

Simultaneous Acetabular Labrum Reconstruction and Remplissage of the Femoral Head–Neck Junction



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Abstract: With the recent increase in the use of hip arthroscopy, revision hip arthroscopy also has become more prevalent; nevertheless, it is often complex, and many factors should be considered to achieve a satisfactory clinical outcome. Labral reconstruction or augmentation technique is used in cases of severely deficient acetabular labral tissue to restore the fluid seal mechanism. In cases of previous over-resection of cam impingement, the remplissage technique, used to restore the bony defect of the femoral head–neck junction and preserve the joint seal, is an established technique that has been recently reported in the hip with the use of iliotibial band with the same aim as in the shoulder, filling in of the defect due to healing of the soft tissue to the underlying bony impression. We aim to describe a labrum reconstruction in combination with a remplissage of the femoral head–neck junction with a dermal graft in a patient with recurrent hip pain after hip scope. This combination may improve hip stability and reduced pain after failed hip scope.

An important aspect of hip arthroscopy is the management of patients with residual or recurrent symptoms after surgery. Although the most common cause of failure after hip arthroscopy is incomplete resection of a cam lesion, a previously unrecognized complication is excessive cam resection, which also can lead to excessive femoral offset and loss of the suction seal. Labral reconstruction or augmentation technique is used in cases of severely deficient acetabular labral tissue to restore the fluid seal mechanism. We aim to describe the surgical technique for performing simultaneous acetabular labrum reconstruction in combination with a remplissage of the femoral head–neck junction in a patient with recurrent hip pain after hip scope.

Preoperative Planning

Careful preoperative planning is a major determinant of postoperative outcome, particularly in a revision setting. A review of history, physical examination, and

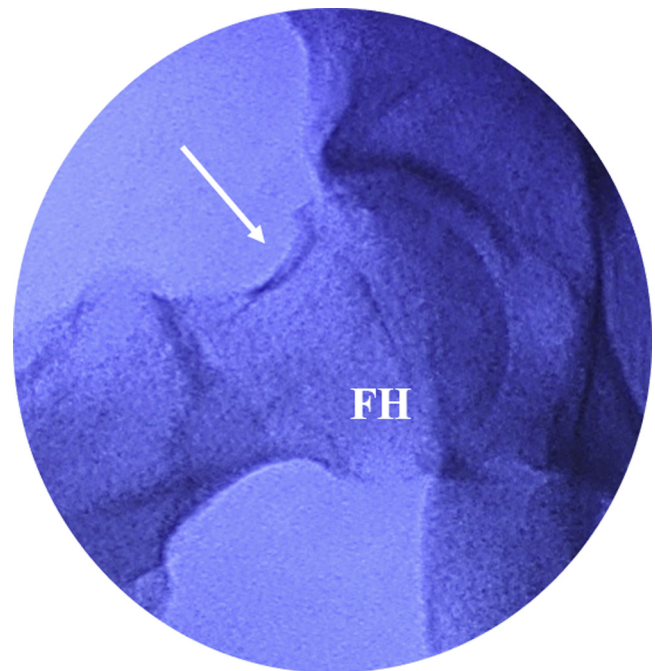


Fig 1. Right hip. Dunn radiographic image of a patient that had undergone cam over-resection (white arrow) with loss of the hip suction seal. (FH, femoral head).

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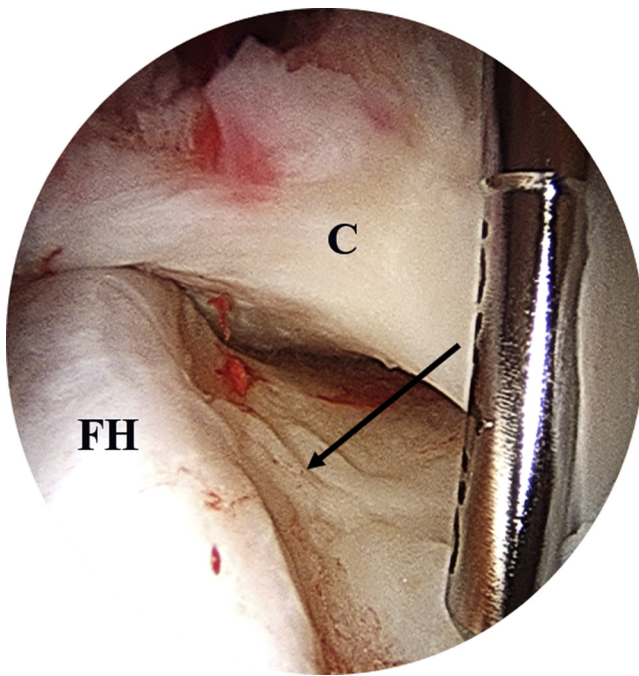


