Surgical Technique: Arthroscopic Femoral Osteochondroplasty

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J. W. Thomas Byrd

Contents

Introduction 721

Anatomy/Pathoanatomy 722

Patient Selection 723
History and Physical Examination 723
Diagnostic Imaging 723
Indications/Contraindications 724

Conservative Treatment 725

Surgical Technique 725

Case Reports 729

Rehabilitation 729

Results 730

Summary 733

References 733

Abstract

Ganz termed cam impingement "the silent killer of the hip" because advanced damage occurs to the aneural acetabular articular surface before the densely innervated labrum starts to fail, creating symptoms. There is a high predilection for active young adult males where breakdown occurs as the joint exceeds its diminished physiologic limits imposed by the altered morphology. The clinical assessment and imaging are detailed in this chapter. The arthroscope is an important part of the surgical treatment algorithm, identifying the secondary damage that indicates pathological impingement and the need for correction of the underlying cam bump. Most can be corrected arthroscopically and the technique is detailed. With proper patient selection, the results are quite favorable with few complications.

Introduction

Professor Ganz has referred to cam impingement as the silent killer of the hip. That is because the cam lesion results in preferential damage to the aneural articular surface of the acetabulum long before the labrum, with its dense nociceptive innervation, starts to fail, sounding the alarm to the patient that a problem exists.

This author has identified a bimodal population of patients with cam-type FAI [1]. One is the typical middle-aged patient (average age 43 years, with a 1.9:1 male/female ratio) who presents with

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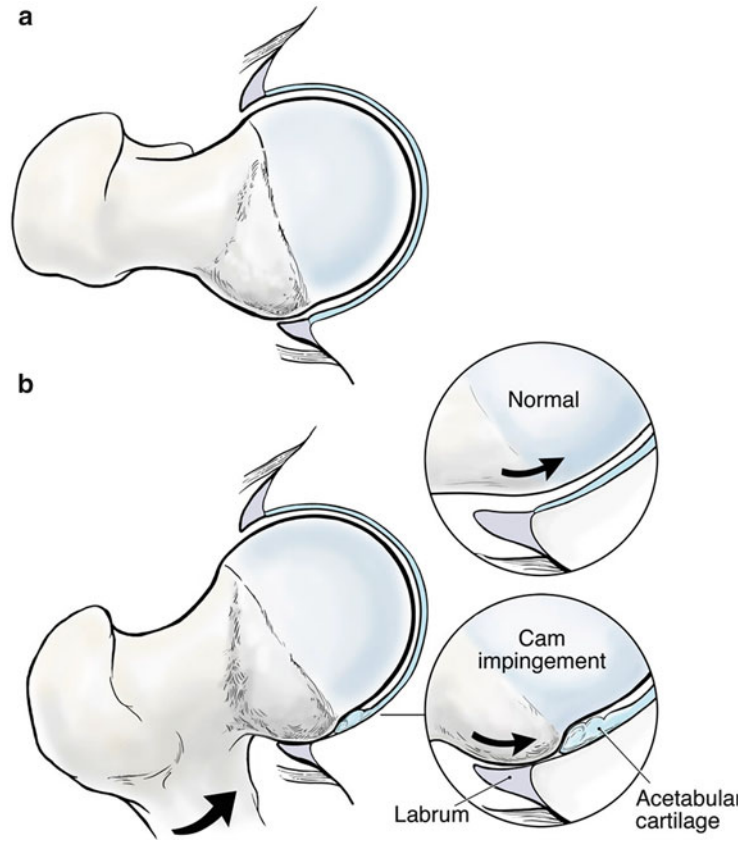

Fig. 1 Cam impingement occurs with hip flexion as the bony prominence of the nonspherical portion of the femoral head (cam lesion) glides under the labrum engaging the edge of the articular cartilage and results in progressive delamination. Initially, the labrum is relatively preserved, but secondary failure occurs over time (© J. W. Thomas Byrd, reprinted with permission)

early age onset osteoarthritis. The second population is much younger, with an even greater male preponderance (average age 20 years, with 3.1:1 male/female ratio), and most (70 %) are involved in athletic activities. These are active individuals who push their hips beyond the diminished physiologic limits and sustain substantial joint breakdown at a young age.

Anatomy/Pathoanatomy

Cam-type femoroacetabular impingement refers to the cam effect created by a nonspherical femoral head. During flexion, the prominence of the out-of-round portion rotates into the acetabulum, engaging against its surface, resulting in delamination and failure of the acetabular articular cartilage (Fig. 1). Early in the disease process, the labrum is relatively preserved but, with time, it begins to sustain secondary damage.

