Revision Hip Arthroscopy

35

John J. Christoforetti, Michael J. Palmer, Bojan Zoric, and Marc J. Philippon

Introduction

Every year, the indications for arthroscopic hip surgery expand, leading to increased volumes of arthroscopic hip surgery performed yearly [1–6]. This has also created a need for treating physicians to understand and care for patients who have failed arthroscopic hip surgery [7]. There is a paucity of literature focused on failed arthroscopic hip surgery and/or revision arthroscopic hip surgery, and further study is warranted. This chapter will first briefly review current evidence for revision hip arthroscopy indications and outcomes. Next, it will present the authors' strategy for use of MRI technology in the evaluation and treatment of the patient with persistent symptoms following hip arthroscopy. Select cases are shown to highlight effective use of clinical experience and MRI diagnostics in the revision setting. Given the challenges that range from diagnostic and technical limitations to insurance coverage challenges, revision hip arthroscopic surgery should be indicated with caution.

J.J. Christoforetti, MD (✉)
Department of Orthopedic Surgery, Sports Medicine Division, Allegheny Health Network, West Penn Hospital, Pittsburgh, PA, USA
e-mail: John.christoforetti@gmail.com

M.J. Palmer, MD
88th Medical Group, Surgical Operations Squadron, Wright Patterson Air Force Base, Wright Patterson AFB, OH, USA
e-mail: Michael.palmer.30@us.af.mil

B. Zoric, MD
Sports Medicine North, Peabody, MA, USA
e-mail: Bzoric7@gmail.com

M.J. Philippon, MD
The Steadman Clinic and Steadman Philippon Research Institute, Vail, CO, USA
e-mail: drphilippon@sprivail.org

Current Evidence for Revision Hip Arthroscopy

Open and arthroscopic surgery for non-arthritic hip pain can fail to render the patients symptom free and leave treating physicians and patients seeking further treatment. Published evidence to inform the diagnostic process is limited. In all published evidence, modest improvements have been noted in appropriately selected cases.

Evidence exists to support improvement in revision of arthroscopic procedures with additional arthroscopic procedures. The senior author (MJP) has shown results for revision of failed arthroscopic procedures [8]. In this retrospective review of 37 cases of revision arthroscopic hip surgery, 36/37 patients demonstrated unaddressed or inadequately addressed features of femoroacetabular impingement. Thirty-four patients reported hip pain that was unresolved after their prior surgery. Twelve patients had gradually worsening pain, 8 had an acute onset of pain without trauma, and 17 had acute worsening of pain with a traumatic event. The geographic location (lateral, posterior, and groin) of the pain did not correlate to treatment at the time of revision surgery. In another retrospective review of 24 cases in 23 patients, Heyworth et al. identified that 100 % of the patients presented with groin pain that worsened with activity [9]. Thirteen patients reported no improvement of symptoms at all after their prior arthroscopic hip surgery. The average time to recurrence of symptoms was 6.1 months (0–39 months) from their index procedure. They identified 19 cases of unaddressed or incompletely addressed bony impingement. Failed labral repair in the form of a re-torn labrum or loose suture anchor was found in eight cases. Psoas impingement was identified and addressed in seven cases. A variety of concomitant intra-articular/extra-articular pathologies were identified and addressed during revision surgery in patients from both series. Pathologic findings included cam and pincer lesions, synovitis, adhesions, labral fraying/tears, chondral defects, capsular laxity, psoas impingement,

S.F. Brockmeier (ed.), *MRI-Arthroscopy Correlations: A Case-Based Atlas of the Knee, Shoulder, Elbow and Hip*,
DOI 10.1007/978-1-4939-2645-9_35, © Springer Science+Business Media New York 2015

Table 35.1 Authors' tips for patient selection in revision hip arthroscopy (Evidence-Based Medicine Level of Evidence: 5)

Strong potential for success	Relative potential for success
Persistent hip joint pain as confirmed by history/exam/intra-articular injection	Index procedure included implantation of nonabsorbable implants
Under- or unaddressed FAI	MRI signs of failure to heal at prior intended repair
Minimal degenerative hip disease	New onset of different pain in previously untreated area
Intact labrum without prior repair or healed prior repair	
Reasonable expectations	Persistent capsular insufficiency (iatrogenic)
No narcotic medication requirement	Persistent feeling of instability
Absence of major dysplastic or extra-articular impingement morphology	Thickened capsule or adhesions visible on MRI
	Persistent painful psoas snap
	Persistent mechanical symptoms

Table 35.2 Authors' experience with poor indications for revision hip arthroscopy (Evidence-Based Medicine Level of Evidence: 5)

Objective	Subjective
Progressive and severe degenerative joint changes	Pain in a location inconsistent with hip pathology
Severe hip dysplasia	Incomplete or no response to prior treatment performed
Absence of abnormal hip findings on exam or radiographs	Without complication and without surgical implants
Severe bone deformity in areas inaccessible to arthroscopic exposure	Lack of definably different surgical goals in the setting of persistent hip area pain
	Surgeon's experience

ligamentum teres tears, loose bodies, recurrent PVNS, snapping IT band, and trochanteric bursitis.

