

A Less-Invasive Technique for Capsular Management During Hip Arthroscopy for Femoroacetabular Impingement

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Abstract: The aim of this work is to describe a new arthroscopic technique for the treatment of femoroacetabular impingement that allows a complete articular joint view with maximum protection of the capsuloligamentous complex. This arthroscopic technique avoids injury to the capsuloligamentous complex, preventing the risk of postoperative instability. The diagnosis of femoroacetabular impingement was based on clinical and radiographic grounds. An alpha angle greater than 50° was considered pathologic. In this technique, the use of intra-articular devices (retractors) allows us to separate the capsular tissue from the femoral head-neck junction and mobilize the capsule, achieving an adequate joint view without performing a capsulotomy and, consequently, avoiding the complications of capsular damage.

In 2001, Ganz et al.¹ described the surgical dislocation technique for the treatment of femoroacetabular impingement (FAI).² It was and still is the gold standard for this pathologic condition, giving full access to the joint with a risk of avascular necrosis close to zero.

To avoid the surgical dislocation of the hip and the trochanteric osteotomy required with the open procedure, Ribas et al.³ described a mini-anterior approach to the hip as an alternative to the previous technique.⁴

Arthroscopic techniques allow us to address the problem with the same efficacy as the gold standard for anterior and anterosuperior cam and focal rim impingement lesions.⁵ Management of the capsule has become an important issue in recent years.⁶ The role of the capsule is essential in hip stability and also significant regarding postoperative functional status and pain.⁷⁻⁹ The initial capsulectomies and extensive capsulectomies have given way to more conservative trends with regard to capsular tissue.⁶ Currently, capsular management is carried out in 2 different ways: (1)

T-capsulotomy, which allows a wide exposure of the femoral head and the head-neck junction, and (2) interportal capsulotomy, which is less aggressive. Both techniques provide an adequate view of the entire femoral head to assess and correct the bony deformity. In both cases, capsular suture at the end of the surgical procedure is preferred to restore the capsule back to the original anatomy.^{6,10-13}

It is imperative to ascertain the correct balance between the maximum protection of the capsule and the broadest view of the joint. We describe a new arthroscopic technique that allows a complete view of the joint, with full protection of the capsuloligamentous complex.

Surgical Technique

The diagnosis of FAI was based on clinical and radiographic grounds. The radiographs used were the anteroposterior view of the pelvis with 15° of internal rotation of the lower limbs and the axial view of Dunn at 45° and 90° of hip flexion. All patients underwent arthro-magnetic resonance imaging to assess the presence of labral tears and chondral lesions. The femoral head sphericity was calculated by measuring the preoperative alpha angle in the Dunn view. An alpha angle greater than 50° was considered pathologic.¹⁴

Under general anesthesia, the patient is positioned supine on a fracture table for hip distraction. Access to the hip joint is performed systematically through 2 portals (anterolateral and anterior). An extension of the portals is made using diathermy. The extension is less

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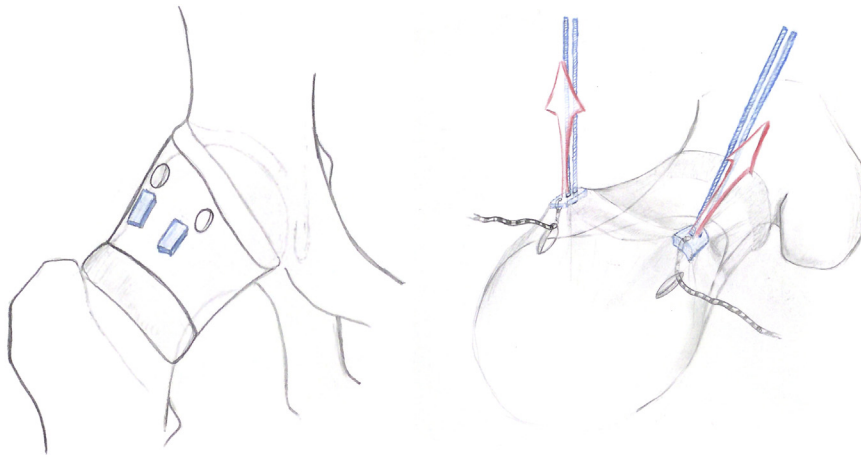


Fig 1. Adequate placement of the retractors to carry out the technique and to separate the capsule from the femoral head-neck junction.

than 1 cm in length, which crosses the full thickness of the capsule ([Video 1](#)). This increases the mobility at the portals sufficiently to work smoothly in the central compartment for both labral repairs and acetabular chondral injury if required. The proximal capsular insertion is always preserved.

