Arthroscopic Capsule Reconstruction in the Hip Using Iliotibial Band Allograft

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We have no financial relationships to disclose.

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I have financial relationships with the following companies:

- Research support, Paid Consultant, Royalties
- Stockholder, Consultant
- Ownership, Stockholder
- Stockholder, Royalties
- Research Support
- Research Support
- Research Support
- Royalties
- Royalties
- Royalties
- Royalties
- Smith and Nephew Endoscopy
- Arthrosurface
- HIPCO
- MIS
- Ossur
- Arthrex
- Siemens
- Bledsoe
- DonJoy
- SLACK Inc.
- Elsevier
The hip capsule, consisting of the iliofemoral, ilioischial, and pubofemoral ligaments and zona orbicularis\textsuperscript{1}, has been identified as an important static stabilizer of the hip joint. During routine hip arthroscopy, management of the capsule at the conclusion of the procedure is evolving towards either capsular closure or capsular plication.\textsuperscript{2, 3}
Patients who do not have a capsular closure or plication may continue to complain of hip pain and dysfunction post-operatively, likely secondary to micro-instability or muscle invagination into the capsular defect. High resolution MRI or MR arthrogram will identify the capsular defect.
Introduction

Magnetic resonance image (A) showing large capsular defect on coronal view and (B) muscle herniation into the capsular defect on sagittal view.
Surgical Technique

The patient is positioned in the modified supine position (10° flexion, 15° internal rotation, 10° lateral tilt, neutral abduction) and the procedure is conducted under spinal epidural anesthesia with propofol for complete muscular relaxation.
Surgical Technique

Manual traction is applied through the operative hip and light countertraction is applied to the contralateral extremity. The traction is carefully increased until the vacuum sign is present and a minimum of one centimeter of distraction is noted on fluoroscopy. The operative leg is adducted to neutral and the foot internally rotated in order to have the femoral neck parallel to the ground.
Two arthroscopic portals are used: anterolateral and mid-anterior and a detailed inspection of the central and peripheral compartments is performed to evaluate for pathology including labral tears, chondral defects, ligamentum teres pathology, and bony impingement.
Surgical Technique

Following treatment of the pathology in the central and peripheral compartments, the capsular defect is sized and the traction is released. The graft is prepared on the back table.
Surgical Technique

Iliotibial allografts are used, as it provides a large piece of tissue in order to reconstruct sizeable capsular defects. On the back table, the allograft is folded three times upon itself to provide comparable thickness to the native hip capsule and is kept moist.
(A) The folded graft has its edges sutured with a 2-0 absorbable, braided suture, making a quadrilateral shape. (B) The 2-0 runs in a figure of eight fashion to make a complete surrounding of the graft edges. (C) On each corner of the graft, loops are made using a number 2 absorbable, braided suture and tied over a straight mosquito clamp, with a “overhand loop knot”.

Surgical Technique
Surgical Technique

The loops will help to facilitate intra-articular control of the graft and be incorporated into the suture fixation. Distal loops are dyed in purple ink to help orientation. The graft is re-measured to confirm appropriate sizing.
Surgical Technique

When graft preparation is complete, traction is re-established and two suture anchors (one medial and one more lateral) are placed in the subspinal region of the acetabulum; These serve as the proximal points of fixation for the graft.
The graft is transfixed with one of the suture limbs of the medial anchor and is advanced into the joint through a large cannula in the mid-anterior portal and then placed into position. After adequate positioning, the graft is fixed by a sliding knot and tied down to the subspinal anchor. The procedure is repeated to fix the lateral end of the graft, using the suture loop to aid in control.
After an adequate fixation of the graft, traction is released and the hip is brought into flexion and internal rotation. Side-to-side absorbable sutures are used to secure the allograft to the residual native capsule, with the aid of suture shuttling device. The number sutures necessary depends on the size of the graft.
At the conclusion of the procedure, it is vital to gently take the hip through a range of motion to determine tension on the capsule and post-operative range of motion precautions.
Discussion

• Despite the intrinsic bony stability of the hip socket, the capsule plays a key role in hip stability, particularly at the extremes of motion$^4,5$
  – the iliofemoral ligament is the most important stabilizer in extension and external rotation$^6$
  – Between the 12 o’clock and 3 o’clock position on the acetabular clock-face anatomy, there is an increase in capsular thickness, with the 2 o’clock position being the thickest$^6$

• This is the region where the capsulotomy is generally performed to access the joint during an arthroscopic hip procedure
  – Not addressing the capsular defect resulting from the capsulotomy, particularly in its thickest region, can result in persistent, symptomatic, micro-instability in the operative hip in certain cases
  – Capsular closure or plication at the completion of the procedure is necessary to restore native anatomy

• Cases of subluxation and dislocation following hip arthroscopy are rare
  – this complication may be under-reported$^7$
Discussion

• The diagnosis can be confirmed with a high resolution MRI or a MR arthrogram\(^8\)

• Besides the history of prior arthroscopy, patients with large defects in the capsule may have:
  – signs of instability including anterior hip pain
  – sensation of giving away or catching
  – may present a positive dial test
  – may also complain of an anterior “pinching” sensation
    o secondary to muscle invagination into the defect

• Recurrent dislocation following revision total hip arthroplasties have been described in the literature
  – successfully managed with reconstruction of the iliofemoral ligament\(^9\)
  – likewise, this technique of arthroscopic capsular reconstruction provides a surgical solution to a challenging post-operative complication
Conclusion

Seen primarily in the revision setting, capsular defects can lead to micro-instability and cause recurrent stress at the chondrolabral junction. An attempt at secondary closure can be challenging due to capsular limb adherence to the surrounding soft tissues. Therefore, reconstruction maybe the only possible surgical solution for this problem. This arthroscopic technique is still developing and the best clinical results are expected in the medium and long term, mainly for the elite athletes with hip disorders.
Conclusion

Pearls and Pitfalls to Consider During Hip Capsular Reconstruction

Pearls

• Use iliotibial allografts
• Fold the graft three times upon itself to provide comparable thickness to the native hip capsule
• Make suture loops on each corner of the folded graft
• Dye the distal loops with purple ink to help orientation

Pitfalls

• Introducing the graft into the joint prior to placing the proximal anchors in the subspinal region
• Inadequate measurement of the capsular defect
References