Evidence also exists that modest gains can be made with revision hip arthroscopy following open hip preserving surgery [10]. Retrospective review of patient reported outcomes in the setting of hip arthroscopy performed, following open hip preserving surgery has shown modest but significant improvements. Once again, the most common finding in successful treatments was treatable residual femoroacetabular impingement (present in 66 % of cases). Treatable segmental labral defects and symptomatic heterotopic bone were also predictors of improved outcome.

Likewise, recent evidence shows that open hip preserving surgery can be effective in improving disappointing outcomes following index hip arthroscopy procedures. Severe extra-articular impingement, posteriorly located intra-articular impingement features, and moderate to severe hip dysplasia have all shown to be common features in failed index hip arthroscopy during salvage open surgery efforts. Periacetabular osteotomy for correction of untreated moderate to severe dysplasia has been shown to be an effective salvage of failed arthroscopy [11].

Given the small numbers of patients present in all studies available for review today [12, 13], selection for arthroscopy of the hip following failed index procedures remains largely a clinical decision. The efforts to ascertain reasons for failure in hip preserving surgery from a research perspective always demonstrate significant observation bias. As knowledge of new and potentially impactful diagnoses grows, investigators will undoubtedly identify reasons for failure that currently are not under investigation.

Table 35.1 shares the authors' tips for patient selection in revision hip arthroscopy (Evidence-Based Medicine level of Evidence: 5), and Table 35.2 shows the authors' experience with poor indications for revision hip arthroscopy (Evidence-Based Medicine level of Evidence: 5).

Clinical Evaluation of Patients with Persistent Dysfunction After Hip Arthroscopy

When evaluating a patient who has failed arthroscopic hip surgery, it is important to take a detailed history. It is important to identify the characteristics of pain that led to the first surgery and chronologic detail of the pain after that surgery. It is important to tease out if the pain is different in quality or intensity, whether there was a new trauma to the hip, or if the pain ever went away. Understanding the patients and their expectations and insight into their problem is an art that comes with experience but is vital in counseling and educating patients.

Physical exam should include a comprehensive evaluation of all possible causes of hip pain. This includes multi-positional musculoskeletal exam to evaluate gait, stance, core strength, lumbosacral spine pathology, pinpoint areas of maximal tenderness, hip range of motion, provocative maneuvers, weakness, and abnormal sensation or reflexes. It should also include a basic abdominal exam to rule out

non-musculoskeletal causes of hip pain. We defer female pelvic exams, but if there is any question of a genitourinary cause of hip or groin pain, a referral to the gynecologist is initiated. Comprehensive review of the history and physical exam in this patient group are beyond the scope of this text, yet it is the opinion of the authors that these considerations are the best guides for selecting appropriate treatment for this patient group.

Imaging of Postoperative Hip

Postoperative changes can complicate the interpretation of imaging studies. Retained implants can cause distortion of MRI imaging decreasing the quality of the study. It is also challenging to identify clinically significant new findings in the postoperative hip.

Standard radiographic studies should include an AP pelvis, AP hip, and a lateral view of the hip (frog leg or cross table) [14]. These images should be scrutinized for pathology including cam and pincer impingement, hip arthritis, fracture, dysplasia, SI joint arthritis, and lumbar stenosis. Original imaging from before the initial surgery should be available for comparison.

MRI arthrogram should be the study of choice when evaluating for intra-articular soft tissue pathology in the postoperative hip. Blankenbaker et al. performed a retrospective review of 20 patients who had undergone revision arthroscopic hip surgery for recurrent labral tear after initially undergoing a labral debridement [15]. Original and postoperative MRI arthrograms, as well as surgical documentation of the revision procedure, were available for evaluation. All MRI arthrograms were obtained at the same institution using the same protocol. Two fellowship trained musculoskeletal radiologists reviewed the images retrospectively. Nineteen patients were diagnosed with recurrent labral tear intraoperatively. Fourteen tears were identified by consensus retrospective review on MRI arthrogram (12 based on high intensity line to the labral surface, two based on labral distortion and paralabral cyst formation). The other five patients were found to have only labral shortening. They concluded that a recurrent labral tear can be diagnosed on MRI arthrogram by the presence of a new high intensity line to the labral surface, an enlarged or distorted labrum, or a new paralabral cyst.

McCarthy and Glassner have shown the useful correlations between arthrography and arthroscopy in the revision setting [16]. We currently use a combination of MRI and MRI arthrogram to evaluate patients after hip arthroscopy when standard plain radiographs do not reveal the complete diagnosis. Figure 35.1 provides a summary of our most common uses for both studies.