When the operation in the central compartment is complete, 2 intra-articular devices (retractors; Arthroscopic Surgery Unit Ltd., Vitoria-Gasteiz, Spain) are

placed between the portals and the zona orbicularis, 1 in the anterior region and the other located anterolaterally. The devices incorporate a high-strength thread for traction from the exterior and another high-strength thread to retrieve the devices from the portal at the end of the operation. These devices allow us to separate the capsular tissue from the femoral head-neck junction, making the view of the peripheral compartment adequate for the operation ([Fig 1](#)).

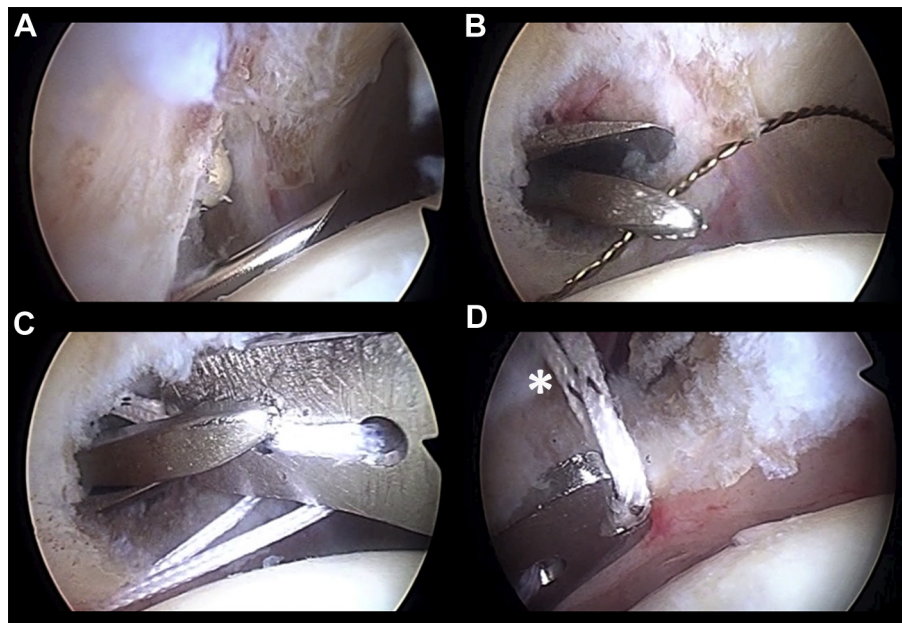
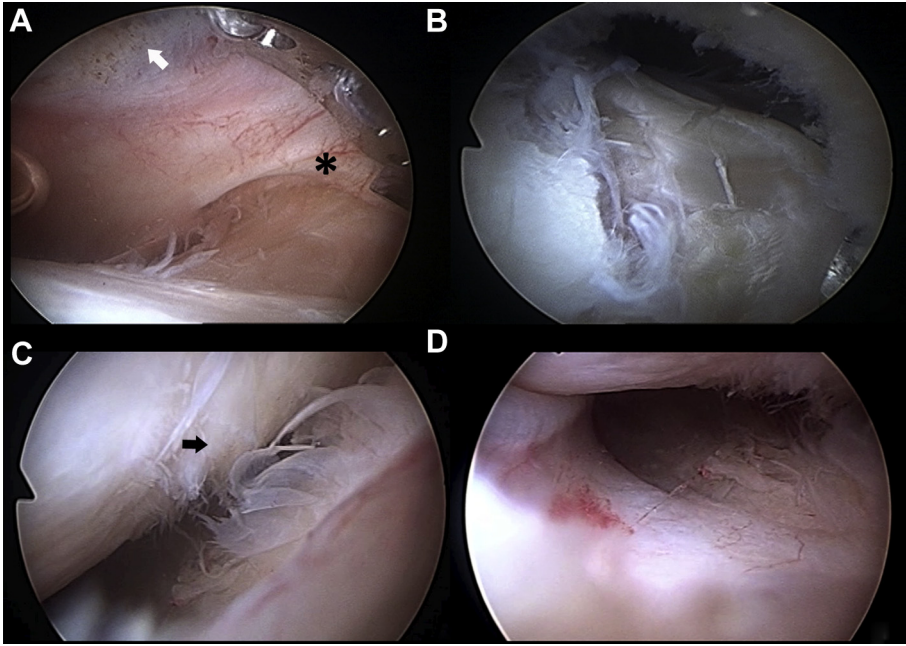


