Technical Note

Minimally Invasive Hip Arthroscopy for Femoroacetabular Impingement Using Iliofemoral Ligament–Preserving Skip Capsulotomy for Cam Resection

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Abstract: Interportal capsulotomy is the standard approach for treating femoroacetabular impingement during hip arthroscopy. However, this method carries a substantial risk of injuring the iliofemoral ligament, which may result in joint instability and persistent pain. We describe a modified "skip capsulotomy" technique, which preserves iliofemoral ligament integrity while enabling adequate access for cam resection. This technique employs a small longitudinal capsulotomy (~5 mm) aligned with the mid-anterior portal and a short transverse incision (~1.5-2 cm) extending posteriorly from the anterolateral portal, without connecting the 2 portals. The iliofemoral ligament is preserved by avoiding an interportal incision. This minimally invasive approach allows sufficient visualization and instrument maneuverability while preserving capsular stability, which is particularly advantageous in patients with hip instability.

Hip arthroscopy is the standard surgical treatment for femoroacetabular impingement (FAI), yielding high patient satisfaction and favorable outcomes.[1] Among the key determinants of surgical success, complete cam resection is crucial, as inadequate resection remains the leading cause of revision hip arthroscopy and is associated with poorer functional outcomes and reduced joint survival.[2,3]

Owing to the deep location of the hip joint, achieving adequate visualization and working space typically requires capsulotomy. The most common technique, interportal capsulotomy, which connects the anterolateral portal (ALP) and mid-anterior portal (MAP), is frequently used for larger or more distal deformities, followed by T-capsulotomy.[4] However, both techniques involve partial or complete transection of the iliofemoral ligament, a key stabilizing structure of the anterior capsule.[5,6] A cadaveric study showed that standard interportal capsulotomy damages more than 50% of the ligament width, with complete tears occurring in over one-third of cases.[7] Additionally, the ALP-MAP region contains many nociceptive nerve endings, and injury to this area may increase postoperative pain. Therefore, preserving the iliofemoral ligament is particularly important in patients with borderline instability or ligamentous laxity.[8] Notably, biomechanical data show that no capsular repair fully restores native hip stability once the iliofemoral ligament is transected.[9] To address these limitations, we describe a skip capsulotomy technique that avoids direct iliofemoral ligament injury while allowing sufficient access for labral repair and cam resection. In this Technical Note, we outline the surgical approach and rationale behind this modified ligament-preserving strategy.

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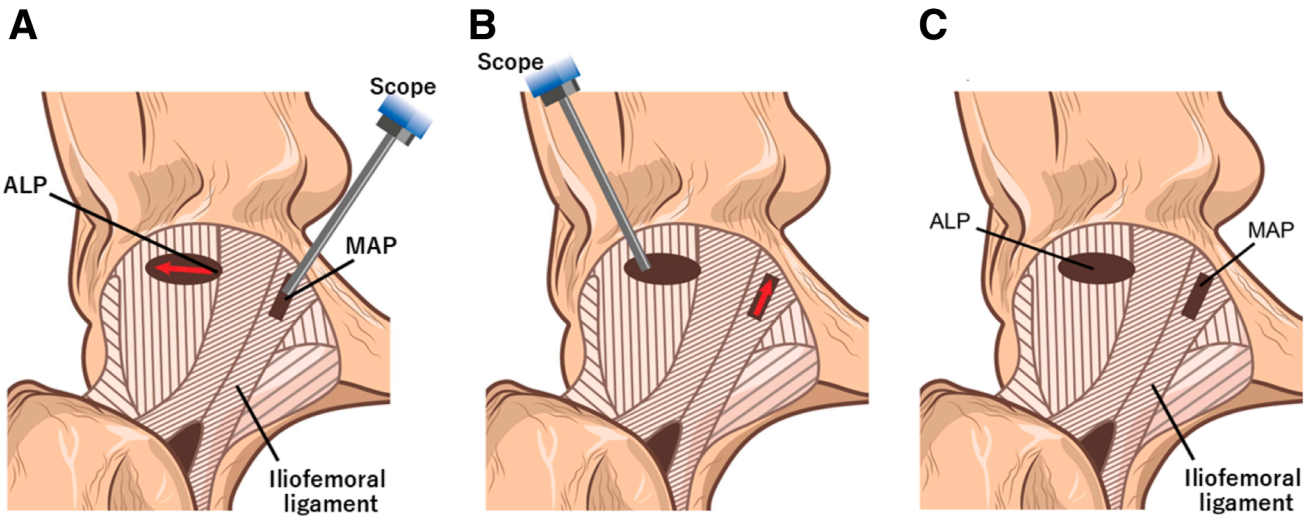