Fig 2. Right hip. Scope in the anterolateral portal. Arthroscopic view of the defect showing excessive resection of the femoral head-neck junction with loss of the normal femoral head-neck contour. Area of excessive resection are noted with black arrow. (C, capsule; FH, femoral head).

imaging is important in identifying the diagnosis for failure and the goals of the revision operation. Findings on imaging can be subtle and may only be apparent on advanced imaging studies. Conventional radiography may show a small lucency or impression at the anterolateral femoral head–neck junction in the area of expected cam resection instead of a smooth contour that can suggest an overresection and loss of appropriate labral contact. Radiographs can be considered normal in the anteroposterior view but a loss of contour in the head neck union may be better observed in the axial projection of Dunn (Fig 1). Magnetic resonance imaging may reveal degeneration/rerupture in the acetabular labrum and a labral reconstruction in the revision setting must be considered.

Surgical Technique

Indications

The technique is mainly indicated in symptomatic patients who underwent previous procedure(s) and over-resection of the femoral bone was performed to reduce the cam femoroacetabular impingement lesion.

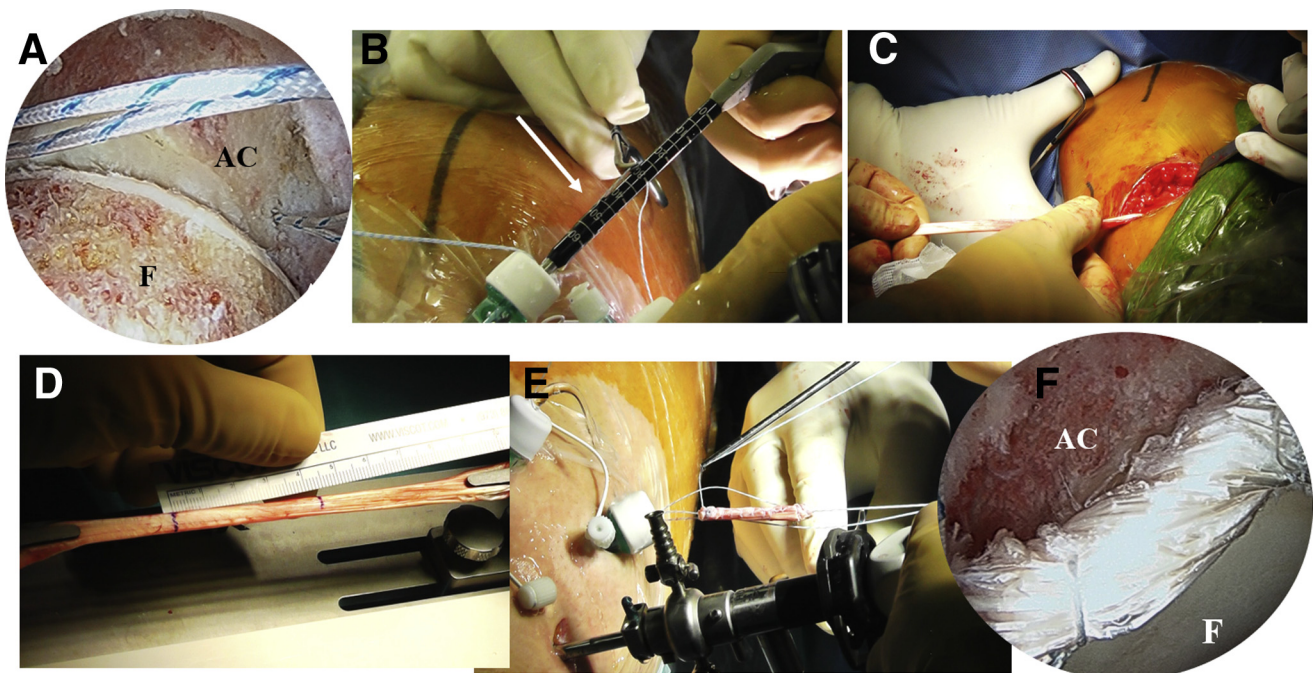


Fig 3. Right hip. Labral reconstruction with a semitendinosus autograft. Two Iconix 1.4-mm (Stryker) suture anchors preloaded with a No. 2 FiberWire, medial and lateral, were placed in the acetabular rim (A). The extent of the labral deficiency is measure to estimate the graft appropriate length using the Superior Capsule Reconstruction Guide (Arthrex) (white arrow) (B). A semitendinous graft is harvested from the ipsilateral knee and prepared (C and D). Using a shuttle technique, the graft is delivered into the joint and fixed (E and F). (F, femoral head; AC, acetabulum).

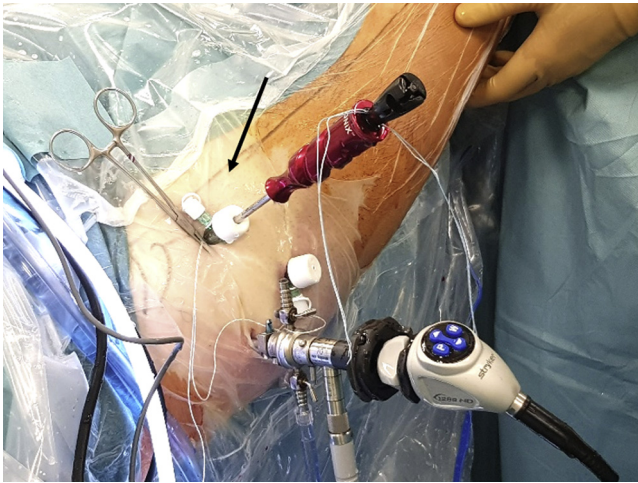


Fig 4. Right hip. From the anteromedial portal (black arrow) a 2.4-mm Iconix (Stryker) suture anchor preloaded with a No. 2 FiberWire is placed in the medial extension of the defect and the sutures brought out the cannula.

Patient Positioning and Portal Placement

