulotomy has been shown to restore the rotational profile of the hip back to its natural state [20••].

Capsular Plication

Once the arthroscopic procedure is complete, a complete capsular closure is performed to restore normal biomechanical properties of the IFL. While viewing from the MAP, an 8.5 × 110-mm plastic cannula is placed in the DALA portal and an 8.5 × 90-mm plastic cannula is placed in the AL portal.

The vertical T-limb of the T-capsulotomy is closed first, beginning at the base of the iliofemoral ligament (IFL) using suture passing device loaded with a no. 2 high-molecular weight polyethylene suture (Fig. 6). A crescent tissue penetrating device (SlingShot Suture Manager, Stryker, Greenwood Village, CO) loaded with the suture is placed through the ALP to sharply pierce the lateral leaflet of the ILFL at approximately 3 mm from the edge. The suture is shuttled into the intraarticular side of the capsule, at which point the penetrating device is used to pierce the medial leaflet at approximately 6 mm to retrieve the free suture through the DALA portal. Subsequently, the suture retriever is used to pull the suture from the AL portal to the DALA portal so that it can be tied after each pass. Each subsequent stitch is passed approximately 1-cm proximal to the previous stitch. A total of 2–3 stitches are placed to close the vertical limb of the capsulotomy.

Following repair of the vertical limb, the interportal capsulotomy is closed using a self-passing suture device (Injector II Capsule Restoration System, Stryker Sports

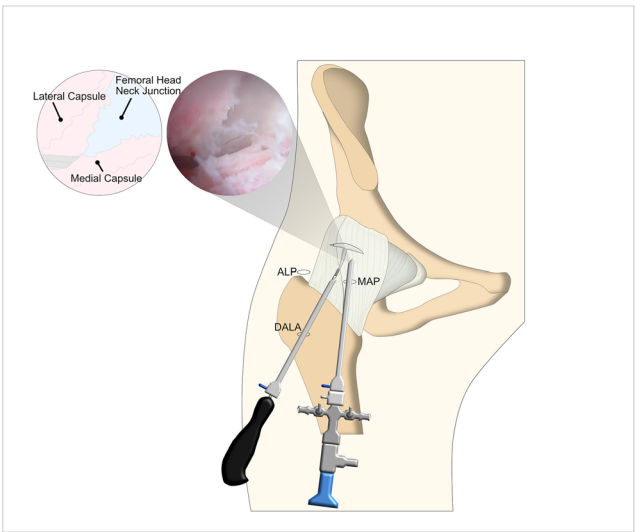

Fig. 5 Illustration demonstrating creation of the vertical limb of a T-capsulotomy. This incision is created in order to augment access the peripheral compartment of the intraarticular hip joint. The incision allows for improved access and direct visualization of femoral pathology

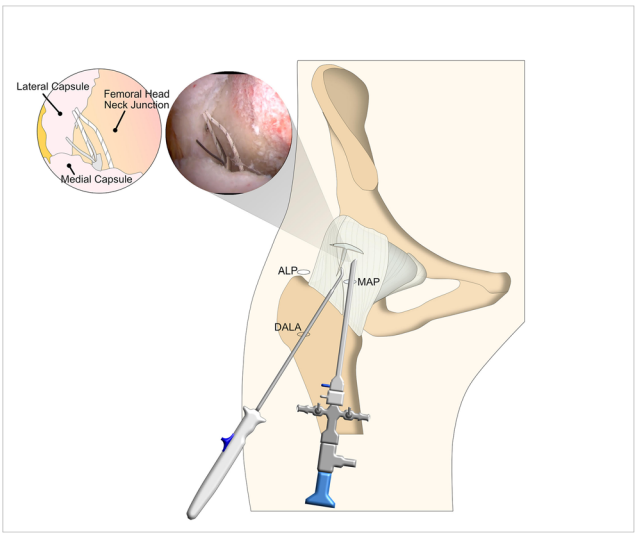

Fig. 6 Illustration demonstrating commencement of capsulotomy closure, which begins with closure of the vertical limb followed by interportal capsule closure. Depending various factors including hip range of motion, capsular integrity, capsular laxity, and plication may be used to ensure biomechanical stability of the hip

Medicine) that allows for closure through a single cannula lateral to medial. The suture passer is introduced through the ALP in order to pass the suture through the proximal IFL stump attached to the acetabulum. After passage, the device is removed from the cannula, and the opposite end of the suture is passed through the distal IFL. The stitch is then tensioned and tied with the hip in neutral extension. Likewise, closure of the medial IFL involves suture passage through the proximal and distal IFL using the DALA portal. Generally, 2 to 3 stitches are used to close the interportal capsulotomy. Complete capsular closure is confirmed by the inability to visualize the underlying femoral head/neck and by probing the anterior capsule to ensure proper tension.

Conclusions

Violation of the hip capsule produces iatrogenic instability through disruption of the complex ligamentous anatomy that normally provides stability. Complete capsular repair is an essential aspect of hip arthroscopy to return the hip to a naïve functional state. There is a growing body of literature demonstrating the functional and clinical advantages of complete capsule closure.

