Technical Note

Outside-In Distal-to-Proximal Longitudinal Capsulotomy Using the Greater Trochanter as a Bony Landmark With Postless Traction During Hip Arthroscopy

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Abstract: Hip arthroscopy is an established treatment for femoroacetabular impingement syndrome, with demonstrated long-term efficacy. However, the deep-seated anatomy of the hip joint and its complex periarticular structures pose significant challenges for achieving safe capsulotomy and adequate intra-articular exposure. We describe a technique using the greater trochanter as an anatomical reference point to perform an outside-in, distal-to-proximal longitudinal capsulotomy under postless traction.

Femoroacetabular impingement syndrome has emerged as a prevalent cause of hip pain, with hip arthroscopy evolving as a definitive treatment.[1-3] The procedure's complexity stems from the hip's unique anatomical constraints, including its thick fibrous capsule and proximity to neurovascular bundles, making capsulotomy and joint access critical yet technically demanding steps.[4-6]

Conventional inside-out capsulotomy techniques necessitate specialized instrumentation and fluoroscopic guidance, prolonging traction time and increasing perineal injury risk.[7-9] These approaches often require sectioning of the iliofemoral ligament—a key hip stabilizer—potentially leading to iatrogenic instability.[10] Furthermore, irregular capsular tears generated by this method complicate surgical closure.[11]

Although existing outside-in techniques reduce instrument dependency and preserve ligamentous structures,[12,13] they rely on arthroscopic identification of ambiguous soft-tissue landmarks, resulting in prolonged operative time and technical difficulty.[12,14] To address these limitations, we describe an approach: an anatomically guided outside-in distal-to-proximal longitudinal capsulotomy using the palpable greater trochanter as a definitive bony landmark, facilitated by post-free traction.

Surgical Technique

Patient Positioning

The patient is placed under general anesthesia and administered muscle relaxants to obtain adequate traction. Perineal post-free traction is then applied with the patient in the Trendelenburg position. This involves positioning the patient at 15° to 20° head-down orientation while stabilizing the operative limb in slight internal rotation to achieve optimal joint distraction (Fig 1).

Surgical Approach

The greater trochanter and anterior superior iliac spine are first palpated and marked. The standard anterolateral portal (ALP) is established superior to the greater trochanter. The anterior portal (AP) is then established superior to the ALP and inferior to the anterior superior iliac spine. In addition, an accessory midanterior portal (MAP) is established (Fig 2, Video 1).

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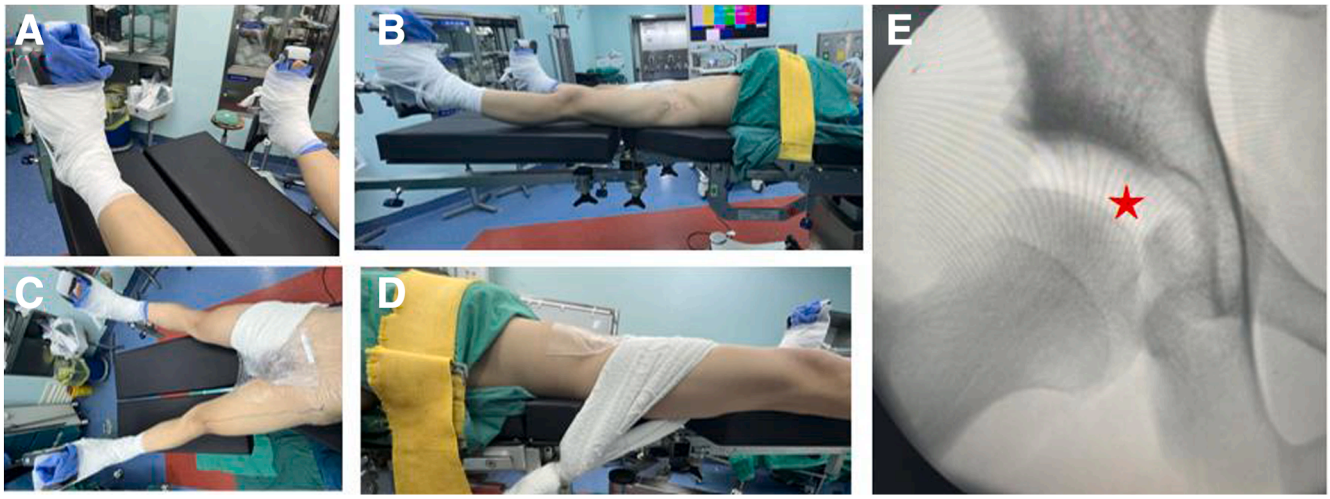


