

Groin Pain after Open FAI Surgery

The Role of Intraarticular Adhesions

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Abstract Femoroacetabular impingement (FAI) is an established cause of osteoarthritis of the hip. Surgery is intended to remove the cause of impingement with hip dislocation and resection of osseous prominences of the acetabular rim and of the femoral head-neck junction. Using the Merle d'Aubigné score and qualitative categories, recent studies suggest good to excellent outcomes in 75% to 80% of patients after open surgery with dislocation of the femoral head. Unsatisfactory outcome is mainly related to pain, located either in the area of the greater trochanter or in the groin. There are several reasons for persisting groin pain. Joint degeneration with joint space narrowing and/or osteophyte formation, insufficient correction of the acetabula, and femoral pathology are known factors for unsatisfactory outcome. Recently, intraarticular adhesions between the femoral neck and joint capsule have been identified as an additional cause of postoperative groin pain. The adhesions form between the joint capsule and the resected area on the femoral neck and may lead to soft tissue impingement. MR-arthrography is used for

diagnosis and the adhesions can be treated successfully by arthroscopy. While arthroscopic resection improves outcome it is technically demanding. Avoiding the formation of adhesions is important and is perhaps best accomplished by passive motion exercises after the initial surgery.

Level of Evidence: Level V, expert opinion. See the Guidelines for Authors for a complete description of levels of evidence.

Introduction

Femoroacetabular impingement (FAI) is an established cause of early osteoarthritis of the hip [3, 9, 12]. Morphologic alterations of the acetabulum and proximal femur lead to an abutment conflict between the acetabular rim and the femoral neck [3, 9]. Global or local overcoverage of the acetabulum causes so-called “pincer” FAI, and asphericity of the femoral head-neck junction causes “cam” FAI. Both lead to a specific cartilage damage pattern [3]. Surgery is intended to remove the cause of impingement by resecting the osseous prominences of the acetabular rim and of the femoral head-neck junction [5, 8, 14]. Recent studies reported a good to excellent outcome (16–18 points of 18 points) using the Merle d'Aubigné score in 75% to 80% of patients after open surgery with dislocation of the femoral head [4, 6]. Advanced degenerative changes with joint space narrowing, cartilage damage, and resection of the labrum are associated with poorer clinical results [2, 4, 6, 15]. Unsatisfactory short term outcomes are primarily related to the persistence of pain and persisting groin pain is present in approximately 10% to 15% after open FAI surgery.

This review explores the most common causes for groin pain after open FAI surgery and focuses on the role of intraarticular adhesions for continuing groin pain.

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Clinical Presentation

After surgical dislocation of the hip for the treatment of FAI, we have found it is not uncommon for patients to continue to complain about groin pain similar to the pain that was present before surgery. Occasionally it radiates towards the knee. It can have a dull, burning, sharp, or locking character. Rarely, the patient feels a pulling sensation in the groin during the extension phase of the gait cycle. Pain can be absent for a variable period of time after surgery but often there is no pain-free interval. Clinical examination shows an increase of typical groin pain in flexion and internal rotation, occasionally also in external rotation, and hip motion can be limited for flexion and internal and external rotation.

Known causes for persistent groin pain after open and arthroscopic impingement surgery are insufficient correction of the femoral and acetabular pathology [10, 16], joint degeneration with joint space narrowing, osteophyte formation, and advanced cartilage damage, especially on the femoral side [4]. Other more rare causes for postoperative groin pain are snapping iliopsoas tendon and tendonitis of the iliopsoas tendon. On the basis of the observation of intraarticular adhesions during open revision surgery (Fig. 1), we now consider intraarticular adhesions another potential reason for groin pain and limitation of motion after surgical dislocation [13].

Pathoanatomy of Intraarticular Adhesions

Adhesions can be observed in two areas of the joint: (1) between the joint capsule and the former resection area of