Fig 1. Schematic illustration of the iliofemoral ligament–preserving skip capsulotomy technique in right hip arthroscopy (supine position). This figure illustrates the skip capsulotomy approach that preserves the iliofemoral ligament by avoiding an interporal incision. (A) Under mid-anterior portal (MAP) visualization, a transverse capsulotomy of approximately 1.5 to 2 cm is made from the anterior lateral portal (ALP) posteriorly. (B) Under ALP visualization, a small longitudinal incision of approximately 5 mm is made at the MAP aligned parallel to the fibers of the iliofemoral ligament. (C) These 2 portals remain unconnected, creating a "skip capsulotomy" that preserves the continuity of the iliofemoral ligament.

Surgical Technique

The surgical procedures, including portal placement, skip capsulotomy, labral repair, cam resection, and capsular plication, are demonstrated in Video 1.

Patient Positioning and Setup

The patient is positioned supine on a post-less traction table with the operative leg secured in a padded boot. Traction is applied to distract the hip joint under fluoroscopic guidance, followed by standard sterile preparation and draping.

Portal Placement and Capsulotomy Technique

An ALP is created under fluoroscopy for visualization. Using it as a guide, a MAP is established under direct arthroscopic control, confirming portal positions and avoiding iatrogenic damage to the labrum.

A 1.5- to 2-cm transverse capsulotomy is made from the ALP posteriorly, avoiding the iliofemoral ligament (Figs 1A, 2A). Through the ALP, a separate 5-mm longitudinal capsulotomy is made in the MAP, parallel to the ligament fibers (Figs 1B, 2B). These unconnected incisions form a skip capsulotomy, preserving iliofemoral ligament integrity while allowing cam resection (Fig 1C).

Labral Repair

Following capsulotomy, the central compartment is inspected, and labral tears are addressed. Pincer lesions are resected with a burr when necessary. Labral tears are typically located between the 12- and 3-o'clock positions. The repair is performed using 1.8-mm Q-FIX curved suture anchors (Smith & Nephew), which facilitate accurate anchor placement, even with limited capsulotomy. The suture technique depends on the labral width and quality. A mattress with a lasso loop is used for broad labra and a single-loop lasso for narrow labra to minimize tension.

For anterior-superior tears (1- to 2-o'clock), the arthroscope is placed in the ALP, with repair performed through the MAP. Care is taken to minimize dissection of the capsular-labral recess, particularly near the inferior margin of the anterior inferior iliac spine, which marks the origin of the iliofemoral ligament and is crucial for stability.[10] In cases requiring anterior inferior iliac spine decompression, the balance between exposure and ligament preservation should be carefully considered. For superior tears near the 12-o'clock region, the arthroscope is positioned in the MAP, and instruments are inserted through the ALP. Fluoroscopic guidance is used for anchor placement to ensure safety and accuracy.