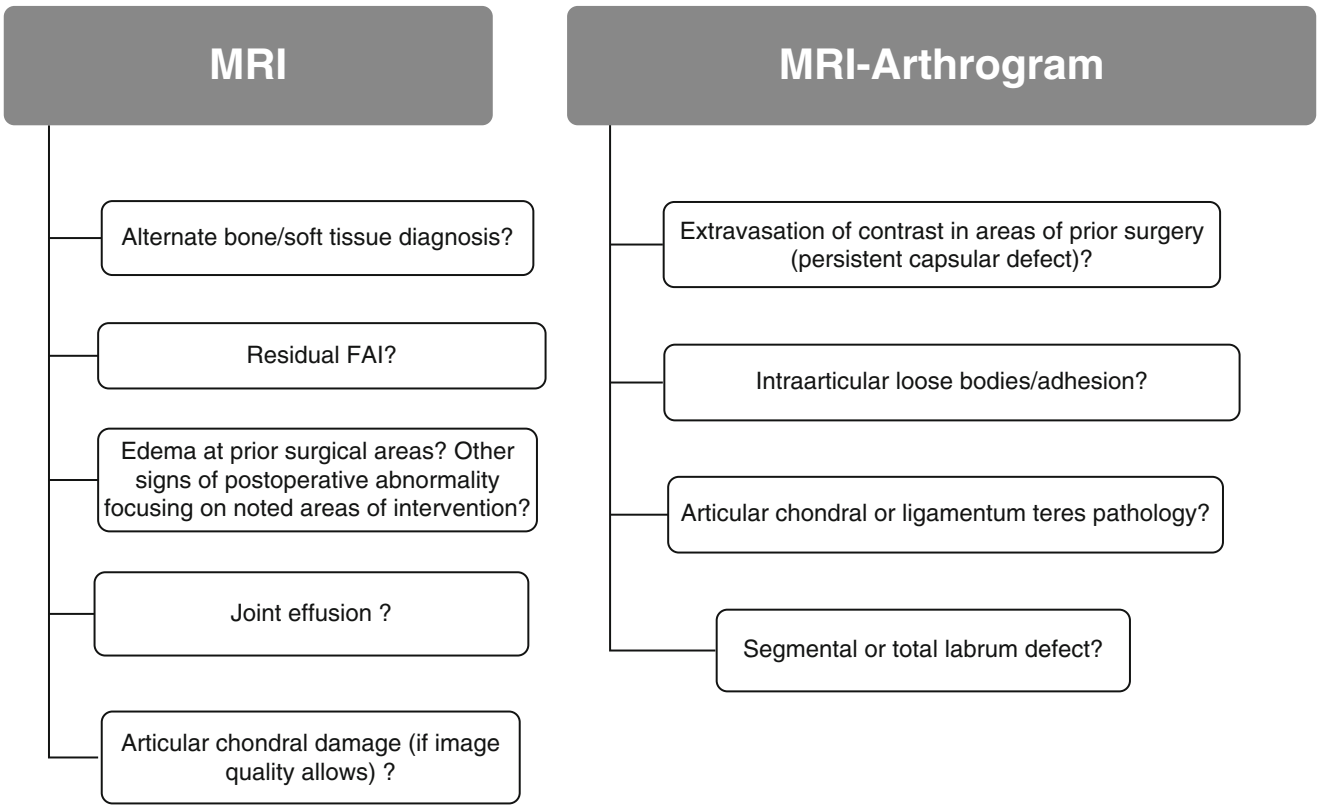

Fig. 35.1 Surgical considerations for review of MRI and MRI arthrogram of the hip in the revision setting

Cases

Case 1: Postoperative Adhesions

History, Clinical Presentation, and Exam

A 32-year-old female presents for second opinion when she failed to have any significant relief after arthroscopic labral debridement and microfracture of a chondral defect 8 months prior. The operative note indicated that minimal labrum debridement in the anterior acetabulum was performed along with a femoral head microfracture procedure. The patient expressed that her initial complaint prior to index surgery was groin pain during and after physical activity for 6 months.

Her only period of significant relief after her first surgery was from an intra-articular steroid injection. Her rehabilitation protocol following the index procedure included crutch protection for 6 weeks. Physical therapeutic exercise was initiated at 8 weeks.

On physical exam, she had pain with flexion adduction internal rotation. She also had a decrease in arc of motion compared to her uninjured side. FABER testing and off the table extension testing reproduced pain. There was tenderness over the anterior hip capsule with no signs of infection and well-healed incisions.

Imaging

Plain radiographs showed no signs of residual femoroacetabular impingement or arthritic change. MRI arthrogram was obtained which demonstrated postoperative adhesions and loss of normal capsulolabral architecture and lacked any significant alternate pathology (see Fig. 35.2).

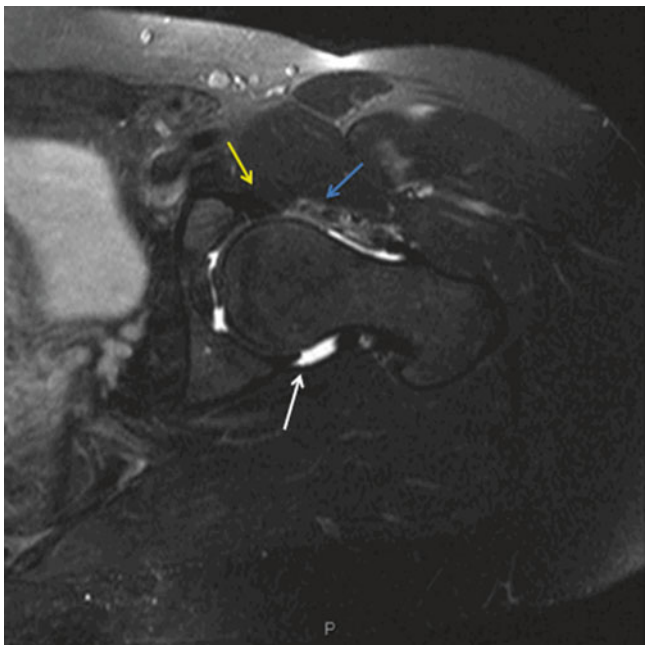

Fig. 35.2 Axial T2-weighted MRI arthrogram image demonstrating low signal interruption of the intra-articular contrast at the area of prior surgical exposure (*blue arrow*). Anteriorly, there is loss of the normal supraacetabular recess as evidenced by lack of contrast fill between the labrum and capsule (*yellow arrow*). Posteriorly, the normal supraacetabular recess contrast fill is demonstrated in the area distant from the prior surgical field (*white arrow*)