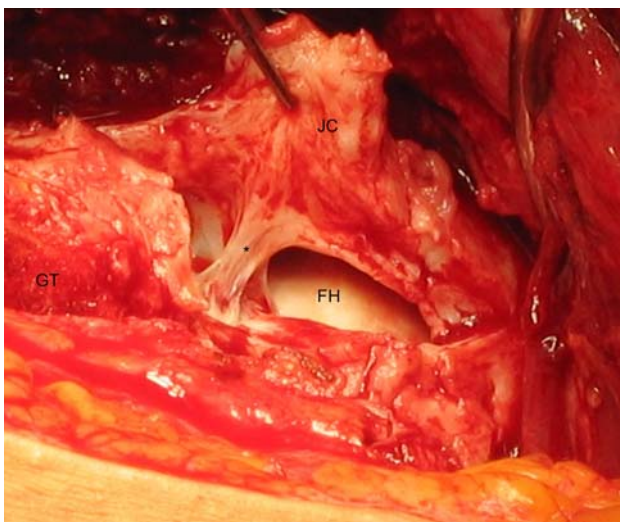


Fig. 1 Shown is a left hip after osteotomy of the greater trochanter and capsulotomy. GT: stable part of greater trochanter; FH: femoral head; JC: joint capsule; *: adhesions between joint capsule and femoral head neck junction.

the femoral neck (Fig. 2); and (2) between the labrum and joint capsule (Fig. 3). As part of the normal healing process, the adhesions are caused by scar tissue that forms between the joint capsule and the area of the femoral neck osteochondroplasty and between the labrum and joint

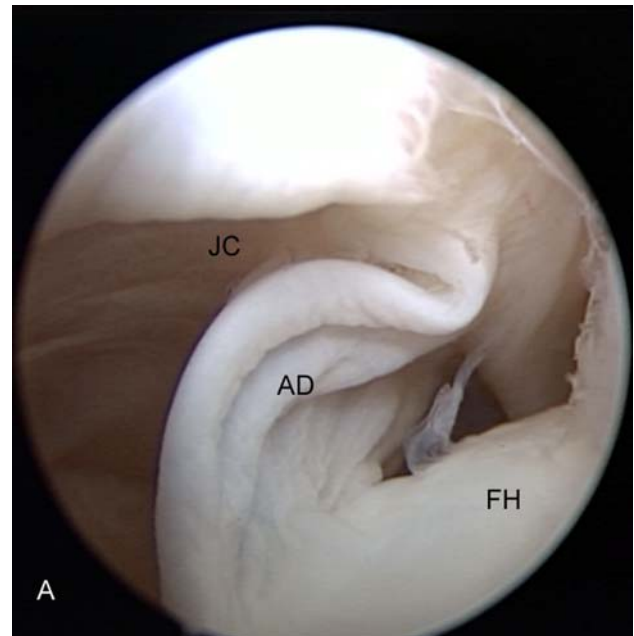


Fig. 2 Arthroscopic view of the periphery of a left hip shows the adhesions (AD) that originate at the resection area just distal of the cartilage of the femoral head (FH) and run towards the joint capsule (JC). In additional flexion and internal rotation the adhesions will impinge at the labrum.

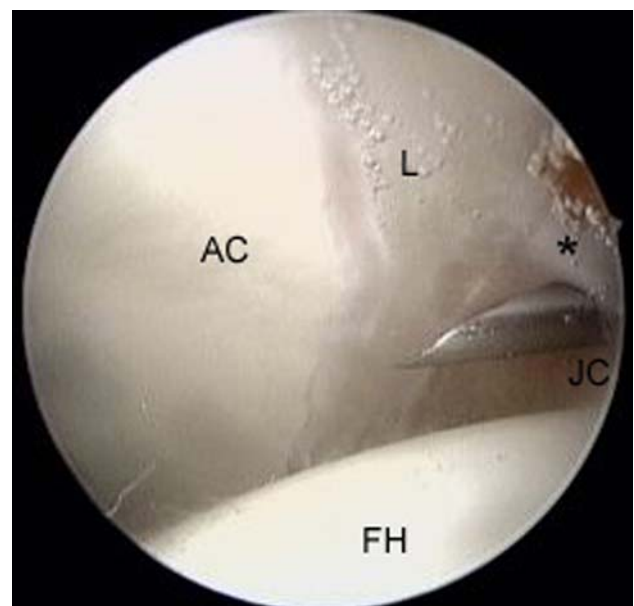


Fig. 3 Arthroscopic view of the distracted left hip joint shows the adhesions (*) between the labrum (L) and the capsule (JC), just to the right of the needle. Femoral head (FH); acetabular cartilage (AC).

capsule. Scar formation occurs in all hips, but to a highly variable degree. The scars can be thin or heavy and are mostly located in the periphery of the joint in the area of the normal capsular attachment. If the adhesions form more proximal in the area of the resected femoral neck, they may interfere with motion. During flexion and internal rotation the adhesions between the femoral resection area and joint capsule impinge against the acetabular rim and squeeze the labrum (Fig. 4A–B). However, not only the labrum is exposed to this impingement, but the adhesions can slip into the joint and grind against the articular surface of labrum and acetabular cartilage. Eventually, this may lead to a rerupture of the labrum and/or to ongoing damage to the acetabular cartilage. The groin pain and the positive impingement signs are evidence for the soft tissue impingement.