The patient lies supine on a traction table with the feet well padded and placed into traction boots. After placement of an extra wide post (perineal post) to protect the perineum, the hip is placed in a position of 10° of flexion, 15° of internal rotation, and neutral abduction. Traction force is applied gradually in the operative limb, with gentle counter traction applied to the contralateral limb. After traction, the leg is placed in slight adduction over the post, which forces the femoral head laterally. Traction is controlled using fluoroscopy. After routine preparation and draping of the hip, the procedure is begun by establishing standard anterolateral, midanterior, and distal anterolateral (DALA) portals.

Capsulotomy and Addressing Intra-articular Pathology

After access is obtained, an interportal capsulotomy is done and a standard diagnostic arthroscopy is performed using a 70° arthroscope to evaluate any other concomitant pathology (Video 1). The labral tissue quality is assessed regarding its location and size. The presence of a labrum extensively torn, shredded, degenerative, severely bruised, or small can give us information that it is non-functional and does not contribute to the stability or volume of the acetabulum. After the labrum and other central compartment pathologies have been appropriately addressed, traction is released and the femoral neck in the peripheral compartment is visualized. The presence of an area of impression at the head–neck junction instead of a smooth contour suggestive of overresection and a space between the labrum and femoral head–neck in mid-ranges of flexion can result in a loss of suction seal (Fig 2).

Labral Reconstruction

The leg is placed into traction. Preparing the bony area where the reconstruction or augmentation will take place is done. Poor-quality remnant tissue is removed. An arthroscopic 5.5-mm burr is used to create an acetabular bleeding bed, which will potentiate the healing of the graft to the acetabular rim. Stable soft-tissue margins of the reconstruction/augmentation also are created on both ends of the reconstruction/augmentation area. An 8.5- × 110-mm plastic cannula is placed in the anterolateral portal and in the midanterior portal. Two Iconix 1.4-mm (Stryker, Kalamazoo, MI) suture anchors preloaded with a No. 2 FiberWire (Arthrex, Naples, FL) are placed in the acetabular rim in preparation of securing the labral graft, one at the anteromedial extent of the labrum reconstruction