Fig 2. Placement of lateral retractor. The camera is located through the anterior portal. (A) Introduction of a needle into the joint immediately distal to the anterolateral portal. (B) Introduction of the suture shuttle relay through the needle and exterior recovery from the lateral portal. (C) Intra-articular placement of the high-strength thread attached to the retractor through the lateral portal. Recovery of the high-strength thread with the aid of a suture shuttle relay from the exterior allows the retractor to be in the correct intra-articular position. (D) Once the retractor is in position, the traction thread is pulled from the exterior to mobilize the most lateral aspect of the capsule; the recovery thread can be observed leaving through the lateral portal (asterisk). At the end of surgery, the retractors are removed easily by pulling the retrieving thread from the outside.

Fig 3. Examination of the peripheral compartment in a right hip; the camera is located through the lateral portal. (A) Anterior region. Viewing of this area is facilitated by flexion; the zona orbicularis (asterisk) and anterior portal can be observed (white arrow). (B) Lateral region. Viewing of this area is facilitated by inner rotation. (C) Medial femoral circumflex artery vascular pedicle (arrow). (D) Posterior area.



The lateral retractor is positioned before removing traction of the limb (Fig 2). A needle is introduced through the skin directly into the joint immediately distal to the anterolateral portal. A suture shuttle relay is placed through the needle, which is recovered from the lateral portal. With the aid of the suture shuttle relay, a retractor is introduced into the joint through the lateral portal at the same time the traction thread is recovered outside. Then, pulling from the exterior, the surgeon mobilizes the most lateral aspect of the capsule (Video 1). The same procedure is carried out to position the anterior retractor. The traction point is immediately distal to the anterior portal. Once the anterior retractor is in place, we can mobilize the most anterior aspect of the capsule without performing a capsulotomy. When

the retractors are in position, we achieve a complete view of the peripheral compartment (Fig 3).

A methodical and thorough resection of the cam deformity is performed. At the end of the procedure, the full capsular integrity is preserved, altered only at the portal sites (Fig 4). The retractors are removed by pulling the retrieving threads in the lateral and anterior portals from the exterior.

Discussion

Iatrogenic injury of the capsule during surgery has a direct impact on the development of complications, as well as the recovery time. One of the most problematic complications after hip arthroscopy is instability of the joint. Several cases of dislocation or subluxation of the joint after hip arthroscopy have been reported in the literature.¹⁵ A frequent problem is postoperative micro-instability, especially in patients with hyperlaxity or an alteration in the normal bony anatomy. Bedi et al.,⁶ who advocate performing a T-capsulotomy to increase the view in the peripheral compartment, highlight the importance of iliofemoral ligament repair after surgery to prevent residual joint instability. Domb et al.,¹⁰ who favor interportal capsulotomy, claim that closing the capsulotomy reduces microinstability. It is also stated that this potentially accelerates postoperative recovery