Treatment

After discussion of risks and benefits, the patient elected for revision hip arthroscopy. During arthroscopy, the labrum was found to be healed in the area of prior debridement, and no segmental loss was present. The supraacetabular space was obliterated with adhesions along the anterior labrum (Fig. 35.3). The area of prior capsulotomy scarred directly to the femoral head region of microfracture (Fig. 35.4). Operative treatment included mechanical and thermal lysis of adhesions and closure of the prior capsulotomy defect.

Postoperative care instructed the patient to use a hip orthosis for 2 weeks. Crutch protection with 20 lb. foot-flat weight bearing was initiated immediately. Continuous passive motion machine was used 6 h daily for 2 weeks, and home caregiver administered passive circumduction exercises were performed.

At 1 year post-revision, the patient had returned to her pre-injury level of activity including outdoor running and fitness class participation.

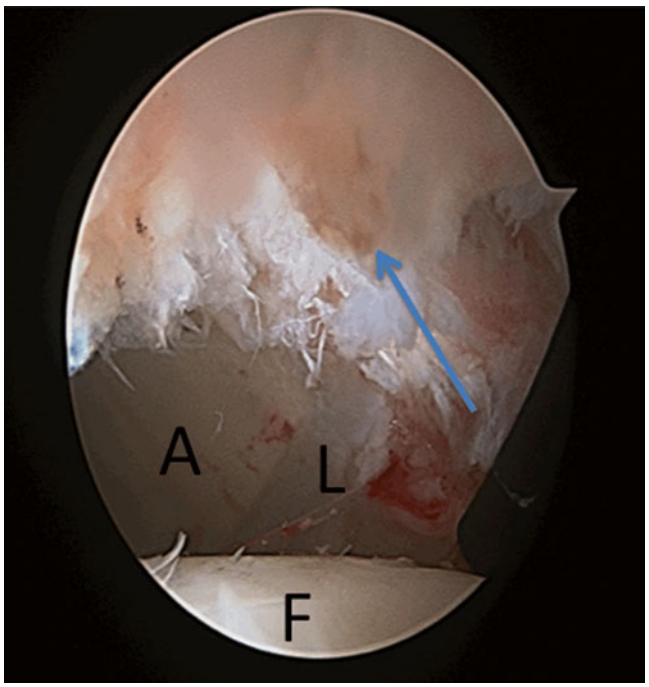

Fig. 35.3 Arthroscopic image corresponding with MRI arthrogram shown in Fig. 35.2 at the level of the acetabular rim. Adhesions obliterating supraacetabular recess (*blue arrow*) in postoperative zone. *A* acetabulum, *F* femoral head, and *L* labrum

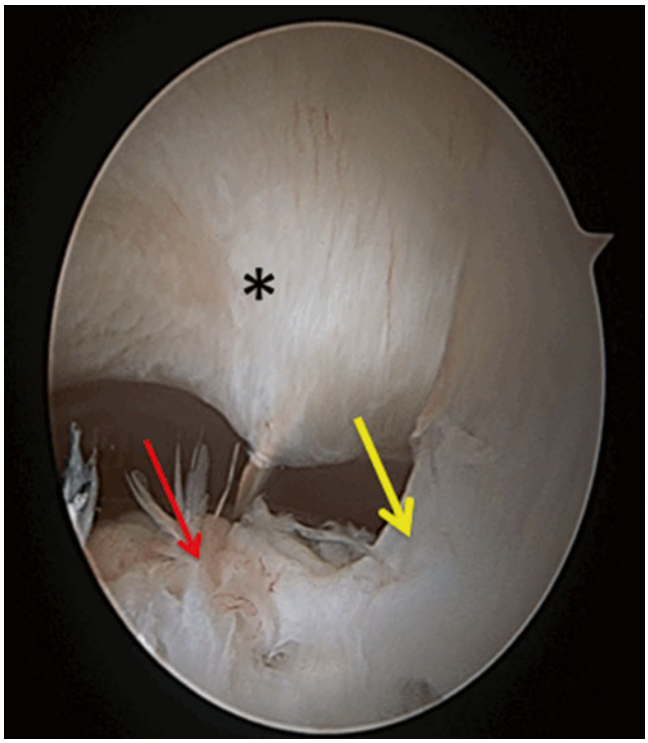

Fig. 35.4 Arthroscopic image in the peripheral space corresponding with MRI arthrogram shown at the level of the capsule-femoral head adhesion. Normal capsule (*asterisk*); adhesion (*yellow area*) sweeping from prior capsulotomy to femoral head at the area of prior microfracture (*red arrow*)

Discussion

The most basic form of appropriate revision hip arthroscopy is shown in this case. Development of untoward effects of appropriate operative care in the form of excessive adhesions can occur, and correction has the potential to help. Particularly, when the index procedure is performed by another center, attention to the potential existence of postoperative adhesions helps to provide an option for salvage.