Fig 1. Patient positioning. The patient is in a supine position; left hip is shown. (A) The patient's feet are wrapped with towels and secured by restraint straps, reinforced with outer gauze wrapping. (B) Under general anesthesia, the patient is positioned supine on a hip traction table lined with friction pads or surgical drapes. The patient's arms are padded with cotton rolls to reduce vascular compression, then wrapped with surgical drapes and secured using wide restraint straps; the patient is placed in a 15° to 20° head-down position to enhance traction. (C-D) A long bath towel is passed around the contralateral hip and fixed to the operating table, with transparent film applied to protect the perineal area from antiseptic solution injury. (E) Preoperative traction confirms adequate hip joint distraction (asterisk).

Surgical Technique

A 70° arthroscope (Arthrex, Naples, FL) is introduced through the ALP for joint visualization (Fig 3D). Instrumentation via the MAP and AP requires a 45° radiofrequency probe (Smith & Nephew, Andover, MA) and shaver (Arthrex) (Fig 3 D and E). The greater trochanter is identified by debriding periarticular soft tissues using a shaver and radiofrequency. Using this bony landmark as a reference, a longitudinal capsulotomy is performed along the femoral neck axis, extending from distal to proximal (Fig 3 B and C).

Capsular Traction and Exposure of Hip Structures

Through the AP, ALP, and MAP portals, high-strength sutures were used to apply bilateral capsular traction, facilitating comprehensive exposure of the hip joint structures (Fig 4). Medial capsular traction via the AP portal exposed anterior inferior iliac spine (AIIS) impingement (Fig 4 A and B), whereas lateral capsular

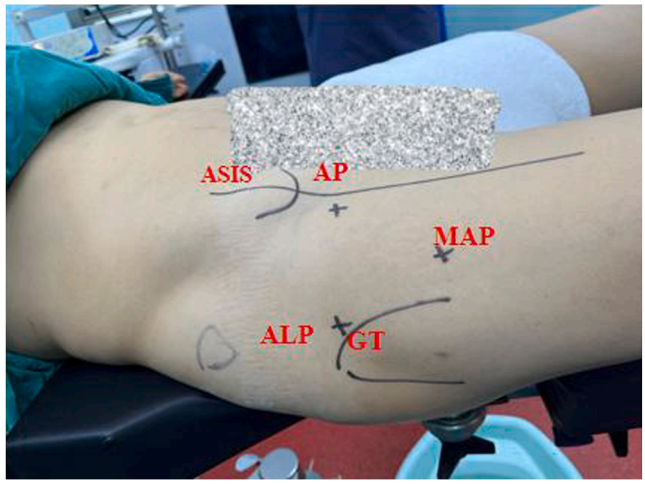


Fig 2. Establishment of the 3 portals. The patient is in a supine position; right hip is shown. (ALP, anterolateral portal; AP, anterior portal; ASIS, anterior superior iliac spine; GT, greater trochanter; MAP, midanterior portal.)