Cam Resection

The arthroscope is switched to the ALP, and a switching stick is introduced through the MAP (Figs 3A, 4A). The stick is partially withdrawn and redirected subcutaneously, with its tip inserted into the capsule via the transverse capsulotomy at the ALP (Figs 3B, 4B). This allows the MAP to act as a working portal at the skin level while providing intra-articular access through the transverse capsulotomy. After labral repair, the small (~5 mm) longitudinal MAP capsulotomy is no longer utilized. With visualization

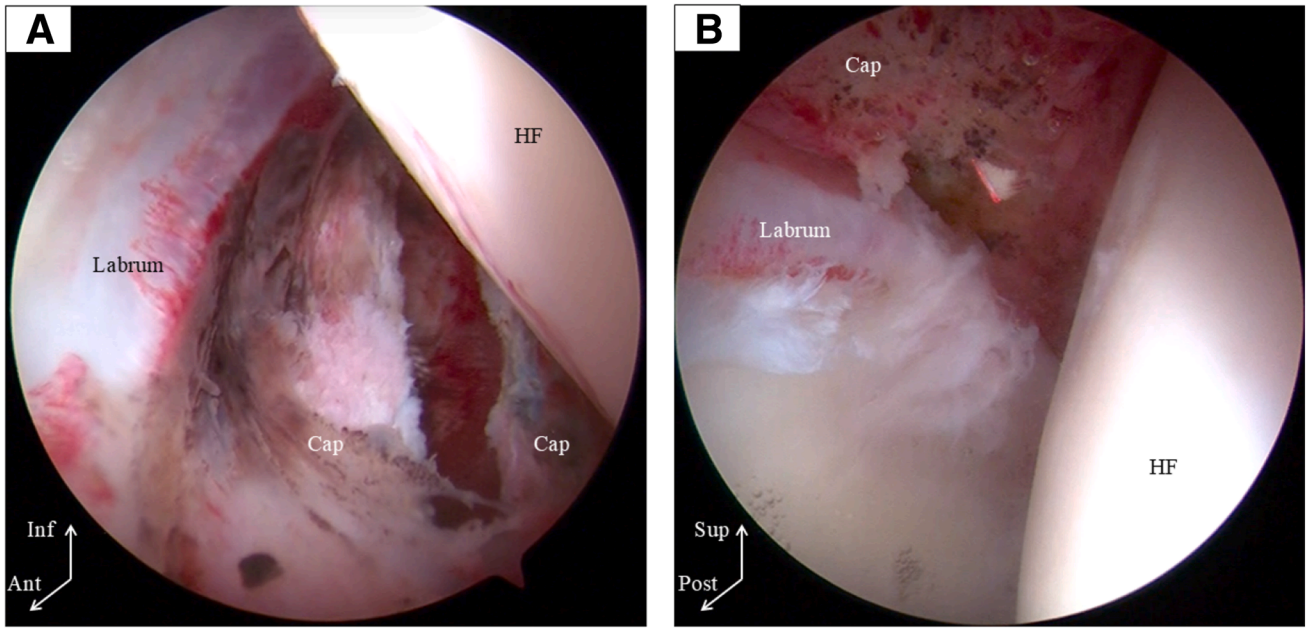


Fig 2. Arthroscopic views of the iliofemoral ligament–preserving skip capsulotomy in the right hip (supine position). These arthroscopic images show the actual intraoperative appearance of the skip capsulotomy configuration. (A) Under the mid-anterior portal (MAP) visualization, a transverse capsulotomy of approximately 1.5 cm is made from the anterior lateral portal (ALP) posteriorly. (B) Under ALP visualization, a small longitudinal incision of approximately 5 mm is made at the MAP aligned parallel to the fibers of the iliofemoral ligament. (Ant, anterior; Cap, hip joint capsule; HF, head of the femur; Inf, inferior; Post, posterior; Sup, superior.)