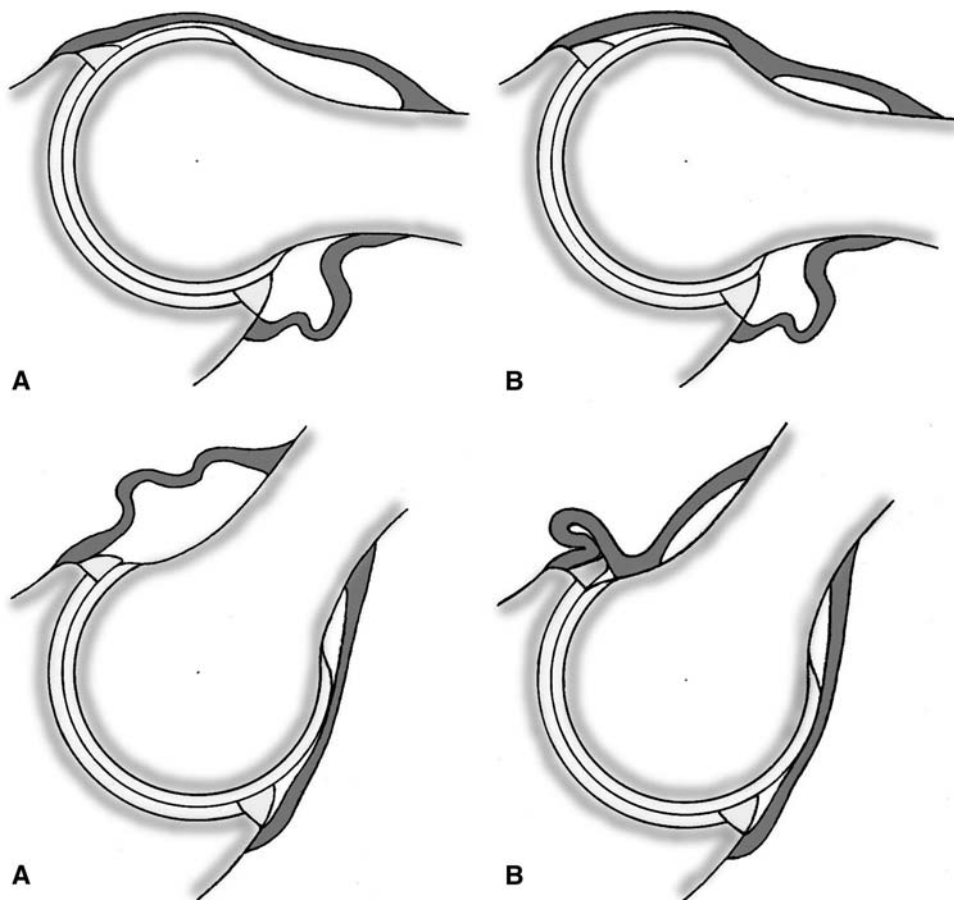
Adhesions forming between the labrum and the joint capsule may result in a differing pathophysiologic process. During motion of the hip, the labrum normally remains in contact with the femoral head, sealing the joint for pressurization of the fluid film and thus reducing friction of the cartilage surfaces [7]. The adhesions between labrum and capsule probably impair sealing function of the labrum that is tethered by the capsule. One experiment suggests

impaired sealing of the labrum increases friction of the joint surfaces [7].

Intraarticular adhesions should be suspected in hips with persistent groin pain without evidence of cartilaginous and osseous alterations. For establishing the diagnosis, MR-arthrography (MRA) is necessary as described previously using radial images [17]. Adhesions only can be visualized with MRA with joint distension by the fluid. Labral adhesions are best visualized on the radial images, the adhesions of the femoral neck, and on the oblique paraxial images (Fig. 5).