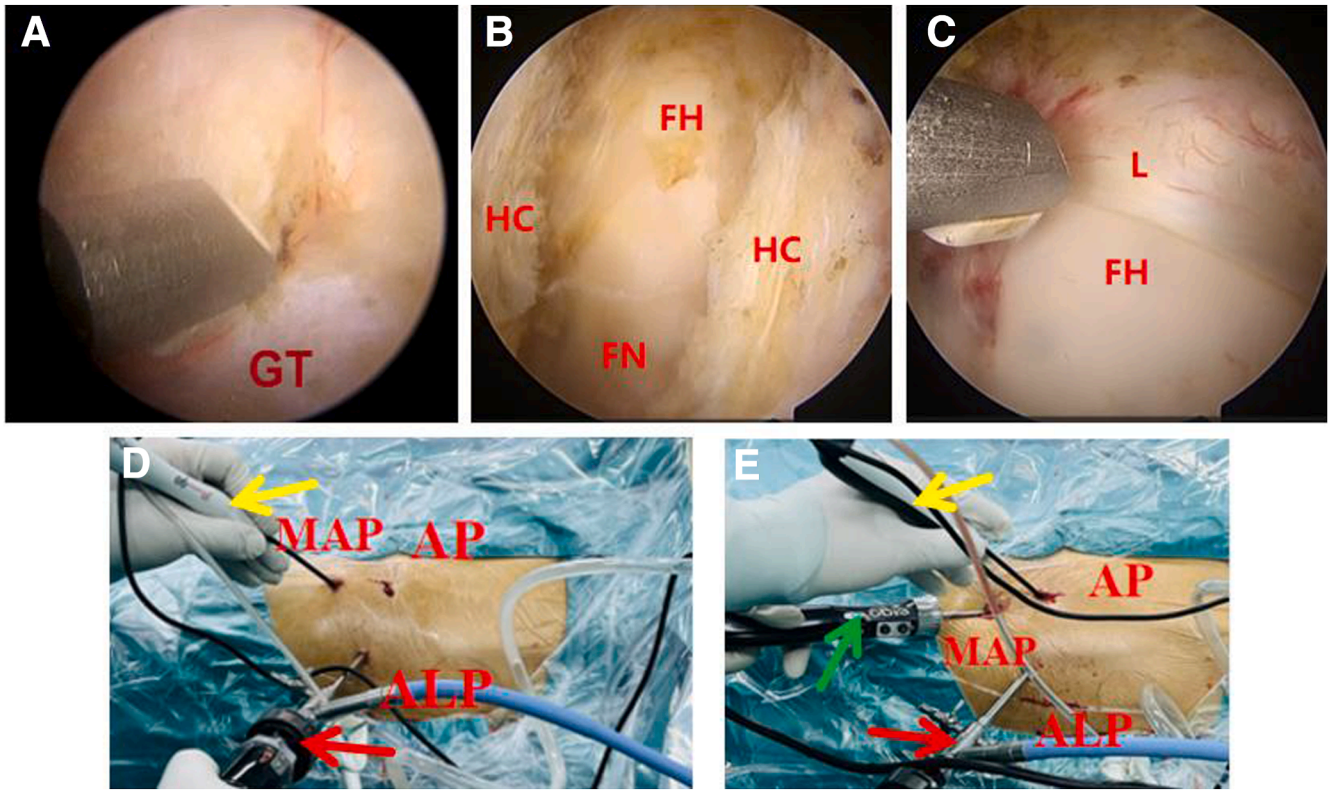


Fig 3. Outside-in distal-to-proximal capsulotomy technique. The patient is in a supine position; left hip is shown. Arthroscopic view from the anterolateral portal. (A) Radiofrequency debridement identifying the greater trochanter (GT). (B) Longitudinal capsulotomy along the femoral neck (FN) from distal to proximal. (C) Exposure of femoral head (FH) and labrum (L) after capsulotomy. (D-E) The portal establishment for the arthroscope (green arrow), shaver (red arrow), and radiofrequency probe (yellow arrow). (ALP, anterolateral portal; AP, anterior portal; HC, hip joint capsule; MAP, midanterior portal.)

traction through the ALP portal enabled clear visualization of the lateral compartment (Fig 4 D and E).

Labral Release, AIISplasty, and Acetabuloplasty

A arthroscopic blade (Arthrex) is used to perform circumferential labral release from the acetabular rim (Fig 5A). For type II/III AIIS, it must be reshaped into a type I AIIS morphology (Fig 5B). A arthroscopic burr (Arthrex) then is used to contour the acetabulum, with bone resection extending to the sclerotic-cancellous bone junction to achieve a uniform bony surface (Fig 5C).

Labral Injury Management

Under traction, assess the labral injury (Fig 6A). If irreparable, perform debridement or reconstruction on the basis of patient age. For repairable injuries, proceed with labral repair (Fig 6B).