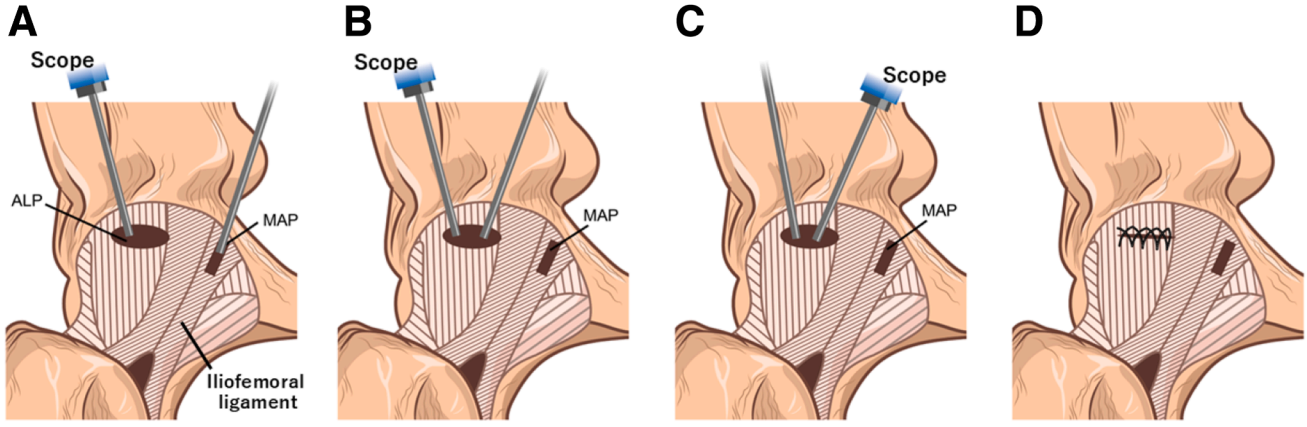


Fig 3. Schematic illustration of the cam resection and capsular plication with iliofemoral ligament–preserving skip capsulotomy in the right hip (supine position). This illustration shows the portal switching, instrument positioning, and capsular management during the procedure. (A) Under anterior lateral portal (ALP) visualization, a switching stick is introduced through the mid-anterior portal (MAP). (B) The switching stick is then partially withdrawn and redirected subcutaneously, with its tip inserted into the capsule via the transverse capsulotomy created at the ALP. This maneuver enables the MAP to function as a working portal at the skin level while providing intra-articular access through the ALP capsulotomy. (C) Visualization from the MAP (intra-articular access via the ALP) and instrumentation from the ALP. (D) Capsular plication of the transverse capsulotomy created posterior to the ALP is performed using the shoelace technique, while the small longitudinal capsulotomy made at the MAP is not closed.

through the ALP and instrumentation via the MAP, the capsule is exposed by debriding the gluteus minimus fibers. If working space remains limited, the transverse capsulotomy at the ALP is extended by approximately 5 mm, taking care to preserve the iliofemoral ligament.

The arthroscope is then repositioned to the MAP (joint access through the transverse capsulotomy), and