There are some common features in the clinical presentation that can raise suspicion for this clinical scenario. Delayed rehabilitation in the setting of procedures that stimulate the healing response such as osteochondroplasty or microfracture can predispose to adhesion. Operative steps, such as complete capsulectomy, that allow communication between raw bone surfaces and the soft tissues of the flexor can also contribute. Patients without overt signs of missed structural pathology at the index procedure who seem to demonstrate good response to intra-articular injection and suffer from limited active motion also raise suspicions for involvement of adhesions in the absence of plain radiographic arthritic progression [17].

As in the case shown, the MRI arthrogram confirms the clinical suspicion by first eliminating alternate diagnoses such as avascular necrosis or stress fracture. Secondly, the use of arthrogram allows appreciation for the loss of normal joint recesses in the area of operative treatment. These are frequently the key signs of potential for successful revision through simple lysis of adhesion.

It is unknown to what degree that the lysis of adhesions component of all revision procedures contributes to overall recovery as no trial exists comparing the simple performance of lysis of adhesions to advanced revision techniques.

Case 2: Postoperative Capsular Defects and Microinstability

History, Clinical Presentation, and Exam

A 22-year-old female Division I rower presented to us with persistent right hip pain for 2 years following arthroscopic labral repair and osteochondroplasty at an outside institution.

The index procedure was performed as an attempt to alleviate rowing-related groin pain and snapping and also included a transcapsular psoas recession, yet capsular management was not noted in the operative report.

Despite early initiation of rehabilitation and good progress, she felt that after 6 weeks postoperatively, she began to suffer recurrence of anterior hip pain. As training intensity increased, her pain increased monthly. She was unable to return to her preoperative level of activity due to the pain and even reported a sense of popping that she felt was new since the procedure.

On physical exam, she had pain with flexion adduction internal rotation but was otherwise comparable to the opposite hip in range of motion and strength. She reported pain upon resisted straight leg raise testing at 30° flexion and pain with FABER testing. Core strength and balance were reduced on the operative side but within normal limits on the asymptomatic side.

Imaging

Plain radiographs showed no signs of residual impingement, heterotopic bone, or dysplasia.

An MRI arthrogram was ordered which revealed extravasation of fluid into the anterior soft tissues, without evidence of recurrent labral tear or residual impingement (Fig. 35.5).

Treatment

Revision hip arthroscopy was performed, which revealed healed labrum tissue in the area of prior repair; there were no signs of recurrent or residual impingement and normal articular cartilage of the femoral head and acetabulum. A persistent 2 × 2 cm capsulotomy defect was present, through which the muscular psoas was visible (Fig. 35.6) in the area corresponding to the MRI arthrogram identified capsular dye extravasation.

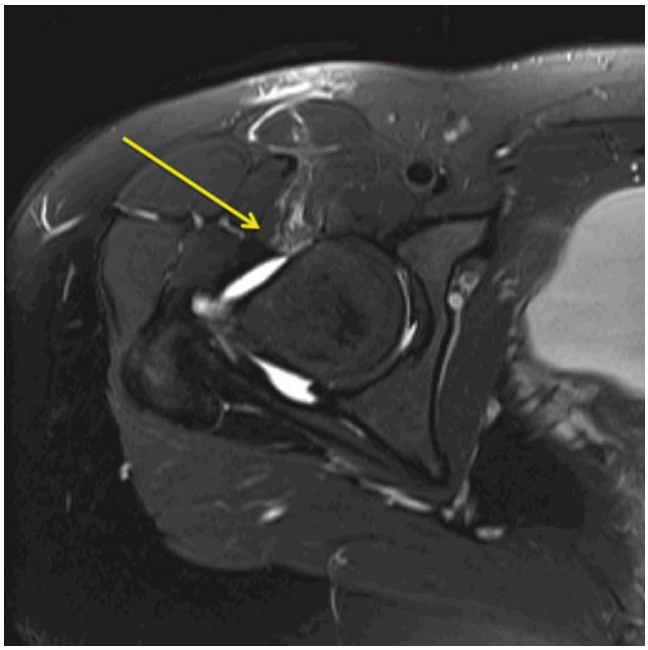

Fig. 35.5 Axial T2-weighted MRI arthrogram demonstrating extravasation of contrast dye into the soft tissues anteriorly

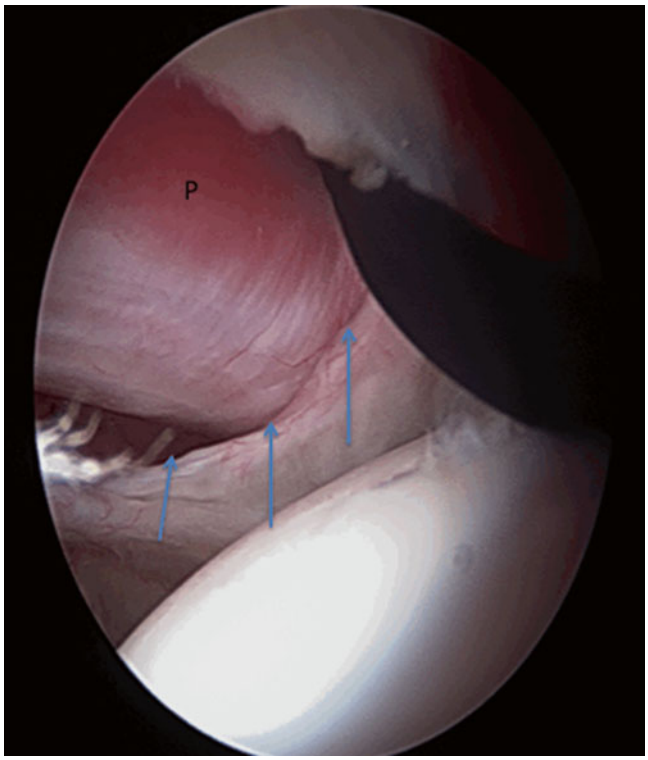

Fig. 35.6 Arthroscopic image of the persistent capsular defect in the anterior hip corresponding to the site of MRI arthrogram leakage. Through the capsule defect (*arrows*), the exposed psoas (P) is visible