Femoral Osteoplasty

Radiofrequency probes are used to delineate the resection margins under direct vision (Fig 7 A and B). The superior margin extends to the articular cartilage edge at the femoral head-neck junction, whereas medial/lateral margins terminate near the synovial folds (Fig 7C).

Capsular Closure

Preplaced anchor sutures are passed through both capsular flaps for superior capsular closure (Fig 8A). Traction sutures previously placed for capsular exposure are repurposed to close the inferior capsule. When necessary, an additional inferior reinforcement suture is placed using a suture passer (Fig 8B).

Discussion

This study proposes the greater trochanter as a bony landmark (Fig 3A) for an outside-in, distal-to-proximal longitudinal capsulotomy. Performed via coordinated ALP/AP/MAP portals without a perineal post (Fig 3B), this technique overcomes traditional limitations and offers significant advantages (Table 1).

The trochanteric landmark enables safe capsulotomy when soft-tissue boundaries are unclear arthroscopically, solving the reference point deficiency of previous

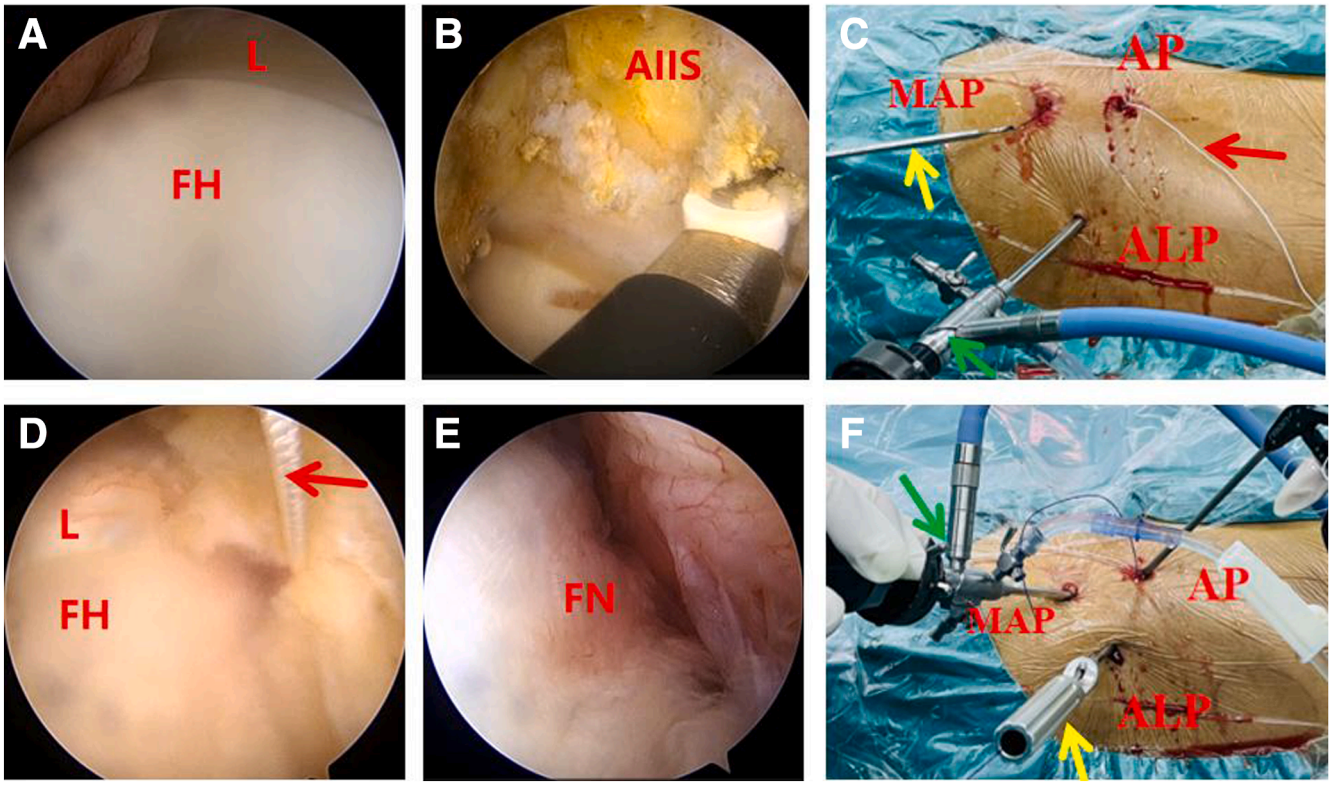


Fig 4. Tractile bilateral joint capsule. The patient is in a supine position; left hip is shown. (A) Arthroscopic view from the anterolateral portal. Perform medial capsular traction via the ALP to expose the femoral head (FH) and labrum (L). (B) Arthroscopic view from the anterolateral portal. Medial capsular traction is performed via the ALP to expose type II anterior inferior iliac spine (AIIS) impingement. (C) Arthroscopic