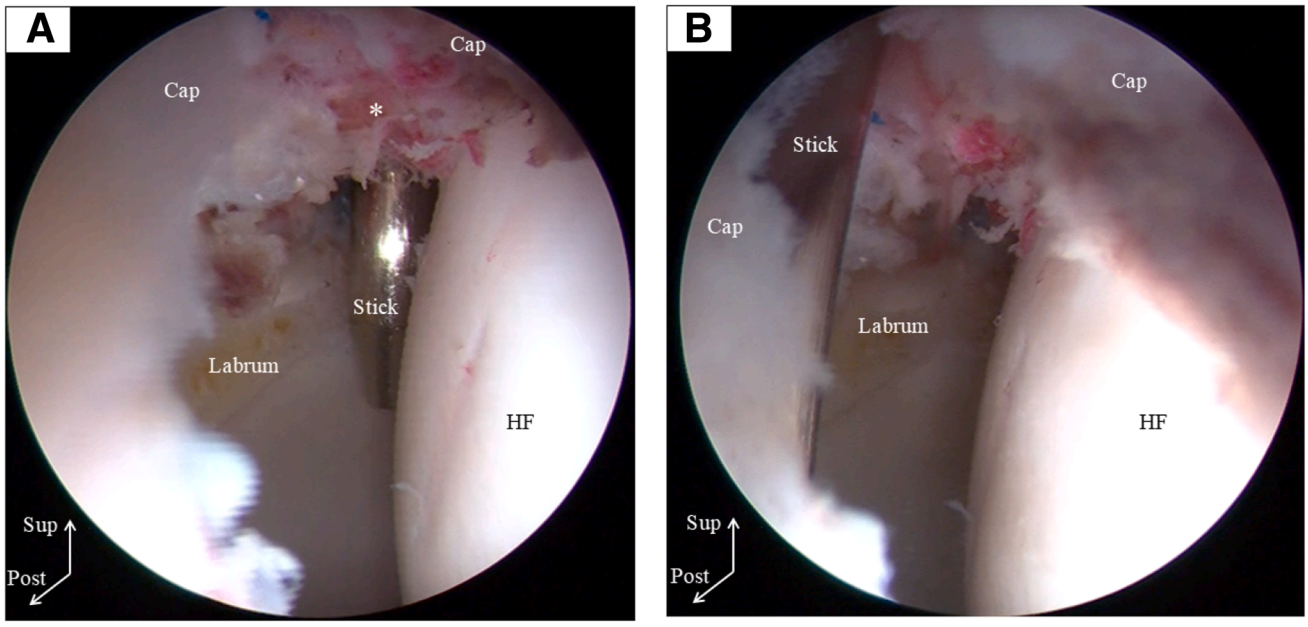


Fig 4. Arthroscopic views of the cam resection with iliofemoral ligament–preserving skip capsulotomy in the right hip (supine position). An asterisk indicates that the anterior lateral portal (ALP) and mid-anterior portal (MAP) remain unconnected, creating a skip capsulotomy that preserves the continuity of the iliofemoral ligament. (A) Under ALP visualization, a switching stick is located in the MAP. (B) Under ALP visualization, the tip of the switching stick is positioned within the capsule via the transverse capsulotomy created at the ALP, while at the skin level, it remains in the MAP. (Cap, hip joint capsule; HF, head of the femur; Post, posterior; Sup, superior.)