Adhesions are likely much more frequent after articular surgery than formerly thought. The difficulty is to determine whether they are responsible for the postoperative groin pain. The adhesions usually are located anteriorly between the resection areas on the femoral neck and extend laterally towards the anterolateral base of the femoral neck. On the radial MRA images, the original attachment of the joint capsule can be seen and gives an indication how far the scar tissue and adhesions extend towards the femoral head (Fig. 5). The treatment algorithm is based on the analysis of conventional radiography (Fig. 6). First, joint space narrowing and osteophytes must be excluded as a contributing cause. Second, insufficient correction of the

Fig. 4A–B (A) A schematic shows a normal labrum and joint capsule. During motion, the capsule moves freely. (B) Adhesions between the femoral neck and joint capsule are apparent. In flexion, the adhesions impinge against the acetabular rim, and often enter the acetabulum. The labrum is tethered by the scar to the joint capsule.



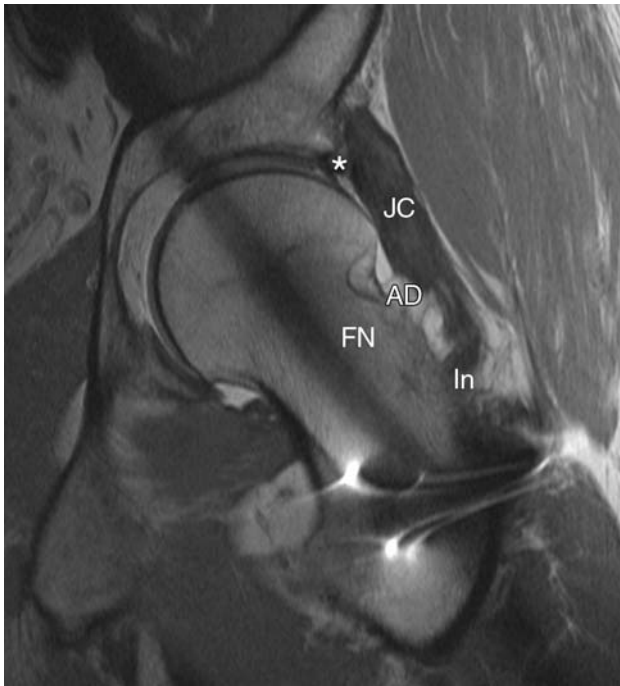


Fig. 5 MR-arthrogram (gadolinium-enhanced) with radial image. It shows the adhesions (AD) between the resection area of the femoral neck (FN) and the joint capsule (JC) and between the labrum and joint capsule (*). The joint capsule (JC) is thicker than normal in this case, its original insertion (In) at the intertrochanteric line is visible.

femoral head and the acetabulum must also be excluded. Finally, femoral-sided cartilage damage must be ruled out, either by MRA or based on the intraoperative description of the state of the femoral head cartilage at the time of the index surgery. If all these causes can be ruled out, we believe it likely adhesions are the cause although their presence should be confirmed by MRA. If MRA does not show adhesions that interfere with motion, other causes like tendonitis of the psoas tendon, irritation of the psoas tendon from screw tips and joint overload due to weak abductors must be considered.

Treatment of Intraarticular Adhesions

If adhesions are identified as the cause, hip arthroscopy with resection of the adhesions is indicated when associated with sufficient symptoms. To treat these patients, we perform hip arthroscopy in the lateral position on a modified traction table under general anesthesia. A perineal post is placed lateral to the ischium in order to avoid compression of the pudendal nerve that runs medial to the ischium. In traction the leg is abducted 15° to 20° . Arthroscopy is started in the peripheral compartment of the joint without traction. A distal ventrolateral portal is established at midlevel of the femoral neck. The guide wire

perforates the joint in the center of the femoral neck approximately 1 cm medial to the intertrochanteric line. Alternatively, particularly with extensive scarring between the femoral neck and joint capsule, a proximal ventrolateral portal can be used as described [18]. Even in cases with severe adhesions, the medial part of the joint usually does not have adhesions and allows sufficient visualization of the joint for the placement of working portals. The first working portal is placed about 4 to 5 cm proximal and 1 to 2 cm posterior to the standard lateral portal, and the second working portal is the proximal ventrolateral portal. With these three portals the entire anterior aspect from Weitbrecht's ligament to the lateral retinaculum can be seen. We perform adhesiolysis with a radiofrequency probe and a curved shaver until the joint space is opened down to the capsular attachment and until the lateral retinaculum is seen. An important area to visualize and to resect the adhesions is at the superolateral base of the femoral neck. Adhesiolysis is only sufficient if this area has been cleared out completely. After completion of the peripheral adhesiolysis, traction is applied. Standard lateral, anterior, and posterolateral portals are established as needed. The joint cartilage of the femoral head and acetabulum is inspected. The labral attachment is scrutinized for labral tears or degeneration. Usually, adhesions between the labrum and the joint capsule are observed in the area of the former capsulotomy along the acetabular rim and in the area of the labral de- and reattachment. The labral adhesions are released with the radiofrequency probe and débrided with a shaver until the labrum is freed up over its entire circumference.