visualization (green arrow) is performed via the ALP. A suture hook (yellow arrow) is introduced through the MAP to pass high-strength suture (red arrow) through the joint capsule, thereby achieving medial capsular traction. (D) Arthroscopic view from the MAP. Using a high-strength suture(red arrow) to retract the lateral joint capsule via ALP to expose the femoral head (FH) and labrum (L). (E) Arthroscopic view from the MAP. Visualization of lateral compartment structures. (F) Arthroscopic visualization (green arrow) is performed via the MAP. A suture hook (yellow arrow) is introduced through the MAP to pass high-strength suture through the joint capsule, thereby achieving lateral capsular traction. (ALP, anterolateral portal; AP, anterior portal; MAP, midanterior portal.)

outside-in techniques. It avoids inside-out drawbacks like blind-puncture labral penetration, fluoroscopy dependence, and irregular capsulotomies. The distal-proximal direction follows capsular fibers, preserving the iliofemoral ligament, easing closure, and reducing healing risks.

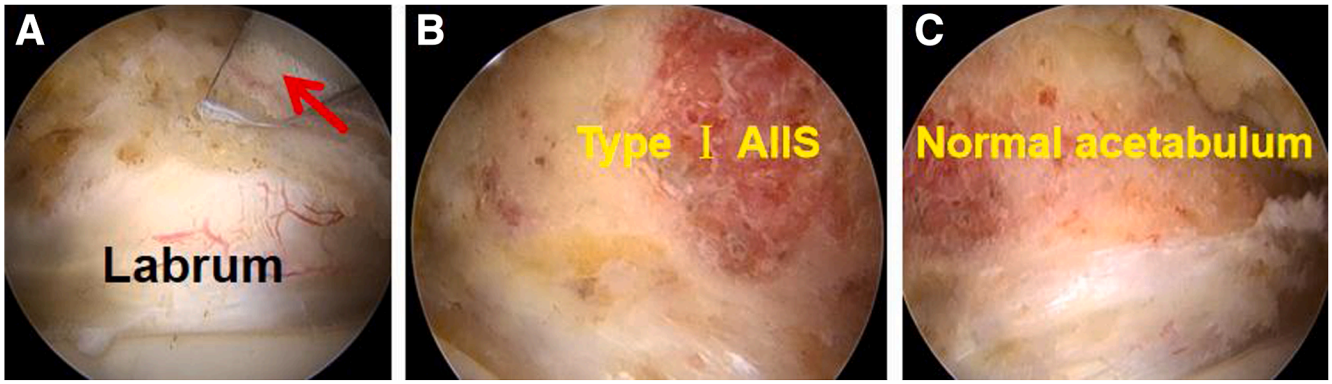


Fig 5. Labral release and acetabuloplasty. The patient is in a supine position; left hip is shown. (A) Arthroscopic view from the anterolateral portal. Circumferential labral release using arthroscopic blade(red arrow). (B) Arthroscopic view from the anterolateral portal. Grind type II AIIS down to type I AIIS with arthroscopic burr. (C) Arthroscopic view from the anterolateral portal. The acetabulum is reshaped to a smooth contour, eliminating pincer deformity.