Arthroscopic suturing techniques were used to close the capsular defect, restoring the normal anatomy of the anterior capsule. Postoperatively, she was placed in a specific rehabilitation protocol focused on early motion and protection of extreme ranges of extension and abduction or external rotation.

By 8 weeks postoperatively, she reported complete relief of pain. At final 2-year follow-up, she remained pain free and active in recreational sports but had not resumed competitive rowing.

Discussion

This case illustrates an increased complexity of considerations in the revision setting. Unlike in the first case presented, the MRI arthrogram demonstrated increased signal in the anterior soft tissues in the region of prior surgical intervention. Rather than adhesions eliminating expected spaces, the capsule has an absent appearance.

Matching the MRI findings with the understanding of the technical aspects of psoas recession performed in the index procedure, the complaint of anterior hip pain with activity could be understood. With over 2 years of failed postsurgical therapy, revision surgery to assess the healing of the labrum and address the deficiency in the capsule identified on MRI was effective in the absence of new or revision bone correction.

Technical considerations for this case are more advanced than in a simple lysis of adhesions. Appreciation of this pathology requires understanding of the normal appearance of the proximal hip capsule as well as deficiencies when present [18]. Facility with advanced arthroscopic suturing techniques and capsular management strategies are required to avoid overtightening or further damage. Finally, careful rehabilitation to avoid re-tear of the capsule and allow improved outcome is required.

Case 3: Unaddressed FAI and Segmental Labrum Defect

History, Clinical Presentation, and Exam

Thirty-three-year-old male presented with acute onset right hip and groin pain while performing a box-jump plyometric exercise. Four years prior to this event, the patient had undergone an arthroscopic labral debridement without osteoplasty at an outside facility. An MR arthrogram revealed a recurrent tear of the anterior superior labrum with thinning of the articular cartilage adjacent to the tear. He had temporary relief with an intra-articular depomedrol injection, nonsteroidal anti-inflammatory medications, and physical therapy. The patient continued to have persistent hip and groin pain, particularly with climbing ladders/sitting or putting shoes on. Examination showed pain with flexion, adduction, and internal rotation (FADIR) testing.