In the periphery of the joint adhesions or scar formations between the joint capsule and the resection area, the femoral neck was present in all scoped hips (Fig. 2). The adhesions were thickest towards the superolateral base of the femoral neck. Synovitis may be present. Towards the inferomedial aspect of the femoral head no or only weak scar formation was observed. In the area where the labrum and joint capsule were detached during open impingement surgery, adhesions existed between the labrum and the joint capsule leading to the loss of the recesses between those two structures (Fig. 3). In all 68 hips that underwent hip arthroscopy after open impingement surgery with reattachment of the labrum, the labrum was stable. Occasionally, ossifications can be observed in the capsule. We usually remove these although their relation to the groin pain is unknown. Depending on their location they may prevent direct access to the joint and should be removed first.

Arthroscopic resection of the adhesions led to a decrease of pain in 80% of the patients with an increase of the average Merle d'Aubigné-Postel score from 13 to 16 points [13]. Among the first patients treated arthroscopically with

Treatment Algorithm For Groin Pain

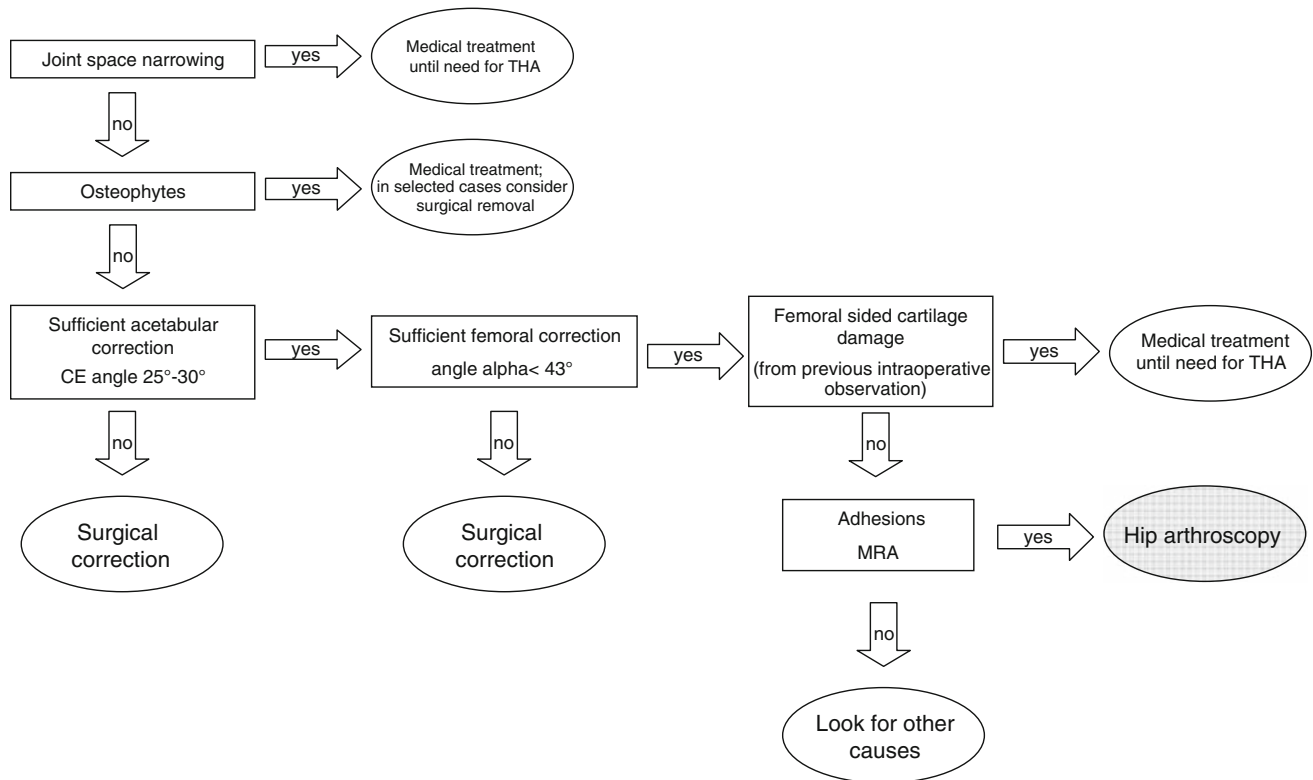


Fig. 6 Treatment algorithm for the evaluation and treatment of groin pain after surgical treatment of FAI.