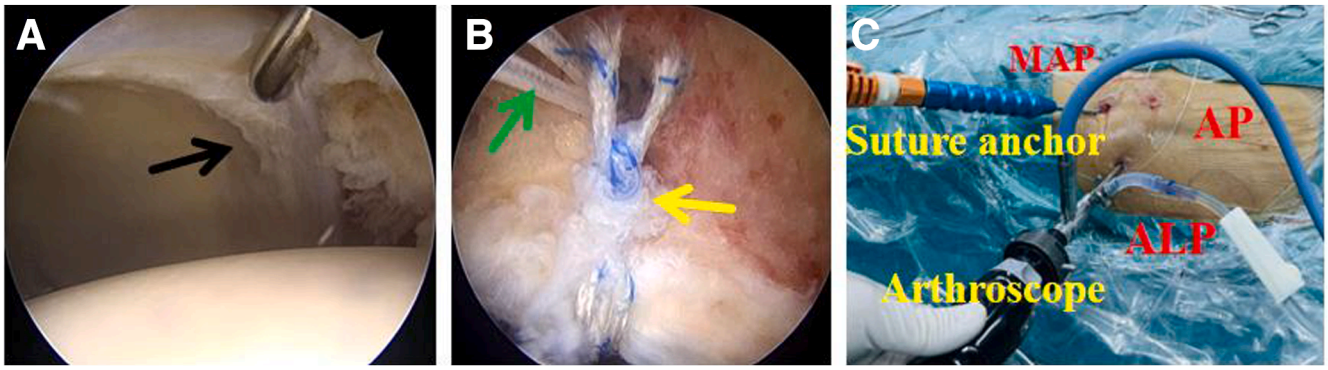


Fig 6. Labral repair. The patient is in a supine position; left hip is shown. (A) Arthroscopic view from the ALP. Assess labral injury(black arrow). (B) Arthroscopic view from the ALP. Repair the labrum using suture anchors (yellow arrow) (Rejon, Zhejiang, China); reserve the remaining screw wire (green arrow) for subsequent capsular suturing. (C) Three portals facilitate labral repair. Arthroscopy is performed from the ALP. Anchors are sutured from the MAP and AP to the acetabular labrum. (ALP, anterolateral portal; AP, anterior portal; MAP, midanterior portal.)

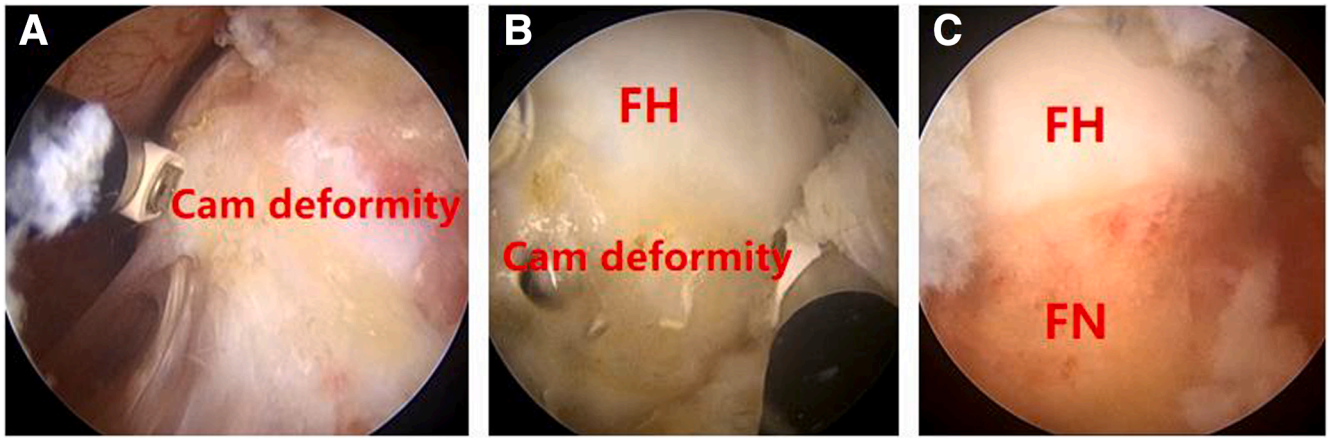


Fig 7. Femoral osteoplasty. The patient is in a supine position; left hip is shown. (A) Medial resection boundary demarcated at synovial fold. (B) Lateral resection boundary demarcated at synovial fold. (C) Postoperative assessment of femoral osteoplasty. (FH, femoral head; FN, femoral neck.)