Compliance with Ethical Standards

Conflict of Interest Edward C. Beck, Kyle N. Kunze, Kelechi Okoroha, and Sunikom Suppauksorn declare that they have no conflict of interest.

Shane J. Nho has received research support from AlloSource, Arthrex, Athletico, DJ Orthopaedics, Linvates, Miomed, Smith & Nephew, and Stryker, is a paid consultant for Stryker and Ossur, and has received publishing royalties from Springer within the past 5 years. Shane J. Nho has also been a committee or board member for the *American Journal of Orthopedics*, the American Orthopaedic Society for Sports Medicine, and the Arthroscopy Association of North America within the past 5 years.

References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance
- •• Of major importance

1.• Hoppe DJ, et al. The learning curve for hip arthroscopy: a systematic review. Arthroscopy. 2014;30(3):389–97 **Purpose: the learning curve for hip arthroscopy is consistently characterized as "steep." The purpose of this systematic review was to (1) identify the various learning curves reported in the literature, (2) examine the evidence supporting these curves, and (3) determine whether this evidence supports an accepted number of cases needed to achieve proficiency. Methods: the electronic databases Embase and Medline were screened for any clinical studies reporting learning curves in hip arthroscopy. Two reviewers conducted a full-text review of eligible studies and a hand search of conference proceedings and reference sections of the included articles. Inclusion/exclusion criteria were applied, and a quality assessment was completed for each included article. Descriptive statistics were compiled. Results: we identified 6 studies with a total of 1063 patients. Studies grouped surgical cases into "early" vs "late" in a surgeon's experience, with 30 cases being the most common cutoff used. Most of these studies used descriptive statistics and operative time and complication rates as measures of competence. Five of 6 studies showed improvement in these measures between early and late experiences, but only one study proposed a bona fide curve. Conclusions: this review shows that when 30 cases were used as the cutoff point to differentiate between early and late cases in a surgeon's experience, there were significant reductions in operative time and complication rates. However, there was insufficient evidence to quantify the learning curve and validate 30, or any number of cases, as the point at which the learning curve plateaus. As a result, this number should be interpreted with caution. Level of evidence: level IV, systematic review of level IV studies.**

2.• Domb BG, et al. Arthroscopic capsulotomy, capsular repair, and capsular plication of the hip: relation to atraumatic instability. Arthroscopy. 2013;29(1):162–73 **Purpose: the purpose of this systematic review was to critically evaluate the available literature exploring the role of the hip joint capsule in the normal state (stable) and pathologic states (instability or stiffness). Furthermore, we examined the various ways that arthroscopic hip surgeons address the capsule intraoperatively: (1) capsulotomy or capsulectomy without closure, (2) capsulotomy with closure, and (3) capsular plication. Methods: two independent reviewers (B.D.G. and B.G.D.) performed a systematic review of the literature using PubMed and the reference lists of related articles by means of defined search terms. Relevant studies were included if these criteria were met: (1) written in English, (2) levels of evidence I to V, (3) focus on capsule and its role in hip stability, and (4) human studies and reviews. Articles were excluded if they evaluated (1) total hip arthroplasty constructs using bony procedures or prosthetic revision, (2) developmental dysplasia of the hip where reorientation osteotomies were used, (3) syndromic instability, and (4) traumatic instability with associated bony injury. Results: by use of the search method described, 5,085 publications were reviewed, of which 47 met appropriate criteria for inclusion in this review. Within this selection group, there were multiple publications that specifically addressed more than 1 of the inclusion criteria. Relevant literature was organized into the following areas: (1) capsular anatomy, biomechanics, and physiology; (2) the role of the capsule in total hip arthroplasty stability; (3) the role of the capsule in native hip stability; and (4) atraumatic instability and capsulorrhaphy. Conclusions: as the capsuloligamentous stabilizers of the hip continue to be studied, and their role defined, arthroscopic hip surgeons should become facile with arthroscopic repair or plication techniques to restore proper capsular integrity and tension when indicated. Level of evidence: level IV, systematic review.**

3. Ekhtiari S, de SA D, Haldane CE, Simunovic N, Larson CM, Safran MR, et al. Hip arthroscopic capsulotomy techniques and capsular management strategies: a systematic review. Knee Surg Sports Traumatol Arthrosc. 2017;25(1):9–23.

4. Mei-Dan O, et al. Catastrophic failure of hip arthroscopy due to iatrogenic instability: can partial division of the ligamentum teres and iliofemoral ligament cause subluxation? Arthroscopy. 2012;28(3):440–5 **Hip arthroscopy is an evolving surgical tool, and with any new procedure, it is important to learn from the complications encountered. A patient with mild hip dysplasia**

and a symptomatic labral tear underwent uneventful hip arthroscopy and labral repair including partial debridement of a hypertrophied ligamentum teres. Despite preservation of the labrum, no pincer resection, and a modest capsulotomy, 3 months, subluxation and joint space narrowing were noted. One year, end-stage arthritis was present, requiring total hip replacement. Instability after hip arthroscopy is due to a number of factors, including excessive rim trimming, capsulotomy, overzealous labral resection, or inadequate labral repair. This report emphasizes the importance of the ligamentum teres and small disruptions of the capsule in patients with mild dysplasia.