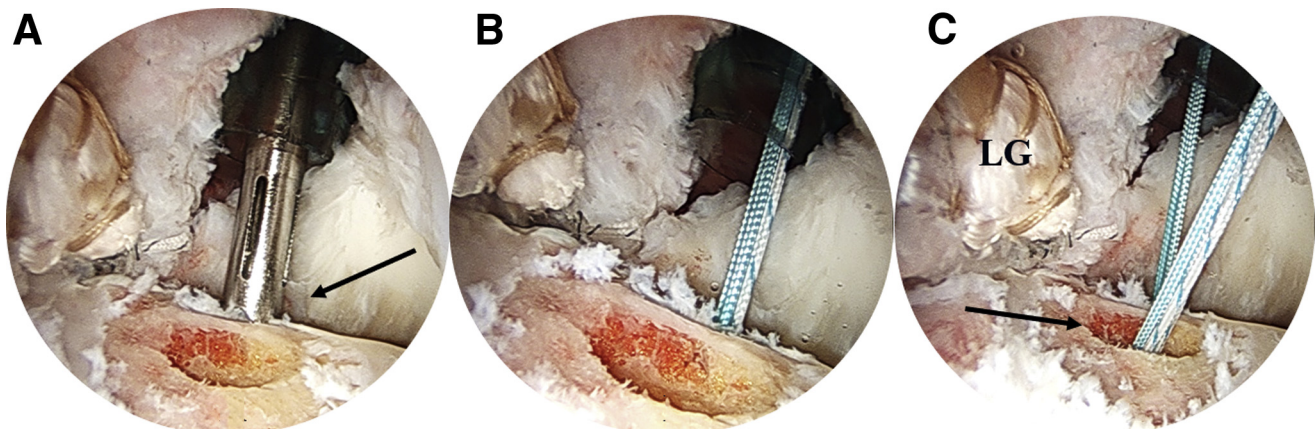


Fig 5. Arthroscopic image of a right hip as viewed through the anterolateral portal. A 2.4-mm Iconix suture anchor preloaded with a No. 2 FiberWire is placed (black arrow) in the medial extension of the defect (A and B) Another similar anchor is placed in the center of the defect (C). (black arrow) (LG, labral graft).

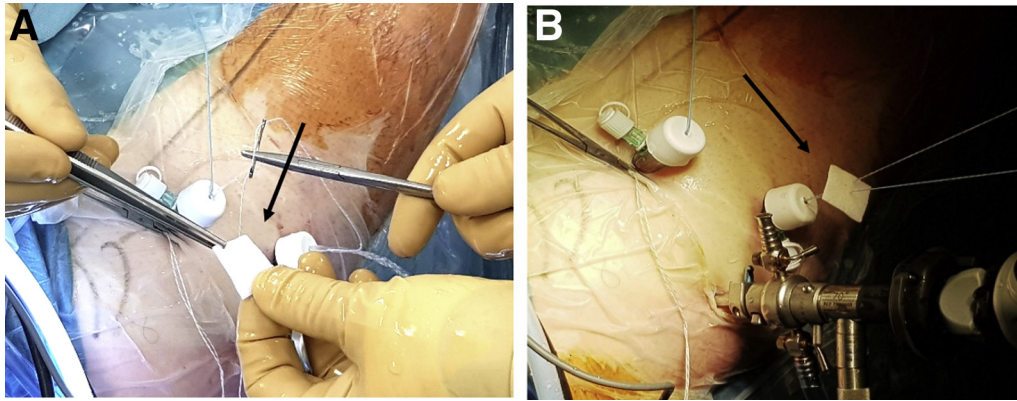


Fig 6. Intraoperative photograph of a right hip with 2 arthroscopic cannula placed in the midanterior portal and in the distal anterolateral portal. The arthroscope is positioned in the anterolateral portal. Sutures from the anchor placed in the center of the defect are brought through and passed through the middle of the dermal graft (black arrow) (A and B).

through the midanterior portal and a second anchor at posterolateral extent of the reconstruction through the Dala portal (Fig 3). Then, one of the anteromedial anchor suture limbs is passed through the DALA portal. Then, the extent of the labral deficiency is measured to estimate the graft appropriate length using the Superior Capsule Reconstruction Guide (Arthrex).