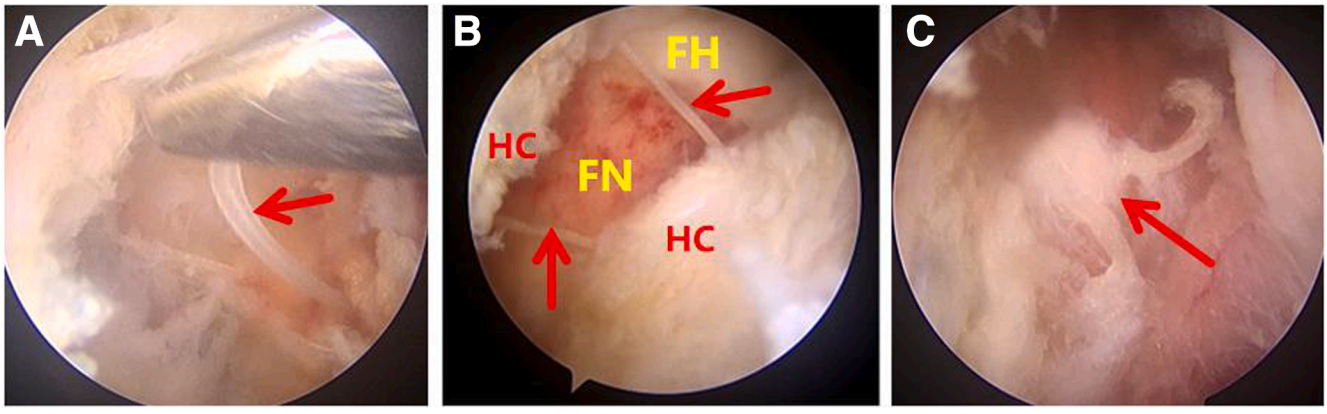


Fig 8. Closure of longitudinal capsulotomy. The patient is in a supine position; left hip is shown. (A) Superior capsular approximation using preplaced anchor sutures (red arrow). (B) Additional use of high-strength suture (red arrow) for inferior joint capsule suturing. (C) Completed capsular repair (red arrow). (FH, femoral head; FN, femoral neck; HC, hip joint capsule.)

Table 1. Advantages and Disadvantages

Advantages	Disadvantages
No specialized hip arthroscopy devices required	This technique requires proficiency in hip arthroscopy
Minimized radiation exposure	Compared with horizontal capsulotomy, the visualization is relatively poor
Low iatrogenic injury risk	Increased the risk of damage to the orbicularis oculi muscle
Facilitated capsular closure	
Maximal preservation of iliofemoral ligament integrity	
Reduced traction burden and time	
Reduced perineal complications	

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
Use perineal post-free traction to minimize neurovascular risks	Inadequate joint distraction in patients with obesity
Palpate the anterior superior iliac spine and greater trochanter as primary references for ALP/AP/MAP portal establishment	Failure to expose the greater trochanter
Debride soft tissue over the greater trochanter using a shaver and radiofrequency probe to visualize the starting point	Deviation from the femoral neck axis during proximal capsulotomy
Initiate longitudinal capsulotomy with radiofrequency at the trochanteric base, advancing distal-to-proximal along the femoral neck axis	Iatrogenic chondral injury during capsular penetration with suture passer
During proximal capsular release, inserting the shaver to retract the capsule prevents iatrogenic labral injury	
Apply high-strength traction sutures through AP/ALP portals to suspend medial/lateral capsular walls, optimizing impingement zone visualization	
Repurpose preinserted labral anchor sutures for superior capsular closure	
Convert inferior traction sutures into repair strands, augmented by suture passer technique for layered closure	

ALP, anterolateral portal AP, anterior portal; MAP, midanterior portal.

The capsulotomy extends longitudinally along the femoral neck (11-2 o'clock), precisely exposing impingement sites. High-strength sutures through AP/ALP portals retract capsular flaps (Fig 4 C and F), creating dynamic suspension for optimal exposure: Medially, type II/III AIIS impingement is fully visualized for burring to type I (Figs 4B and 5C); laterally, cam lesion visualization ensures safe osteochondroplasty margins (Fig 4E). The post-free technique eliminates fluoroscopy, limits traction to <30 minutes, and prevents perineal complications.