5. Uchida S, Pascual-Garrido C, Ohnishi Y, Utsunomiya H, Yukizawa Y, Chahla J, et al. Arthroscopic shoelace capsular closure technique in the hip using Ultratape. Arthrosc Tech. 2017;6(1):e157–61.

6.•• Weber AE, et al. Complications in hip arthroscopy: a systematic review and strategies for prevention. Sports Med Arthrosc Rev. 2015;23(4):187–93 **The primary objective of this study was to determine the minor and major complication rates of hip arthroscopy. The secondary objective was to provide strategies for avoiding complications. A systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and checklist. Therapeutic hip arthroscopy investigations that reported on adverse events or complications were included. Narrative and other systematic reviews, meta-analyses, conference abstracts or proceedings, and level V evidence studies were excluded. No follow-up minimum was imposed. The results yielded 53 studies (8189 hip arthroscopies in 8071 subjects). Most studies were level IV evidence (74%) with a mean of 2.2 ± 2.1 years of follow-up. Femoroacetabular impingement (FAI) and labral pathology were the 2 most common indications for surgery, and osteochondroplasty for FAI and labral treatment were the 2 most common procedures performed. The minor and major complication rates were 7.9% and 0.45%, respectively. Iatrogenic chondrolabral damage and temporary nerve injury were the 2 most common minor complications. Extraarticular fluid extravasation was the most common major complication encountered. Minor complications associated with hip arthroscopy are generally technical in nature and may be related to the learning curve associated with hip arthroscopy. As surgeon experience increases and patient selection improves, a corresponding decline should be observed in minor complications. Strategies to prevent complications include careful preoperative planning, appropriate surgical indications, attention to detail in the operating room, and proper postoperative rehabilitation.**

7.•• Riff AJ, et al. Systematic review of hip arthroscopy for femoroacetabular impingement: the importance of labral repair and capsular closure. Arthroscopy. 2019;35(2):646–656 e643 **Purpose: to evaluate the safety and efficacy of hip arthroscopy for femoroacetabular impingement syndrome by assessing complications, comprehensive procedure survivorship, and the influence of labral and capsular management on procedure survivorship. Methods: a systematic review of multiple medical databases was performed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and checklist. All clinical outcome studies that reported on the presence or absence of reoperation after hip arthroscopy for femoroacetabular impingement syndrome were eligible for inclusion. Data pertaining to patient demographic characteristics, surgical technique (specifically labral and capsular management), patient-reported outcomes, complications, reoperation, and conversion to arthroplasty were extracted from each study. Results: a total of 68 studies (7,241 hips) were included. Most were level IV studies (63%). Complications occurred in 1.9% of cases. The most common complications were neurologic (53%), heterotopic ossification (24%), infection (15%), and thromboembolic (7%). Conversion to total hip arthroplasty (456 cases) was the most common reason for reoperation, followed by revision hip arthroscopy (226 cases) and periacetabular osteotomy (7 cases). The rate of arthroplasty conversion was lower than 10% in 43 of 59 studies reporting this outcome. The average interval to arthroplasty conversion was 58 months. Between 2009 and 2017, the performance of labral repair increased from 19 to 81% of cases and capsular closure increased from 7 to 58% of cases. Conclusions: arthroplasty conversion occurred in fewer than 10% of cases in the clear majority of series. Labral repair (compared with labral debridement) and capsular closure (compared with unrepaired capsulotomy) were associated with a lower risk of conversion to arthroplasty. Throughout the study interval, there were shifts in surgical technique favoring labral repair over debridement and capsular repair over unrepaired capsulotomy. The study is limited by selection bias because cases in which labral and capsular repair was performed may have had superior tissue that was more amenable to repair. Level of evidence: level IV, systematic review.**