A semitendinous graft is harvested from the ipsilateral knee and prepared. The graft must be approximately 30% to 40% longer than the labral defect size. One limb from each suture anchor passing through the DALA 'portal is tied to the graft using a free needle. Then, the allograft is shuttled into the joint through the DALA portal with an arthroscopic knot pusher. The limb from the midanterior portal is pulled and fully seated into the anteromedial anchor first, followed by the limb exiting the DALA portal (Carreira's Shuttle technique)¹ and secured to the acetabulum with a standard arthroscopy half-hitch knot-tying technique. This step is then repeated using one of the suture arms from the posterolateral end of the graft. Similar to

standard labral repair, the segment in between is tied with additional suture anchors.

Preparation of the Femoral Head Defect and Remplissage

Following the labral reconstruction, traction is then released to access the peripheral compartment and the hip is flexed to 40°. A T-capsulotomy is performed between the 12-o'clock and 2-o'clock positions approximately 3 cm in length and the loss and defect of the normal femoral head–neck contour is localized. The defect is then debrided with a mechanical shaver and an arthroscopic 5.5-mm burr to expose a healthy bone bed that promotes healing and graft incorporation. The size of the defect is measured using the burr size and a standard arthroscopic probe, noting the depth, width, and length. A dermal allograft (Arthrex) appropriate to the dimensions of the head defect is cut and prepared. From the anteromedial portal, a 2.4-mm Iconix (Stryker) suture anchor preloaded with a No. 2 FiberWire is placed in the medial extension of the

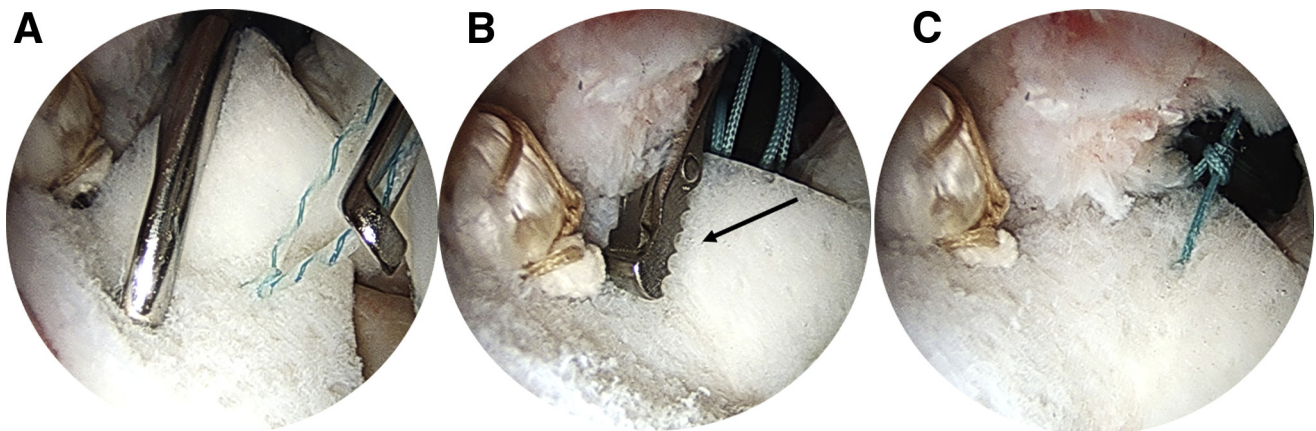


Fig 7. Arthroscopic image of a right hip as viewed through the anterolateral portal. Then, the graft is delivered into the joint, positioned on the defect, and fixed with arthroscopic knots (A). A suture limb of the most medial anchor is passed in a piercing fashion using a Scorpion (Arthrex) suture passer through the graft (black arrow) (B) and tied (C).