Capsular stability is crucial for function.[15] A layered closure is performed: superiorly, labral anchor sutures are used to repair the capsule, restoring iliofemoral ligament tension (Fig 8A). Inferiorly, retraction sutures with suture hooks are used to reinforce posteroinferior stability (Fig 8B). The main limitations of this technique are its learning curve (suited for experienced surgeons) and potential cartilage injury during suture hook passage. However, any cartilage damage would be resected during osteochondroplasty (Table 2). In summary, this technique—trochanter-guided, outside-in distal-proximal capsulotomy via 3 portals without a perineal post—optimizes FAIS exposure while preventing iatrogenic labral injury.

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Disclosures

All authors (Z.L., Y.G., Y.N., Z.Z., S.W., J.D.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Hale RF, Melugin HP, Zhou J, et al. Incidence of femoroacetabular impingement and surgical management trends over time. *Am J Sports Med* 2021;49:35-41.
2. Ochiai DH. Editorial Commentary: Arthroscopic treatment of femoroacetabular impingement yields long-term patient satisfaction. *Arthroscopy* 2025;41:1786-1787.
3. Dwyer T, Whelan D, Shah PS, Ajrawat P, Hoit G, Chahal J. Operative versus nonoperative treatment of femoroacetabular impingement syndrome: A meta-

analysis of short-term outcomes. *Arthroscopy* 2020;36:263-273.
4. Meta F, Clark SC, Krych AJ, Hevesi M. Arthroscopic hip capsular reconstruction: A step-by-step guide with rectus overlay. *Arthrosc Tech* 2024;13:102982.
5. Lv Y, Zeng N, Yang P, et al. A retrospective cohort study: dual cannula combined with modified shoelace continuous capsular closure technique versus nonrepair in hip arthroscopic surgery of femoroacetabular impingement. *BMC Musculoskelet Disord* 2024;25:777.
6. Casp A, Gwathmey FW. Hip arthroscopy: Common problems and solutions. *Clin Sports Med* 2018;37:245-263.
7. Moran J, Jimenez AE. Editorial commentary: Postless hip arthroscopy may help optimize outcomes, but use of a post is acceptable and is indicated in select cases. *Arthroscopy* 2025;41:657-659.
8. Kraeutler MJ, Fasulo SM, Dávila Castrodad IM, Mei-Dan O, Scillia AJ. A prospective comparison of groin-related complications after hip arthroscopy with and without a perineal post. *Am J Sports Med* 2023;51:155-159.
9. Habib A, Haldane CE, Ekhtiari S, et al. Pudendal nerve injury is a relatively common but transient complication of hip arthroscopy. *Knee Surg Sports Traumatol Arthrosc* 2018;26:969-975.
10. Economopoulos KJ, Chhabra A, Hassebrock JD, Kweon C. Capsular closure following hip arthroscopy for femoroacetabular impingement. *JBJS Essent Surg Tech* 2021;11:e20.00037.
11. De Giacomo AF, Lu Y, Suh DH, McGarry MH, Banffy M, Lee TQ. Biomechanical comparison of capsular repair, capsular shift, and capsular plication for hip capsular closure: Is a single repair technique best for all? *Orthop J Sports Med* 2021;9:23259671211040098.
12. Leng P, Zhu Y, Hu A, et al. Rapid outside-in capsulotomy in hip arthroscopy: A safe and feasible procedure for femoroacetabular impingement. *Arthrosc Tech* 2025;14, 103438.
13. Forster-Horvath C, Domb BG, Ashberg L, Herzog RF. A method for capsular management and avoidance of iatrogenic instability: Minimally invasive capsulotomy in hip arthroscopy. *Arthrosc Tech* 2017;6:e397-e400.
14. Hartwell MJ, Moulton SG, Zhang AL. Capsular management during hip arthroscopy. *Curr Rev Musculoskelet Med* 2023;16:607-615.
15. Thaunat M, Sarr S, Georgeokostas T, et al. Femoroacetabular impingement treatment using the arthroscopic extracapsular outside-in approach: Does capsular suture affect functional outcome? *Orthop Traumatol Surg Res* 2020;106:569-575.