adhesiolysis, we had five complications. Two developed sores where the thigh was in contact with the perineal post. In one patient we surgically corrected a hypertrophic scar. One patient had numbness in the area of the superficial peroneal nerve at the back of the foot from pressure of the traction shoe. In one patient breakage of a guide wire occurred but was retrieved without further problems. In two of 68 revision hip arthroscopies, access to the central joint was not possible due to the scarring of the joint capsule. In one patient the arthroscopy was converted to an open capsulectomy. In one patient retroperitoneal and intraabdominal extravasation of 2 to 3 L of arthroscopic fluid was observed that resorbed without further intervention [10].

Discussion

FAI is an established cause for the development of osteoarthritis of the hip [3, 9, 11]. Treatment is directed to the elimination of malformations of the femoral head-neck junction and the acetabular rim [5, 14]. The outcome of surgical treatment of femoroacetabular impingement is related to the persistence of pain, which is present in approximately 10% to 15% after open impingement

surgery with variable intensity [4, 6]. Persistent groin pain after open and arthroscopic impingement surgery can be due to insufficient correction of the femoral and acetabular pathology, advanced joint degeneration with joint space narrowing, cartilage damage [2, 4, 11, 16]. It is also sometimes associated with resection of the labrum [5]. While these factors have been discussed in the recent literature, the role of intraarticular adhesions and their treatment is a new aspect that deserves more attention. In a recent publication we reported arthroscopic resection of the adhesions improves hip function in approximately 80% of the patients with an increase of the Merle d'Aubigné-Postel score from an average of 13 preoperatively to 16 points postoperatively [13]. In this paper we further explored the concept of intraarticular adhesions as a cause of continuing pain after treatment of FAI.

Few articles deal specifically with failed FAI surgery, most from the hip arthroscopy community, but while they mention the presence of adhesions they do not explore the ramifications [11, 16]. Currently, only one paper describes this pathology with its clinical implication proposed therapy [13]. The data in that paper suggest resecting the adhesions reliably improves groin pain. The fact that adhesions can occur is rather recently recognized, but it can

explain the cause of groin pain when no other explanation can be identified. However, there are a variety of open questions that merit further examination. At what stage of the healing process do they occur? Are there methods to prevent them? Are there other possibilities to break the adhesions like capsular distension arthrograms? How does arthroscopic release influence the long-term outcome of open FAI surgery?

Adhesions are due to scar formation during the normal healing process and therefore are most likely present in all hips after surgery. Interestingly, adhesions not only occur after open hip surgery but also after hip arthroscopy, and are present in almost $\frac{2}{3}$ at revision hip arthroscopy [16]. Although adhesions are probably universally present after a surgical dislocation of the hip, only approximately 6% of the patients are symptomatic [13]. The adhesions that cause symptoms interfere with motion and impinge against the acetabular rim. On the one hand, this may cause pain by direct irritation; on the other hand the adhesions between the joint capsule and the femoral neck can cause further damage to the labrum by rubbing against it and also to the acetabular cartilage by the parts of the adhesions that reach into the joint during motion. The presence of adhesions should be suspected when patients continue to have groin pain and limited range of motion and in the absence of osseous and cartilaginous pathology described above. The diagnosis is made by exclusion of all other possibilities and confirming the presence of adhesions with MR-arthrography. It remains unclear whether the adhesions between the labrum and joint capsule cause groin pain or whether they have an adverse mechanical effect on the function of the labrum or both. Nevertheless, we remove labral adhesions and smooth the surface of the labrum as well as release capsular adhesions.

As intraarticular adhesions cannot be avoided, prophylaxis aims at limiting the formation of adhesions that interfere with motion. To avoid symptomatic intraarticular adhesions, the application of bone wax has been recommended [14]. Bone wax, however, can lead to inflammatory and foreign body reactions [1]. We therefore believe the use of bone wax should be discontinued for this purpose. Today, we institute prophylaxis through a strict, aggressive postoperative motion program that includes continuous passive motion postoperatively with hip flexion up to 90° and passive adduction/abduction and rotation movements of the flexed hip. The aggressive postoperative motion program along with discontinuation of the use of bone wax has led to a decrease of postoperative groin pain. To evaluate the effect on postoperative motion programs for prophylaxis of adhesions, further studies are necessary.

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