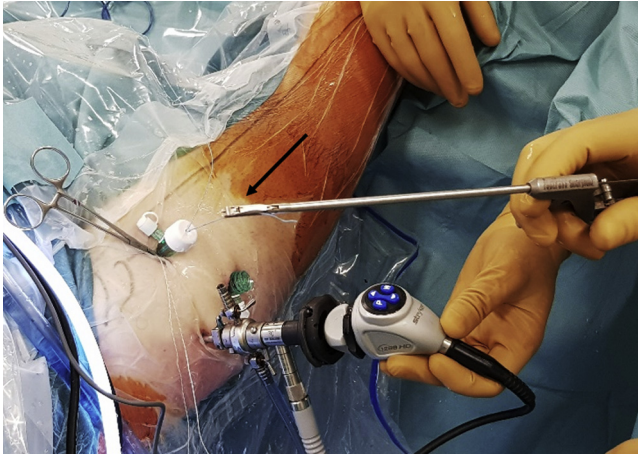


Fig 8. Intraoperative photograph of a right hip. A suture limb of the most medial anchor is passed in a piercing fashion using a Scorpion (Arthrex) suture passer (black arrow) through the graft.

defect and the sutures brought out the cannula (Fig 4). Another similar anchor is placed in the center of the defect and the sutures of this anchor are brought through and passed through the middle of the graft (Figs 5 and 6). Then, the graft is delivered into the joint, positioned on the defect, and fixed with arthroscopic knots. Then, one suture limb of the most medial anchor is passed in a piercing fashion using a Scorpion (Arthrex) suture passer through the graft and tied (Figs 7 and 8). Finally, a third anchor is placed through the midanterior portal on the lateral extension of the defect and sutures are passed and fixed in the same way (Fig 9). The hip is evaluated dynamically in all planes of motion to assess the fixation, position of the graft, and recreation of the suction seal on the femoral head and

neck. T-capsulotomy is closed with 2 to 4 sutures, and the interportal capsulotomy is repaired next.

Postoperative Recovery and Rehabilitation

The patient is discharged the following day and follows the usual postoperative rehabilitation of labral repair and osteocondroplasty with assisted loading with crutches for 3 weeks, circumduction movements, and stationary bicycle. Heterotopic ossification prophylaxis is routinely administered, with the use of naproxen for a minimum of 4 weeks and up to 6 weeks postoperatively.

Discussion

With the recent increase in the use of hip arthroscopy, revision hip arthroscopy also has become more prevalent.² Managing patients with residual and/or recurrent symptoms following hip arthroscopy is diagnostically and technically challenging. It is important to be aware of the most common reasons for failure, such as bony under-resection/overresection, labral tear or re-tear, progression of degenerative joint disease, and missed concurrent disorders such as subspine impingement, snapping hip syndrome, and athletic pubalgia. It is also important to rule out extra-articular causes of hip pain, such as referred pain from the spine or trochanteric bursitis.

Specific advance techniques recently have been developed for use in revision settings, such as labral and/or capsular reconstruction/grafting, remplissage for bony over-resection, and chondral implantation. The labrum's main function is to create a tight seal with the femoral head to prevent fluid flow outside of the joint space and enhance acetabular volume and stability of the joint. The importance of the acetabular labrum on the seal mechanism was highlighted in a cadaveric