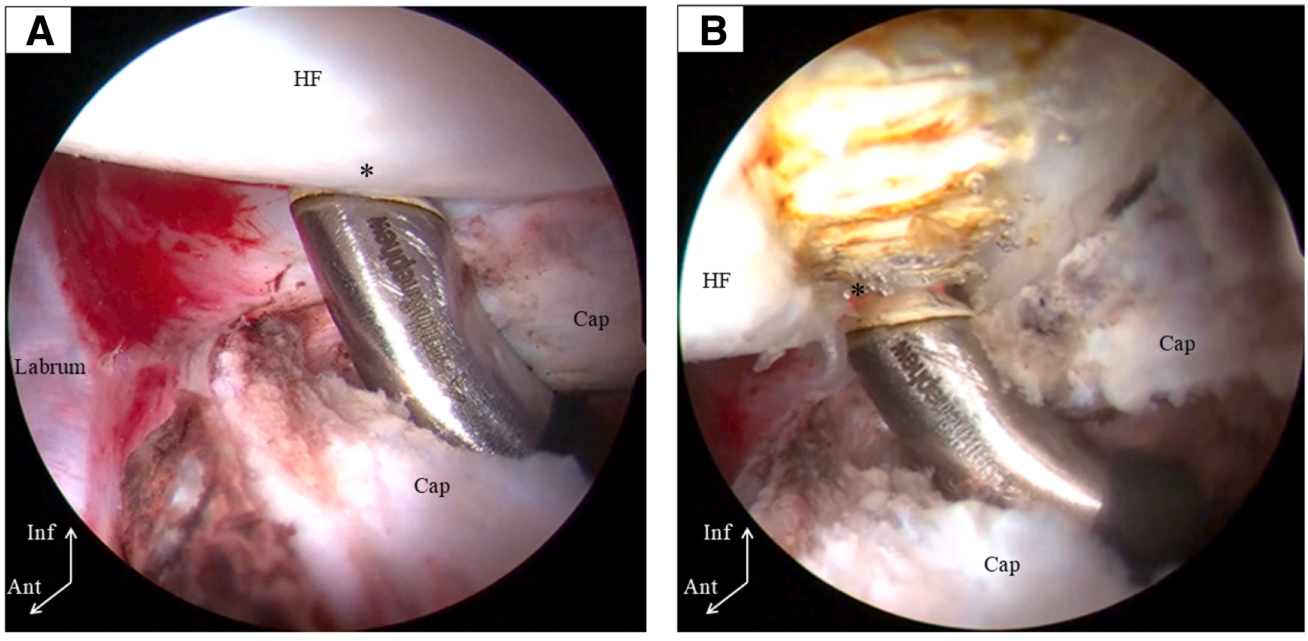


Fig 5. Arthroscopic views of the proximal and posterior or lateral cam deformity, which is the start of the cam resection in the right hip (supine position). An asterisk indicates the proximal and posterior native femoral head-neck junction, characterized by a transition from the white articular cartilage to a slightly darker hue. This anatomic landmark serves as a reference point for determining the depth of cam resection. (A) Under the mid-anterior portal (MAP) visualization, the proximal and posterior native femoral head-neck junction is marked with the tip of a bipolar radiofrequency probe at the site indicated by the asterisk before starting cam resection. (B) Under MAP visualization, the asterisk corresponds to the same location marked in A and serves as the starting landmark for determining the appropriate depth of cam resection. Using this landmark, cam resection is initiated from posterior to anterior, progressing toward the front of the screen. (Ant, anterior; Cap, hip joint capsule; HF, head of the femur; Inf, inferior.)

Table 1. Pearls and Pitfalls

Pearls	Pitfalls
Use a curved burr and curved suture anchors to improve access and visualization through a small capsulotomy.	Limited and close-range field of view may occur because of limited capsulotomy.
Use a switching stick to convert the mid-anterior portal skin portal for internal access to the anterior lateral portal capsulotomy.	Under-resecting the distal cam may occur because of capsular restraint.
Create the proximal mid-anterior portal for better access to distal and anterior cam deformities.	Impede labral repair at the anterior 3-o'clock position may occur because of capsular restraint.
Due to the limited visual field through a small capsulotomy, prioritize limb positioning over aggressive instrument manipulation to optimize access to the cam lesion.	

Table 2. Advantages and Disadvantages

Advantages	Disadvantages
Preserves the iliofemoral ligament and anterior capsular integrity	Requires familiarity with portal switching and curved instruments
Minimizes the risk of postoperative instability and anterior hip pain	Technically demanding, with a learning curve
Facilitates early postoperative rehabilitation without the need for bracing	Not yet supported by extensive short- or long-term outcome data
Reduces nociceptive nerve damage near the interportal capsular region	
Allows sufficient working access while limiting the extent of the capsulotomy	

the working portal is switched to the ALP to begin resecting the proximal posterior and lateral cam lesions (Fig 3C). A 4.5-mm curved burr (CONMED) is used to facilitate cam resection through the limited capsulotomy. The resection depth is guided by visualizing the posterior head-neck junction using the native femoral waist as a landmark (Fig 5). Resection is initially performed with the hip extended under traction, followed by release for distal posterior and lateral cam lesions resection while maintaining hip extension. The arthroscope is returned to the ALP, and the proximal mid-anterior portal (PMAP) is created. The anterior and anterolateral cam lesions are resected through the PMAP. Owing to the limited capsulotomy, reach is improved using a curved burr through the PMAP, and hip flexion with rotation facilitates visualization of cam deformities. Positional adjustments are preferred over excessive instrument manipulation.

The completeness of cam resection is evaluated using dynamic impingement testing and fluoroscopic imaging in various positions, including deep flexion and external rotation. As resection progresses, the intra-articular space increases, thereby improving visualization.