8.•• Frank RM, et al. Improved outcomes after hip arthroscopic surgery in patients undergoing T-capsulotomy with complete repair versus partial repair for femoroacetabular impingement: a comparative matched-pair analysis. Am J Sports Med. 2014;42(11):2634–42 **Background: hip capsular management after hip arthroscopic surgery for femoroacetabular impingement (FAI) is controversial. Purpose/hypothesis: to compare the clinical outcomes of patients undergoing hip arthroscopic surgery for FAI with T-capsulotomy with partial capsular repair (PR; closed vertical incision, open interportal incision) vs complete capsular repair (CR; full closure of both incisions). The hypothesis was that there would be improved clinical outcomes in patients undergoing CR compared with those undergoing PR. Study design: cohort study; level of evidence 3. Methods: consecutive patients undergoing hip arthroscopic surgery for FAI by a single fellowship-trained surgeon from January 2011 to January 2012 were prospectively collected and analyzed. Inclusion criteria included all patients between ages 16 and 65 years with physical examination and radiographic findings consistent with symptomatic FAI, with a minimum 2-year follow-up. For analysis, patients were matched according to sex and age ± 2 years. Primary clinical outcomes were measured via the Hip Outcome Score Activities of Daily Living (HOS-ADL) and Sport-Specific (HOS-SS) subscales, the modified Harris Hip Score (mHHS), patient satisfaction (measured on a visual analog scale), and clinical improvement at baseline, 6 months, 1 year, and 2 years. Statistical analysis was performed utilizing Student paired and unpaired *t* tests, with $P < 0.05$ considered significant. Results: a total of 64 patients were included in the study, with 32 patients (12 males, 20 females) in each group. The average follow-up was 29.9 ± 2.6 months. There were no significant demographic differences between the groups. The CR group demonstrated significantly superior outcomes in the HOS-SS at 6 months (PR 63.8 ± 31.1 vs CR 72.2 ± 16.1; $P = 0.039$), 1 year (PR 72.7 ± 14.7 vs CR 82.5 ± 10.7; $P = 0.006$), and 2.5 years (PR 83.6 ± 9.6 vs CR 87.3 ± 8.3; $P < 0.0001$) after surgery. Patient satisfaction at final follow-up was significantly better in the CR group (PR 8.4 ± 1.0 vs CR 8.6 ± 1.1; $P = 0.025$). Both groups demonstrated significant improvements in the HOS-ADL (PR 64.6 ± 17.0 to 90.7 ± 8.4 ($P < 0.0001$); CR 66.1 ± 15.7 to 92.1 ± 7.9 ($P < 0.0001$) and HOS-SS (PR 39.4 ± 23.9 to 83.6 ± 9.6 ($P < 0.0001$); CR 39.1 ± 24.2 to 87.3 ± 8.3 ($P < 0.0001$)) at final follow-up. There were no significant differences between the groups in the HOS-ADL at any time point. There were no significant differences in the mHHS between the groups at final follow-up (PR 82.5 ± 5.0 vs**

CR 83.0 ± 4.4; $P = 0.364$). The overall revision rate was 6.25%; all patients ($n = 4$) who required revision arthroscopic surgery were in the PR group (13% of 32 patients), while no patients in the CR group required revision surgery. Conclusion: while significant improvements were seen at 6 months, 1 year, and 2.5 years of follow-up regardless of the closure technique, patients who underwent CR of the hip capsule demonstrated superior sport-specific outcomes compared with those undergoing PR. There was a 13% revision rate in the PR group, but no patients in the CR group required revision surgery. While longer term outcome studies are needed to determine if these results are maintained over time, these data suggest improved outcomes after CR compared with PR at 2.5 years after hip arthroscopic surgery for FAI.