Cam impingement is classically attributed to a slipped capital femoral epiphysis, resulting in a bony prominence of the anterior and anterolateral head/neck junction. However, the most common cause is the pistol grip deformity, attributed to a developmental abnormality of the capital physis during growth. The exact etiology is unclear; it may represent premature asymmetric closure of the physis, and it has been postulated that this could be due to late separation of the common proximal femoral growth plate that forms the physis of the greater trochanter and femoral head [2].

Femoroacetabular impingement is still incompletely understood. The pathomechanics explain the observations of secondary joint pathology caused by the impingement. However, some individuals with impingement-shaped hips may never become symptomatic due to secondary damage. Thus, it is possible to have impingement *morphology* without impingement *pathology*. The arthroscope has become invaluable in the treatment

Fig. 2 The impingement test is performed by provoking pain with flexion, adduction, and internal rotation of the symptomatic hip (© J. W. Thomas Byrd, reprinted with permission)

Fig. 3 Abduction and external rotation may elicit pain with laterally based cam lesions (© J. W. Thomas Byrd, reprinted with permission)

algorithm for patients with FAI. Arthroscopic observations on the secondary articular and labral damage associated with pathological impingement dictate the need for correcting the underlying bony abnormalities.

Patient Selection

History and Physical Examination

Patients with cam impingement have typical hip joint-type symptoms [3]. The onset may be gradual or associated with an acute episode, which is the culmination of altered wear developing over a protracted period of time. Patients with cam impingement usually have reduced joint motion which can result in other secondary disorders. Athletes compensate with increased pelvic motion, often resulting in problems with athletic pubalgia [4]. More stress is placed on the lumbar spine, resulting in concomitant lumbar disease.

Pain with flexion, adduction, and internal rotation is almost uniformly present and is referred to as the "impingement test" (Fig. 2) [5]. However, in this author's experience, this maneuver is uncomfortable for most irritable hips, regardless of the underlying etiology, and thus is not specific for impingement. Laterally based cam lesions may result in painful abduction or external rotation (Fig. 3). Internal rotation of the flexed hip is usually diminished but may be preserved in some patients (Fig. 4). Limited range of motion may be present bilaterally as the morphological variation is often present in both hips.

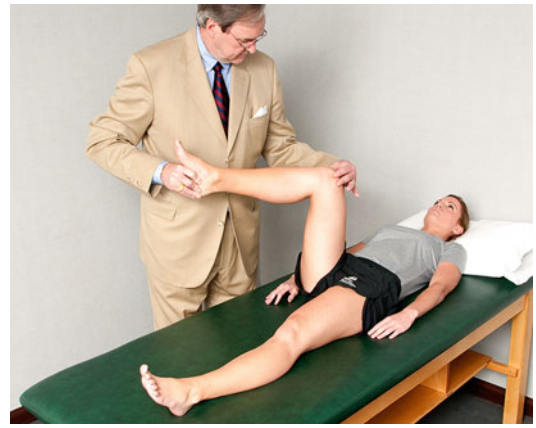

Fig. 4 Internal rotation is checked with the hip in a 90° flexed position (© J. W. Thomas Byrd, reprinted with permission)

Diagnostic Imaging

Radiographs are essential to the routine evaluation of impingement. A well-centered AP pelvis X-ray is important for assessing the acetabular indices of pincer impingement but also allows observations

Fig. 5 A properly centered AP radiograph must be controlled for rotation and tilt. Proper rotation is confirmed by alignment of the coccyx over the symphysis pubis (*vertical line*). Proper tilt is controlled by maintaining the distance between the tip of the coccyx and the superior border of the symphysis pubis at 1–2 cm (© J. W. Thomas Byrd, reprinted with permission)

Fig. 6 The frog lateral radiograph is convenient because it is simple to obtain in a reproducible fashion. The cam lesion (*arrow*) is evident as the convex abnormality at the head/neck junction where there should normally be a concave slope of the femoral neck (© J. W. Thomas Byrd, reprinted with permission)

on the cam lesion by comparing both hips (Fig. 5) [6]. The epicenter and shape of the cam lesion are variable. Thus, while the 40° Dunn view has been reported as the best image, in this author's experience, no single lateral radiographic view is reliable for optimally assessing the cam lesion in all cases (Fig. 6) [7]. Sometimes the cam lesion is more anteriorly based and sometimes more lateral. The characteristic feature is loss of sphericity of the femoral head. The alpha angle has been described to quantitate this observation (Fig. 7) [8]. However, imaging will under interpret this measurement unless it catches the maximal location of the cam lesion. No studies have shown a significant correlation between the amount of alpha angle correction and the results of surgery, indicating that there may be other factors at play; but higher alpha angles have been associated with more clinically relevant lesions [9, 10].