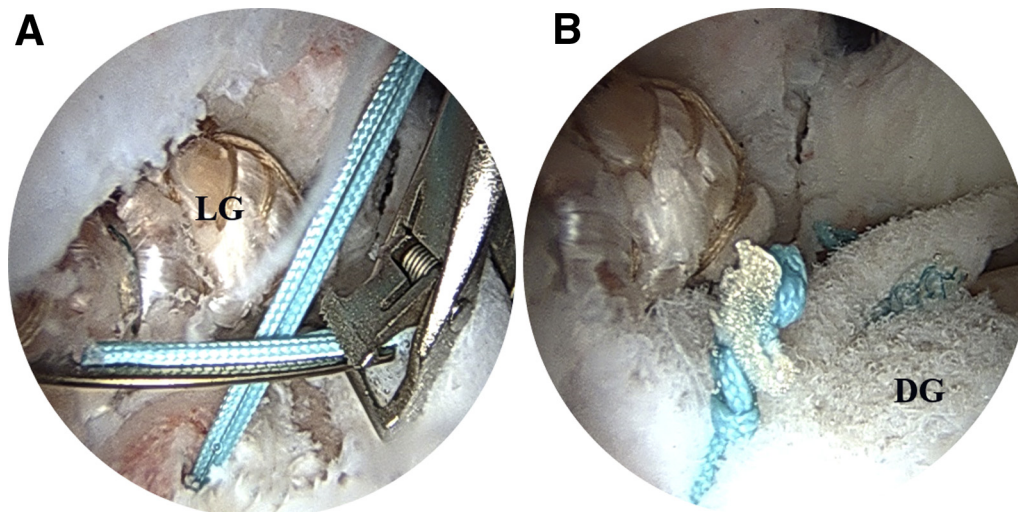


Fig 9. Arthroscopic image of a right hip as viewed through the anterolateral portal. Third anchor is placed through the midanterior portal in the lateral extension of the defect and sutures are passed in a piercing fashion using a Scorpion (Arthrex) suture passer through the graft (A) and tied (B). (LG, labral graft; DG, dermal graft).

Table 1. Technical Pearls and Pitfalls

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Pearls	<ul style="list-style-type: none"> • Place first the labral graft before the remplissage procedure. • Dermal graft is a useful method of filling a small femoral head–neck junction defect.
Pitfalls	<ul style="list-style-type: none"> • Inadequate measurement of the head and neck defect. • If an oversized graft is placed, cam-type femoroacetabular impingement is basically recreated. • In contrast, underestimation of the size of the defect and placement of a relatively small graft results in incomplete filling of the defect and failure to restore the hip fluid seal.

study by Philippon et al.³ Disruption of the fluid seal mechanism causes hip joint instability and compromises the lubrication and nutrition of the articular cartilage, leading to osteoarthritic changes.

Complete arthroscopic allograft labral reconstruction is an emerging technique that allows the surgeon to directly influence the size, quality, and length of a labral graft, which consistently restores functional labral tissue. Labral reconstruction can be performed using autograft or allograft tissue, and several arthroscopic labral restoration techniques have been described in the literature.^{4–8} The technique to measure labral defect size that uses an arthroscopic shoulder instrument to increase the accuracy by which intra-articular graft length is measured also has been recently described.⁹ This technique offers a more precise and efficient way to measure labral defect size by using principles of graft measurement used in superior capsular reconstruction in the shoulder. Arthroscopic acetabular labral reconstruction using a shuttle technique appears to be an effective procedure for the treatment of labral pathology through minimum 2-year follow-up.¹ Although not previously reported as a potential complication in femoroacetabular impingement surgery, overresection is a concern. In such cases, patients can become symptomatic because of the loss of the suction seal¹⁰ and the consequent development of microinstability.^{11,12}

Remplissage is an established technique that has been recently reported in the hip with the use of iliotibial band with the same aim as in the shoulder, filling in of the defect due to healing of the soft tissue to the underlying bony impression. This technique was developed for small anatomic defects of the femoral head–neck junction to restore excessive bone loss.¹³ We consider that the use of a dermal allograft of 3 mm in width is an useful alternative in small head defects because it avoids to make the graft too thick as it may reproduce the effects of a cam lesion. Larger defects may require an additional bone grafting technique. Performing both a labrum reconstruction in combination with a remplissage of the femoral head–neck junction in a patient with recurrent hip pain after hip scope is an option to retain physiological integrity in the hip joint. This procedure is technically

Table 2. Advantages and Limitations

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Advantages	<ul style="list-style-type: none"> • An important addition that highlights success of a novel procedure for a complex presentation. • Restore near-normal anatomy and recreate native hip biomechanics. • The suction seal is reestablished with appropriate contact between the labrum and femoral head–neck junction. • Prevent the femoral head from engaging with the anterior acetabular rim. • Dermal graft is an available graft option.
Limitations	<ul style="list-style-type: none"> • Further long-term assessment is necessary to continue to monitor hip stability, and future joint health with this technique. • Larger defects may require a bone grafting technique. • The use of a dermal graft increases the cost. • Procedure technically demanding, requires advanced hip arthroscopy training, and has a steep learning curve.

demanding, and complications can occur. If an oversized graft is placed, cam-type femoroacetabular impingement is basically recreated. In contrast, underestimation of the size of the defect and placement of a relatively small graft results in an incomplete filling of the defect and failure to restore the hip fluid seal. Arthroscopic remplissage of the femoral head–neck junction coupled with labrum reconstruction represents a way of approaching iatrogenic hip instability and loss of suction seal (Tables 1 and 2). Long-term studies must be done to evaluate the efficacy and durability of this surgical technique.

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