9. Nam D, Osbahr DC, Choi D, Ranawat AS, Kelly BT, Coleman SH. Defining the origins of the iliofemoral, ischiofemoral, and pubofemoral ligaments of the hip capsuloligamentous complex utilizing computer navigation. HSS J. 2011;7(3):239–43.
10. Ito H, Song Y, Lindsey DP, Safran MR, Giori NJ. The proximal hip joint capsule and the zona orbicularis contribute to hip joint stability in distraction. J Orthop Res. 2009;27(8):989–95.
11. Mygind-Klavsen B, et al. Danish Hip Arthroscopy Registry: capsular closing in patients with femoroacetabular impingement (FAI): results of a matched-cohort controlled study. J Hip Preserv Surg. 2016;3(suppl_1):hnw030.017.
12. Bolia I, Briggs KK, Philippon MJ. Superior clinical outcomes with capsular closure versus non-closure in patients undergoing arthroscopic hip labral repair. Orthop J Sports Med. 2018;6(3_suppl): 2325967118S0000.
13.• Domb BG, et al. Patient-reported outcomes of capsular repair versus capsulotomy in patients undergoing hip arthroscopy: minimum 5-year follow-up-a matched comparison study. Arthroscopy. 2018;34(3):853–863 e851 **Purpose: to elucidate whether capsular closure during hip arthroscopy affected patient outcomes over midterm follow-up. Methods: between 2008 and 2011, data were prospectively collected and retrospectively reviewed on patients who underwent hip arthroscopy. Patients were then matched for age, gender, worker's compensation, body mass index, and acetabular coverage. The inclusion criteria were capsular repair or unrepaired capsulotomy, lateral-center edge angle ≥ 18°, and minimum of a 5-year follow-up. The exclusion criteria were previous hip surgery or conditions and Tonnis grade > 1. Patient-reported outcome scores (PROs) included modified Harris Hip Score (mHHS), nonarthritic hip score, hip outcome score sport-specific subscale, and visual analog score for pain, which were collected preoperatively, at 3 months and annually thereafter. Minimal clinically important difference (MCID) and patient acceptable symptomatic state (PASS) for both groups were analyzed. Patient satisfaction was noted as well as any complications, secondary surgery, and conversion to arthroplasty. Results: minimum of a 5-year follow-up was available for 82.5% (287 of 348) hips that met the inclusion criteria and were eligible for matching. Ultimately, 65 patients who underwent capsular repair could be matched in a 1:1 ratio to 65 patients with release. Both groups had significant improvements in all mean PROs. The repair group had significant improvement of mean PROs, visual analog score, and patient satisfaction at both 2-year and minimum 5-year follow-ups. The unrepaired group had a significant decrease in mHHS ($P = 0.001$) and patient satisfaction ($P = 0.01$) between 2- and 5-year follow-ups. Despite decreasing mHHS in the repair group between 2- and 5-year follow-ups, both groups met the MCID and PASS criteria with no significant difference between them. More patients in the release group required conversion to hip arthroplasty (18.5% vs 10.8%). Subgroup analysis considering various perioperative factors confirmed this trend. Rate of revision arthroscopy was the same in both groups (15.4%). Complication rate was low (4.6% vs 6.4%) in both groups. Conclusions: patients undergoing hip arthroscopy and who have minimal or no arthritis have significant short-term improvement, whether the capsule is closed or left unrepaired. However, at midterm follow-up, patients who had unrepaired capsules had deterioration in mHHS as well as a higher rate of conversion to arthroplasty, even when controlling for various perioperative variables. Despite this, patients in both groups met the MCID and PASS criteria. This study suggests that routine capsular closure may lead to more consistently durable outcome in patients undergoing hip arthroscopy, but also that individual patient pathology may dictate capsular management. Level of evidence: level III, retrospective comparative study.**
14.• Abrams GD. Editorial commentary: the importance of capsular closure in hip arthroscopy: is there a limit to the benefit? Arthroscopy. 2018;34(3):864–5 **Capsular closure is an important concept in hip arthroscopy and should be performed in nearly all patients. However, in patients with stiff hips and borderline arthritic changes, leaving the capsule unrepaired or performing a partial repair in the setting of a T-capsulotomy could result in successful outcomes.**
15.• Strickland CD, et al. MRI evaluation of repaired versus unrepaired interportal capsulotomy in simultaneous bilateral hip arthroscopy: a double-blind, randomized controlled trial. J Bone Joint Surg Am. 2018;100(2):91–8 **Background: techniques used in hip arthroscopy continue to evolve, and controversy surrounds the need for capsular repair following this surgical intervention. The purpose of this study was to evaluate the magnetic resonance imaging (MRI) appearance of the hip capsule in patients with femoroacetabular impingement (FAI) who underwent simultaneous bilateral hip arthroscopy through an interportal capsulotomy with each hip randomized to undergo capsular repair or not undergo such a repair. Methods: this double-blind, randomized controlled trial included 15 patients (30 hips), with a mean age of 29.2 years, who underwent simultaneous bilateral hip arthroscopy utilizing a small (< 3 cm) interportal capsulotomy for the treatment of FAI. The first hip treated in each patient was intraoperatively randomized to undergo capsular repair or no capsular repair. The contralateral hip then received the opposite treatment. MRI was performed at 6 and 24 weeks postoperatively, and the scans were analyzed by 2 musculoskeletal radiologists. The patients and the radiologists were blinded to the treatment performed on each hip. Capsular dimensions were measured at the level of the healing capsulotomy site and, for hips with a persistent defect, at locations both proximal and distal to the defect. These values were then analyzed at both time points to assess the rate and extent of capsular healing. Results: at 6 weeks postoperatively, a continuous hip capsule (with no apparent capsulotomy defect) was observed in 8 hips treated with capsular repair and 3 hips without such a repair. Of the 19 hips with a discontinuous capsule at 6 weeks, 17 were available for follow-up at 24 weeks postoperatively; all 17 demonstrated progression to healing, with a contiguous appearance without defects and no difference in capsular dimensions between treatment cohorts. Conclusions: arthroscopic repair of a small interportal hip capsulotomy site yields an insignificant increase in the percentage of continuous hip capsules seen on MRI at 6 weeks postoperatively compared with no repair. Repaired and unrepaired capsulotomy sites progressed to healing with a contiguous appearance on MRI by 24 weeks postoperatively. Level of evidence: therapeutic level I. See Instructions for Authors for a complete description of levels of evidence.**

16.• Shin JJ, de SA DL, Burnham JM, Mauro CS. Refractory pain following hip arthroscopy: evaluation and management. J Hip Preserv Surg. 2018;5(1):3–14 **With increased knowledge and understanding of hip pathology, hip arthroscopy is rapidly becoming a popular treatment option for young patients with hip pain. Despite improved clinical and radiographic outcomes with arthroscopic treatment, some patients may have ongoing pain and less than satisfactory outcomes. While the reasons leading to failed hip arthroscopy are multifactorial, patient selection, surgical technique, and rehabilitation all play a role. Patients with failed hip arthroscopy should undergo a thorough history and physical examination, as well as indicated imaging. A treatment plan should then be developed based on pertinent findings from the workup and in conjunction with the patient. Depending on the etiology of failed hip arthroscopy, management may be nonsurgical or surgical, which may include revision arthroscopic or open surgery, periacetabular osteotomy, or joint arthroplasty. Revision surgery may be appropriate in settings including, but not limited to, incompletely treated femoroacetabular impingement, postoperative adhesions, heterotopic ossification, instability, hip dysplasia, or advanced degeneration.**