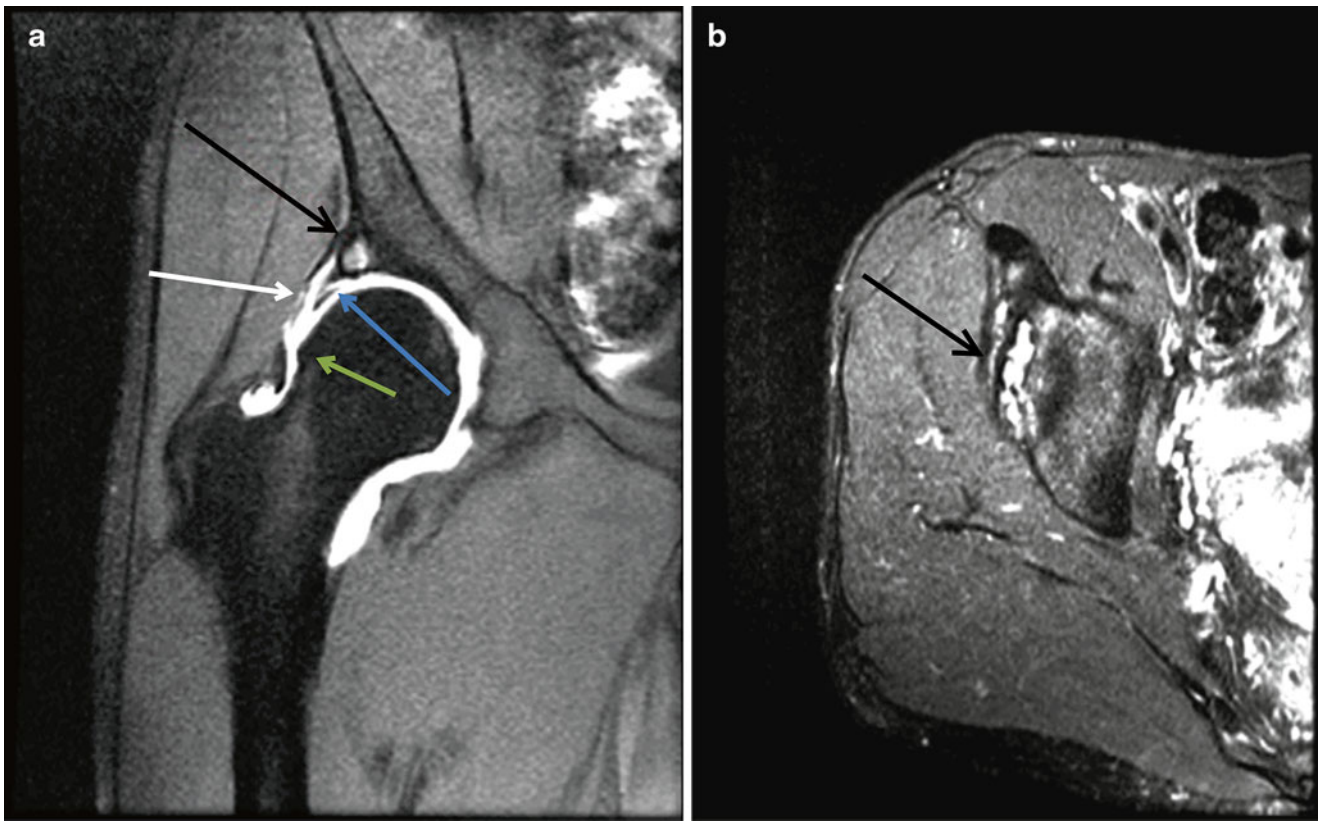

Fig. 35.7 MRI arthrogram of affected hip showing T2-weighted coronal image (**a**) and axial image (**b**). Supraacetabular cyst (*black arrow*); persistent capsular deficiency (*white arrow*); labrum tear; acetabular chondral lesion (*blue arrow*); and femoral head cam lesion (*green arrow*)

Imaging

Plain radiographs (not shown) demonstrated large Cam deformity, supraacetabular intraosseous cyst, and preserved joint space.

MRI arthrogram revealed persistent capsular defect, supraacetabular cyst, labrum tearing, and persistent Cam lesion (Fig. 35.7a, b).

Treatment

Revision hip arthroscopy included lysis of adhesions, capsular closure, femoral osteochondroplasty, and reconstruction of the labrum using semitendinosis allograft. See Fig. 35.8a, b. Postoperative recovery followed a specific protocol for arthroscopic impingement correction. At 1 year postoperatively, the patient continued to report anterior hip pain following vigorous athletics but greatly improved symptoms with daily activities.

Discussion

This case builds further upon the first two cases presented and includes the need for treatment of unaddressed pathology (femoroacetabular impingement) and salvage of iatrogenic tissue damage (labrum reconstruction, capsular closure, and lysis of adhesions). The MRI arthrogram revealed the presence of moderate arthritic damage in the regions of unaddressed impingement as well as the suggestion of persistent labrum and capsule abnormality. Formal discussion of the technical and radiographic parameters of impingement correction is beyond the scope of this chapter. This final case serves as a typical example of the most effective revision steps published to date and reminds the reader that unaddressed impingement is the most common indication for revision hip arthroscopy.

Summary

Revision hip arthroscopy is a difficult task for the treating surgeon and an undesirable need for the suffering patient. Meticulous attention to clinical and radiographic parameters can lead to appropriate patient selection. MRI and MRI arthrogram remain essential to our assessment of the bone and soft tissues of the postoperative hip in this setting. The technical demands of revision hip arthroscopy can range from basic to the most advanced, and surgeons must assess their own capabilities prior to performing these procedures.