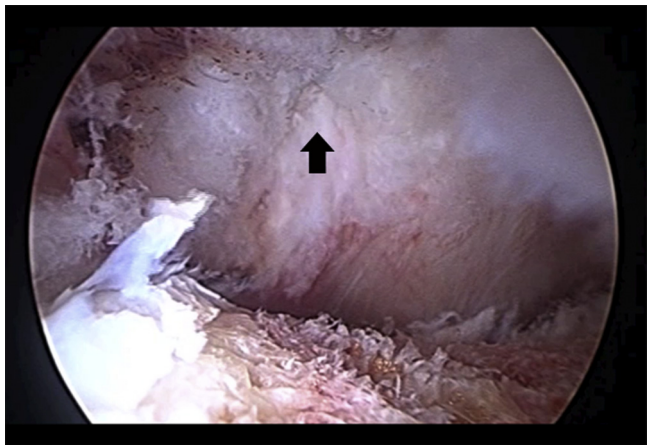


Fig 4. Capsule at the end of surgery, altered only at the level of the portals (arrow).

Table 1. Benefits

Minimizes capsular damage
Reduces postoperative instability
Reduces fluid leakage during surgery
Potentially improves postoperative outcomes

Table 2. Technical Pearls

Placement of the devices with traction of the limb minimizes the risk of chondral injury.
The traction device recovery threads are protected from the arthroscopic instrumentation (with the use of cannulas).
The placement angle of the traction device must be perpendicular to the capsular plane (30° craniocaudal tilt) to ensure its effectiveness.
Hip flexion enhances the view in the anterior region.
Hip internal rotation enhances the view in the lateral region.

compared with those patients in whom no capsular repair is performed. The required capsular suture implies restrictions on mobility during the immediate postoperative period, with limited extension and external rotation for up to 3 weeks.¹¹ These mobility restrictions and the routine closure of the capsule are all associated with an increase in postoperative pain and stiffness.¹⁰ It is possible that the pericapsular damage acquired during the capsulotomy may cause similar complications.

To prevent these complications, we have developed a new technique of “no capsulotomy” that avoids injury to the capsuloligamentous complex, preventing the risk of postoperative instability. Because capsulotomy is not performed, capsule closure and mobility restrictions due to the suture are not required. It is envisaged that there will be a decrease in some of the factors related to postoperative pain and stiffness and this will probably lead to faster recovery (Table 1).

In addition, maintaining the capsular integrity significantly decreases periarticular muscle damage. During the procedure, the capsule itself protects the periarticular musculature from potential damage caused by the instrumentation used during surgery. Soft-tissue care during surgery improves the postoperative pain and stiffness and reduces some of the postoperative complications associated with surgical trauma (e.g., heterotopic ossification).^{13,14} Capsular integrity during surgery also minimizes fluid leakage. Although the use of the described system achieves minimum capsular damage, careless placement could cause chondral lesions; therefore, training and practice are required, which will increase surgical time (Tables 2 and 3).

On the other hand, one of the main causes of failure in the treatment of FAI is insufficient femoral osteoplasty.¹⁶ For correct treatment of FAI, it is necessary to have a broad vision of the joint, particularly in patients with cam-type FAI. The surgical dislocation technique described by Ganz et al.¹ in 2001 allows maximum vision of the femoral head, which gives an accurate correction of the bony deformity with excellent clinical results.² Bedi et al.⁵ compared the efficacy of an arthroscopic osteoplasty technique against surgical dislocation in 60 consecutive patients. Similar efficacy was found in the restoration of the femoral offset for anterior and anterosuperior cam lesions. Our new

Table 3. Pitfalls

Maintaining capsular integrity reduces movement of the instrumentation at the portals. Traction from the device over the capsule is passed on to the arthroscopic instrumentation and camera, which in turn reduces the movement.
The traction device must be placed carefully to avoid chondral lesions.
Placement of the traction device requires training and practice; therefore surgical time may be increased.
Breakage of the recovery thread can increase surgical time (it is essential to protect the recovery thread at all times to avoid this).

technique, with the use of the intra-articular retractors, allows both a broad view of the bony deformity and the adequate resection required to restore the correct head-neck offset without performing a capsulotomy.

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