Capsular Plication

The small (~5 mm) longitudinal capsulotomy made at the MAP is not closed because the incision site is often unrecognizable upon inspection at the end of the procedure. Capsular plication is performed under ALP visualization with the hip in extension. The shoelace technique is used to plicate the capsule, in which a flat, tape-type nonabsorbable suture is passed in a crisscross manner across the transverse capsulotomy created posterior to the ALP (Fig 3D).[11] After capsular plication, care is taken to prevent knot impingement and postoperative adhesions. Particular attention is paid to avoiding disruption of the pericapsular fat pad, which may function as a gliding layer between the anterior capsule and surrounding muscles.[12] Following plication, arthroscopic assessment during hip extension and external rotation confirms the absence of gapping at the repair site, supporting the rationale for unrestricted postoperative range of motion.

Postoperative Rehabilitation

No bracing is used, and there are no restrictions on weightbearing or range of motion during the postoperative period. An accelerated rehabilitation schedule is implemented as much as function allows. The goal is to transition to athletic rehabilitation after 2 months and return to sports after 3 months, depending on functional recovery.

The advantages, pitfalls, and disadvantages of this technique are summarized in Tables 1 and 2.

Discussion

In this Technical Note, we describe a hip arthroscopy technique for FAI that preserves the iliofemoral ligament through a limited "skip capsulotomy." By

avoiding interportal capsulotomy, capsular integrity is maintained, reducing the risk of iatrogenic instability and postoperative pain. Despite the smaller capsulotomy, adequate visualization and instrumentation for labral repair and cam resection are maintained. This may support early postoperative recovery, particularly in cases of joint instability, such as borderline developmental dysplasia of the hip.

Conventional interportal and T-capsulotomy techniques provide sufficient exposure for standard FAI surgery and are associated with favorable clinical outcomes, especially when appropriate capsular closure is performed.[13] However, cadaveric studies have shown that these methods frequently disrupt the iliofemoral ligament,[7] which may not be fully restored even after meticulous repair.[9] This disruption can be particularly problematic in patients with underlying instability.

The concept behind periportal capsulotomy, which preserves the iliofemoral ligament, is similar to the current technique.[14] However, concerns persist regarding the adequacy of cam resection.[15] Additionally, the MAP in periportal approaches may undergo overdilation or unintended connection with adjacent portals, leading to full interportal capsulotomy and increasing the risk of inadvertent iliofemoral ligament injury during extensive resections. By contrast, skip capsulotomy avoids direct ligamentous injury while offering sufficient operative access and balancing preservation with practicality.

The primary advantage of this technique is its ability to preserve the iliofemoral ligament by avoiding interportal capsulotomy. The transverse incision from the ALP does not transect the ligament, and the small longitudinal MAP capsulotomy remains distant from its origin. In this study, ligament integrity was maintained. This technique allows both labral repair and cam resection while preserving this critical stabilizing structure, representing a meaningful refinement in arthroscopy.

Nevertheless, this technique has limitations. The restricted capsulotomy imposes a steeper learning curve, and complete cam resection may be technically challenging. Visualization is limited, requiring precise limb positioning and strategic portal switching. Furthermore, both short- and long-term clinical outcomes remain to be established. Further investigation is warranted to determine whether preserving the iliofemoral ligament improves recovery and joint function, particularly in patients predisposed to instability.

In conclusion, the skip capsulotomy technique offers a viable approach for hip arthroscopy in patients with FAI, enabling labral repair and cam resection while preserving the iliofemoral ligament. This technique may reduce the risk of postoperative instability and pain, particularly in patients with borderline hip stability, and facilitate earlier functional recovery.

Disclosures

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: S.T. reports a relationship with Zimmer Biomet Japan that includes consulting or advisory and speaking and lecture fees. All other authors (M.S., H.U., T.K., H.O., N.H., Y.I., N.K.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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