17.• Krych AJ, et al. Is posterior hip instability associated with cam and pincer deformity. Clin Orthop Relat Res. 2012;470(12):3390–7 **Background: posterior hip instability is an increasingly recognized injury in athletes; however, the function of patients after these injuries and an understanding of the pathoanatomy and underlying mechanism are currently unclear. Questions/purposes: we determined (1) the function of patients after these hip injuries using validated, self-reported outcome instruments and (2) the specific pathoanatomy sustained in these events to better understand the mechanism of posterior hip instability. Methods: we reviewed the records of all 22 athletes presenting to our clinics with a posterior acetabular rim fracture confirming a posterior hip instability episode. Radiograph, CT, and MRI findings were documented in all patients. Intraoperative findings were recorded in patients undergoing surgery. There were 19 males and three females with an average age of 22 years (range, 13–31 years). Minimum follow-up was 2 years (average, 4 years; range, 2–16 years). Results: the mean modified Harris Hip Score was 94, Hip Outcome Scores for Activities of Daily Living and Sport were 99 and 87, respectively, and 20 of 22 athletes returned to sport. The most common constellation of pathoanatomy was a posterior labral tear with rim fracture, anterior labral tear, capsular tear, ligamentum teres avulsion, and chondral injury of the femoral head with loose bodies. Sixteen of the 18 patients with femoroacetabular impingement (FAI) had a twisting or noncontact mechanism of injury. Conclusions: when posterior hip subluxation is recognized and avascular necrosis avoided, these athletes generally have high functional outcome scores and high rates of return to sport. There is an apparent association between the occurrence of posterior hip instability and the presence of structural abnormalities often associated with FAI, which may contribute to a mechanism of FAI-induced posterior subluxation. Level of evidence: level IV, therapeutic study. See the Instructions for Authors for a complete description of levels of evidence.**

18.•• Canham CD, et al. Does femoroacetabular impingement cause hip instability? A systematic review. Arthroscopy. 2016;32(1):203–8 **Purpose: to determine whether femoroacetabular impingement (FAI) is associated with hip instability. Methods: a systematic search examining FAI and hip instability was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Clinical and basic science studies were included. Instability had to be documented with either a clinical or imaging examination. Studies were excluded if they did not define diagnostic criteria for FAI, involved prosthetic hips, were not in English, were review articles, or reported level V evidence (case reports, expert opinion). Rates of FAI morphologic features in patients with documented hip instability were determined. Mechanisms and rates of FAI-induced hip subluxation were examined in basic science studies. Results: the search yielded 1,630 relevant studies. Seven studies (4 clinical and 3 basic science) met inclusion criteria. Four studies investigated an association between FAI and hip instability in 92 patients with an average age of 31 years. Seventy-six patients experienced frank dislocations, and 16 experienced posterior subluxation events. The prevalence of FAI was documented in 89 patients with hip instability. The rates of cam and pincer morphologic characteristics were 74% and 64%, respectively. The average lateral center edge angle and prevalence of acetabular retroversion were 30° and 70%, respectively ($n = 76$ patients). All 3 basic science studies had real-time visualization of FAI-induced hip subluxations. Conclusions: high rates of FAI morphologic characteristics are present in patients with hip instability. FAI morphologic characteristics may predispose the hip to instability through anatomic conflict caused by pincer or cam lesions (or both) levering the femoral head posteriorly. Level of evidence: level IV, systematic review of level III, level IV, and nonclinical studies.**

19.• Duplantier NL, et al. Hip dislocation or subluxation after hip arthroscopy: a systematic review. Arthroscopy. 2016;32(7):1428–34 **Purpose: to determine patient- and surgery-specific characteristics of patients sustaining postarthroscopic hip dislocation or subluxation. Methods: a systematic review of multiple medical databases was registered with PROSPERO and performed using Preferred Reporting Items for Systemic Reviews and Meta-Analysis guidelines. Level I to IV clinical outcome studies reporting the presence of hip dislocation or subluxation after hip arthroscopy were eligible. Length of follow-up was not an exclusion criterion. All patient- and surgery-specific variables were extracted from each, specifically evaluating osseous morphology and resection details; labral, iliopsoas, ligamentum teres, and capsular management; generalized ligamentous laxity; instability direction and mechanism; management; and outcome. Study authors were individually contacted to assess most recent outcome. Results: ten articles with 11 patients were analyzed (mean patient age 36.6 ± 12.3 years). There were 9 hip dislocations and 2 subluxations. Mean time between surgery and dislocation was 3.2 ± 4.0 months (range: recovery room to 14 months). Anterior was the most frequent dislocation direction (8 cases). Acetabular undercoverage (preoperative dysplasia or iatrogenic rim overresection) was observed in 5 cases. Labral debridement was performed in 5 cases, iliopsoas tenotomy in 3 cases, and ligamentum teres debridement in 1 case. A "T" capsulotomy was created in 1 case (isolated interportal in other 10 cases). Capsular closure was performed in 2 cases (both interportal). Generalized ligamentous laxity was diagnosed in 1 case. A combination of external rotation and extension was observed in 5 of the 6 cases reporting the mechanism of anterior dislocation. Four cases were successfully treated with closed reductio, 4 required total hip arthroplasty, and 3 required revision capsulorrhaphy. Conclusions: Postarthroscopic hip instability was observed in patients with acetabular undercoverage (including iatrogenic resection), labral debridement, capsular insufficiency, or iliopsoas tenotomy. Most dislocations were anterior, occurring with hip extension and external rotation. Level of evidence: level IV, systematic review of level IV studies.**