Magnetic resonance imaging (MRI) and gadolinium arthrography with MRI (MRA) aid in assessing secondary damage to the articular cartilage and labrum associated with cam impingement [11]. These studies are better at detecting labral pathology and less often reveal the severity of articular involvement. Alpha angle can again be recorded but is still variable depending on whether the cross-sectional images catch the maximal location of the cam lesion.

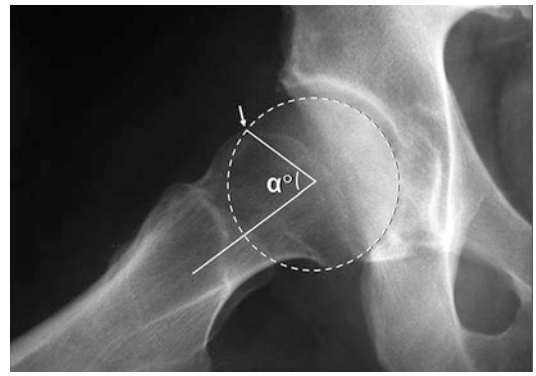

Fig. 7 The alpha angle is used to quantitate the severity of the cam lesion. A circle is placed over the femoral head. The alpha angle is formed by a line along the axis of the femoral neck (1) and a line (2) from the center of the femoral head to the point where the head diverges outside of the circle (*arrow*) (© J. W. Thomas Byrd, reprinted with permission)

Computed tomography with 3-D reconstruction provides great clarity in evaluating the shape, size, and location of the cam lesion. This is quite valuable for the arthroscopic management of this condition. Exposure of the abnormal bone is simplified by knowing its exact appearance.

Indications/Contraindications

The indication for hip arthroscopy is imaging evidence of intra-articular pathology amenable to arthroscopic intervention, or sometimes simply

recalcitrant hip pain that remains refractory to efforts at conservative treatment, keeping in mind that imaging studies may often underestimate the severity of intra-articular pathology. Correction of the cam lesion is performed, especially when there is arthroscopic evidence that it is responsible for the concomitant joint pathology. This secondary joint damage is best characterized by failure of the anterolateral acetabular articular surface. The failure is most typically represented by articular delamination with the peel-back phenomenon but, earlier in the disease process, may be characterized by simply deep closed Grade I articular blistering, referred to as the wave sign [12].

It is this author's opinion that simply radiographic findings of impingement, in the absence of clinical findings of a joint problem, are not an indication for arthroscopy. Some individuals with impingement morphology may function for decades without developing secondary joint damage and symptoms. For some it is unclear when, or if, they will develop problems warranting surgical intervention. For example, many individuals may present with symptoms in one hip when radiographic findings of impingement are present in both. While intervention in the asymptomatic joint would not be appropriate, it is important to educate the patient about warning signs of progressive joint damage. It is a clinical challenge in the decision not to intercede too early or too late. In this author's experience, 93 % of patients undergoing arthroscopy for cam impingement demonstrate Grade III and Grade IV articular damage, reflecting that the disease process is already substantially advanced at the time of intervention [1].

Objective contraindications include advanced disease states characterized by Grade 3 Tonnis changes, or less than 2 mm remaining joint space [13–15]. Prominent cam lesions, almost by definition, constitute a Grade 2 Tonnis change and broad spectrum of disease. Larson has subcategorized Tonnis 2 into those with greater or less than 50 % joint space remaining, showing poorer results among those with less than 50 % residual space [15]. Subjective contraindications may include the patient's expectations of surgery. If the patient has unreasonable goals of what the procedure may accomplish, then surgery may not be the best option. Also, in the presence of secondary degenerative disease, the potential advantages of a joint preserving procedure must be weighed against the high level of satisfaction associated with joint arthroplasty.

Conservative Treatment

Conservative management begins with an emphasis on early recognition of the underlying impingement disorder. The mainstay of treatment is identifying and modifying offending activities that precipitate symptoms. Some individuals can modify their lifestyles and stabilize the process for years. Efforts can be made to optimize mobility of the joint, but these are only modestly effective since motion is limited by the bony architecture which cannot be corrected with manual techniques. Decompensatory disorders are those secondary problems that develop as individuals struggle to compensate for the chronic limitations imposed by the impingement. A conservative strategy must include assessment and treatment of the secondary problems, which can contribute substantially to the patient's symptoms.