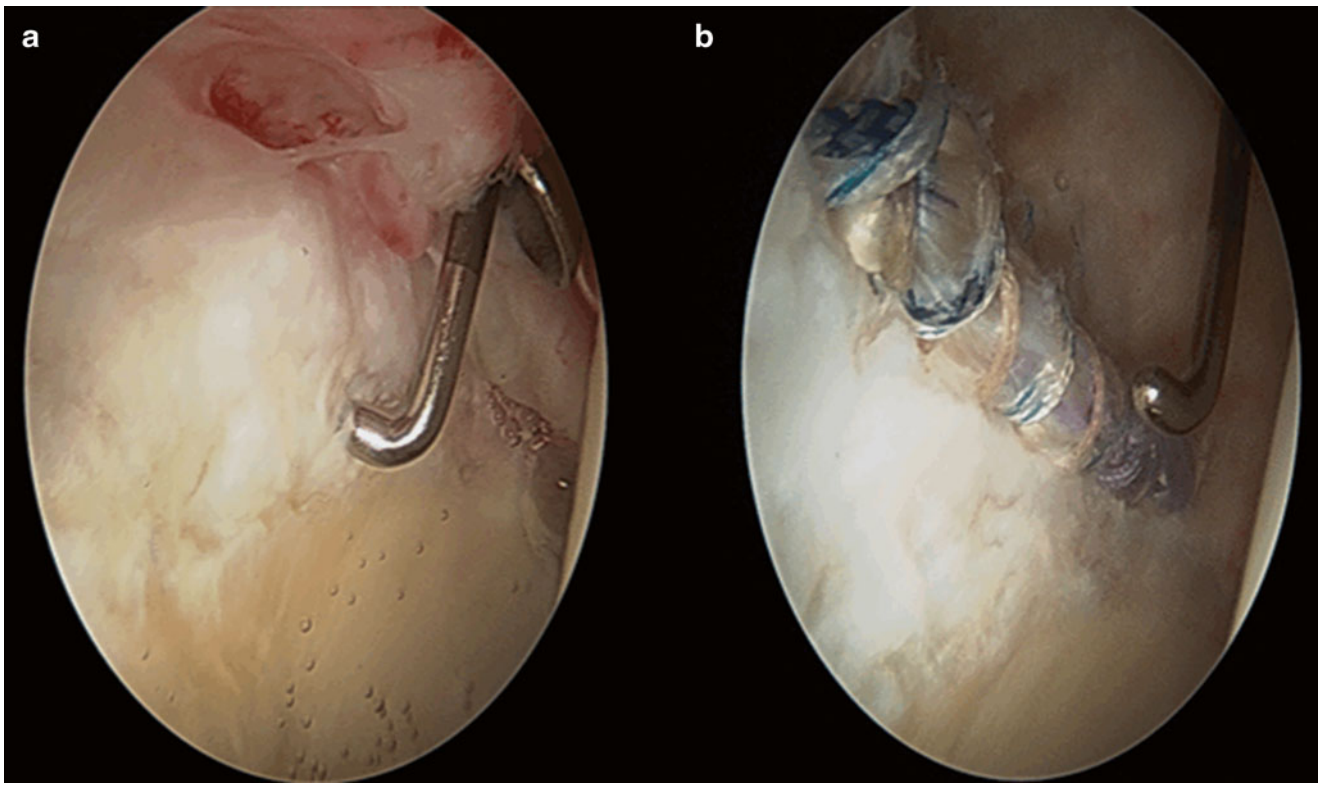

Fig. 35.8 Arthroscopic images showing anterior labrum deficiency and acetabular articular chondral damage corresponding to the zone of unaddressed impingement (**a**) and post-revision labrum reconstruction (**b**)

References

1. McCarthy JC, Lee J. Hip arthroscopy: indications, outcomes and complications. Instr Course Lect. 2006;55:301–8.
2. Smart LR, Oetgen M, Noonan B, Medvecky M. Beginning hip arthroscopy: indications, positioning, portals, basic techniques, and complications. Arthroscopy. 2007;23:1348–53.
3. Chen AF, Wright V. Hip arthroscopy: current indications and setup. Oper Tech Orthop. 2010;20:212–6.
4. Kelly BT, Williams RJ, Philippon MJ. Hip arthroscopy: current indications, treatment options, and management issues. Am J Sports Med. 2003;31:1020–37.
5. McCarthy JC, Jibodh SR, Lee J-A. The role of arthroscopy in evaluation of painful hip arthroplasty. Clin Orthop Relat Res. 2009; 467:174–80.
6. Colivin AC, Harrast J, Harner C. Trends in hip arthroscopy. J Bone Joint Surg Am. 2012;94(4):e23.
7. Bogunovic L, Gottlieb M, Pashos G, Baca G, Clohisy JC. Why do hip arthroscopy procedures fail? Clin Orthop Relat Res. 2013; 471:2523–9.
8. Philippon MJ, Schenker MK, Briggs KK, Kupersmith DA, Maxwell RB, Stubbs AJ. Revision hip arthroscopy. Am J Sports Med. 2007; 35:1918–21.
9. Heyworth BE, Shindle MK, Voos JE, Rudzki JR, Kelly BT. Radiologic and intraoperative findings in revision hip arthroscopy. Arthroscopy. 2007;23:1295–302.
10. Domb BG, Stake CE, Lindner D, El-Bitar Y, Jackson TJ. Revision hip preservation surgery with hip arthroscopy: clinical outcomes. Arthroscopy. 2014;30(5):581–7.
11. Ross JR, Clohisy JC, et al. Patient and disease characteristics associated with hip arthroscopy failure in acetabular dysplasia. J Arthroplasty. 2014;29(9 Suppl):160–3.
12. Aprato A, Jayasekera N, Villar RN. Revision hip arthroscopic surgery: outcome at three years. Knee Surg Sports Traumatol Arthrosc. 2014;22(4):932–7. Available from http://www.ncbi.nlm.nih.gov/pubmed/23328987.
13. Ward JP, Rogers P, Youm T. Failed hip arthroscopy: causes and treatment options. Orthopedics. 2012;35:612–7. Available from http://www.ncbi.nlm.nih.gov/pubmed/22784891.
14. Clohisy JC, Carlisle JC, Beaule PE, Kime Y-J, Trousdale RT, Sierra RJ. A systematic approach to plain radiographic evaluation of the young adult hip. J Bone Joint Surg. 2008;90 Suppl 4:47–66.
15. Blankenbaker DG, Keene JS, DeSmet AA. MR arthrographic appearance of the postoperative acetabular labrum in patients with suspected recurrent labral tears. Am J Roentgenol. 2011;197: 1118–22.
16. McCarthy JC, Glassner PJ. Correlation of magnetic resonance arthrography with revision hip arthroscopy. Clin Orthop Relat Res. 2013;471(12):4006–11. Available from http://www.ncbi.nlm.nih.gov/pubmed/23637056.
17. Byrd JWT, Jones KS. Adhesive capsulitis of the hip. Arthroscopy. 2006;22:89–94.
18. McCormick F, Slikker W, Harris JD, Gupta AK, Abrams GD, Frank J, et al. Evidence of capsular defect following hip arthroscopy. Knee Surg Sports Traumatol Arthrosc. 2014;22(4):902–5. Available from http://www.ncbi.nlm.nih.gov/pubmed/23851921.