20.•• Abrams GD, et al. Biomechanical evaluation of capsulotomy, capsulectomy, and capsular repair on hip rotation. Arthroscopy. 2015;31(8):1511–7 **Purpose: to determine the effect of different types of capsulotomies on hip rotational biomechanical characteristics. Methods: seven fresh-frozen cadaveric hip specimens were thawed and dissected, leaving the hip capsule and labrum intact. The femur was transected and potted, and each specimen was placed in a custom loading apparatus that allowed for adjustment of flexion, extension, and axial rotation of the femur. Six reflective infrared markers were attached to the specimens to track the motion of the femoral head with respect to the acetabulum in real time, and external rotation was produced by applying a torque of 10 nm to the hip specimens. Data analysis was performed using the 3-dimensional position of the markers in space. The specimens were tested in neutral flexion and 40° of flexion in the following capsular states: intact, interportal capsulotomy, T-capsulotomy, repaired capsulotomy, and capsulectomy. Paired *t* tests and analysis of variance were used with an alpha value of 0.05 set as significant. Results: with the hip in neutral flexion, there was increased external rotation with a T-capsulotomy (91.1° ± 20.3°, $P = 0.029$) and capsulectomy (91.9° ± 19.6°, $P = 0.015$) compared with the intact hip (83.2° ± 20.5°). After complete repair of the T-capsulotomy (87.4° ± 20.6°), there was no significant difference in external rotation compared with the intact hip. No significant differences were seen between groups at 40° of hip flexion. Conclusions: a T-capsulotomy showed significantly increased external rotation vs the intact and interportal capsulotomy states. The repaired T-capsulotomy restored the rotational profile back to the native state. Clinical relevance: many methods of capsular treatment during hip arthroscopy exist. Capsulotomy and capsulectomy do not restore the external rotation restraint of the hip back to its native state.**

21.•• Myers CA, et al. Role of the acetabular labrum and the iliofemoral ligament in hip stability: an in vitro biplane fluoroscopy study. Am J Sports Med. 2011;39(Suppl):85S–91S **Background: recent biomechanical reports have described the function of the acetabular labrum and iliofemoral ligament in providing hip stability, but the relative stability provided by each structure has not been well described. Hypothesis: both the iliofemoral ligament and acetabular labrum are important for hip stability by limiting external rotation and anterior translation, with increased stability provided by the iliofemoral ligament compared with the acetabular labrum. Study design: controlled laboratory study. Methods: fifteen fresh-frozen male cadaveric hips were utilized for this study. Each specimen was selectively skeletonized down to the hip capsule. Four tantalum beads were embedded into each femur and pelvis to accurately measure hip translations and rotations using biplane fluoroscopy while either a standardized 5 nm external or internal rotation torque was applied. The hips were tested in 4 hip flexion angles (10° of extension and neutral and 10° and 40° of flexion) in the intact state and then by sectioning and later repairing the acetabular labrum and iliofemoral ligament in a randomized order. Results: external rotation significantly increased from the intact condition (41.5° ± 7.4°) to the sectioned iliofemoral ligament condition (54.4° ± 6.6°and both-sectioned condition (61.5° ± 5.7°; $P < 0.01$), but there was no significant increase in external rotation when the labrum alone was sectioned (45.6° ± 5.9°). The intact and fully repaired conditions were not significantly different. External rotation and internal rotation significantly decreased when the hip flexion angle decreased from 40° of flexion to 10° of extension ($P < 0.01$) regardless of sectioned condition. Anterior translation varied significantly across sectioned conditions but not across flexion angles ($P < 0.001$). The ligament-sectioned (1.4 ± 0.5 mm), both-sectioned (2.2 ± 0.2 mm), and labrum-repaired (1.1 ± 0.2 mm) conditions all resulted in significantly greater anterior translation than the intact condition (− 0.4 ± 0.1 mm) ($P < 0.001$). Conclusion: the iliofemoral ligament had a significant role in limiting external rotation and anterior translation of the femur, while the acetabular labrum provided a secondary stabilizing role for these motions. Clinical relevance: these results suggest that, if injured, both the acetabular labrum and iliofemoral ligament should be surgically repaired to restore native hip rotation and translation. In addition, a careful repair of an arthroscopic capsulotomy should be performed to avoid increased external hip rotation and anterior translation after arthroscopy.**

22.• Khair MM, et al. The effect of capsulotomy and capsular repair on hip distraction: a cadaveric investigation. Arthroscopy. 2017;33(3):559–65 **Purpose: to quantify how increasing interportal capsulotomy size affects the force required to distract the hip and to biomechanically compare simple side-to-side suture repair with acetabular-based suture anchors as capsular repair techniques. Methods: twelve fresh-frozen cadaveric hip specimens were dissected to the capsuloligamentous complex of the hip joint and fixed in a material testing system, such that a pure axial distraction of the iliofemoral ligament could be achieved. After each hip in was tested an intact state, sequential distraction was tested with 2-, 4-, 6-, and 8-cm capsulotomies. Specimens were assigned randomly to be repaired with either 4 side-to-side suture repair ($n = 6$) or 2 double-loaded all-suture anchors ($n = 6$). The distraction force as well as the relative distraction force percentage normalized to the intact capsule were compared between suture repair and suture anchor repair groups. Results: increasing the size of the capsulotomy resulted in less force required to distract the hip to 6 mm. The force decreased as the capsulotomy was extended with statistical significance in distraction force seen between the intact state and the 4-cm ($P = 0.003$), 6-cm ($P < 0.001$), and 8-cm ($P \leq 0.001$) capsulotomy but not for the intact state compared with the 2-cm capsulotomy ($P = 0.28$). Statistical significance in relative distraction force was seen for each of the capsulotomy conditions ($P < 0.001$ for all conditions compared with the intact state). The side-to-side suture repair construct (104.3% of intact force) required greater force to distraction to 6 mm compared with the suture anchor repair (87.1% of intact force) ($P = 0.008$). Conclusions: an interportal capsulotomy significantly affected the force required to distract the hip in a cadaveric model, with the larger the size of capsulotomy resulting in less force required to distract the hip. When we performed an interportal capsulotomy, the iliofemoral ligament strength was altered significantly, but capsular repair with either side-to-side sutures or suture anchor-based repair was able to restore the capsular strength to a native intact hip. We found, however, that the side-to-side suture repair was better able to restore the distraction force compared with suture anchor repair. Clinical relevance: capsular management during hip arthroscopy remains a debated topic, with multiple techniques involving both capsulotomy and capsular closure published in the literature. This study provides insight into capsular stability against axial stress under capsulotomy and capsular repair conditions.**

23. Stone AV, et al. Comparable patient-reported outcomes in females with or without joint hypermobility after hip arthroscopy and capsular plication for femoroacetabular impingement syndrome. J Hip Preserv Surg. 2019;6:33–40.

24.• Waterman BR, et al. Intra-articular volume reduction with arthroscopic plication for capsular laxity of the hip: a cadaveric comparison of two surgical techniques. Arthroscopy. 2019;35(2):471–7 **Purpose: to compare intracapsular volume reduction between interportal capsular shift and T-capsulotomy plication in a**

cadaveric model. Methods: twelve pair-matched specimens were randomized into T-capsulotomy plication or interportal capsular shift. T-capsulotomy was performed using a 2-cm interportal and 2-cm bisecting, longitudinal limb to the intertrochanteric line. Plication was performed utilizing 5-mm bites on either side of the capsulotomy with arthroscopic knot tying technique standard alternating half hitches. Pair-matched interportal capsular shift specimens underwent 5-cm interportal capsulotomy, and capsular shift was performed utilizing 5 nonabsorbable sutures placed in 45° orientation at 5 mm from the capsulotomy margin. With each specimen in a position of slight flexion and adduction, a spinal needle was used to inject methylene blue-colored saline solution intraarticularly; the volcano method was used to measure capsular volume before and after each respective plication technique. Mean absolute volumes and relative volumetric reduction for each technique were quantified and compared with determine statistical significance. Results: at baseline, there were no statistically significant differences in capsular volume between pair-matched specimens (T-capsulotomy plication, 42.5 ± 5.1 mL; interportal capsular shift, 45.0 ± 88.6 mL; $P = 0.555$). After capsulotomy and secondary plication, both the T-capsulotomy (post: mean = 32.5 ± 8.0 mL; $P < 0.001$) and interportal capsulotomy groups (post: mean = 29.4 ± 10.0; $P < 0.0001$) demonstrated significant decreases in capsular volume, with average reductions of 10.0 ± 3.3 mL and 15.6 ± 3.2 mL, respectively. Although the interportal capsular shift (35.9% ± 11.3%) demonstrated greater volumetric reduction relative to baseline when compared with the T-capsular plication (24.5% ± 10.8%), these results were not significant ($P = 0.104$). Conclusions: both T-capsular plication and interportal capsular shift produce statistically significant reductions in overall hip capsular volume. Although the interportal capsular shift may generate modestly higher degrees of capsular reduction, the comparative biomechanical repercussions of each technique are not currently known. Clinical relevance: irrespective of arthroscopic technique, capsular plication with 5-mm bites decreases capsular volume by approximately one-third to one-fourth that of baseline measures.