For patients with degenerative disease, treatment may simply be lifestyle modifications to keep the symptoms manageable. For athletes pushing the joint beyond its diminished physiologic limitations, a specific program becomes more important. Optimizing core strength can aid in regaining the athlete's ability to properly compensate. Loading of a flexed hip can be particularly destructive in the presence of impingement; thus, repetitive training activities such as squats and lunges should be avoided, or modified, to limit hip flexion.

Surgical Technique

The procedure begins with arthroscopy of the central compartment to assess for the pathology associated with cam impingement. This is carried out with the standard supine three-portal technique that has been well described in the literature

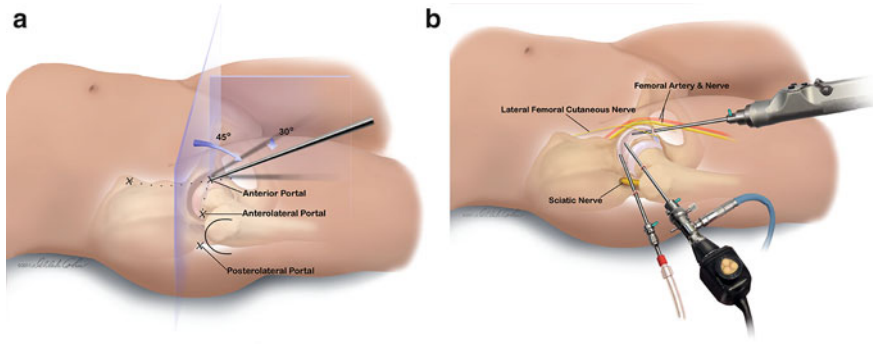

Fig. 8 (**a**) The site of the anterior portal coincides with the intersection of a *sagittal line* drawn distally from the anterior superior iliac spine and a transverse line across the superior margin of the greater trochanter. The direction of this portal courses approximately 45° cephalad and 30° toward the midline. The anterolateral and posterolateral portals are positioned directly over the superior aspect of the trochanter at its anterior and posterior borders. (**b**) The relationship of the major neurovascular structures to the three standard portals is illustrated. The femoral artery and nerve lie well medial to the anterior portal. The sciatic nerve lies posterior to the posterolateral portal. The lateral femoral cutaneous nerve lies close to the anterior portal. Injury to this structure is avoided by using proper portal placement. The anterolateral portal is established first because it lies most centrally in the safe zone for arthroscopy (© J. W. Thomas Byrd, reprinted with permission)

(Fig. 8) [16–18]. The characteristic feature of pathological cam impingement is articular failure of the anterolateral acetabulum. The femoral head remains well preserved until late in the disease course. Early stages of the disease are characterized by closed Grade I chondral blistering, which sometimes must be distinguished from normal articular softening (Fig. 9). This author's experience has been that most patients already have Grade III or Grade IV acetabular changes by the time of surgical intervention [1]. The articular surface is seen to separate or peel away from its attachment to the labrum (Fig. 10) and is caused by the shear effect of the cam lesion. The labrum may be relatively well preserved but, with time, progressive fragmentation occurs.

If the labrum is patent, it is left alone. Often its articular edge is exposed by delamination of the adjacent acetabular cartilage separating away, and the edge can be conservatively smoothed off. If the labral damage is substantial, most can be repaired. Commonly, a combined pincer lesion is also present and is reshaped in conjunction with labral refixation. The articular pathology is addressed with chondroplasty and microfracture as dictated by its severity.

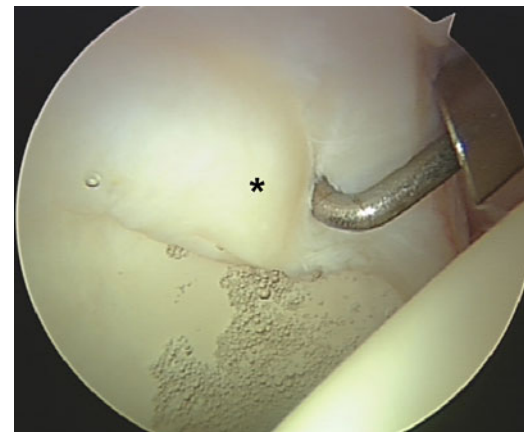

Fig. 9 Pathological chondral blistering (*asterisk*) is being probed from the anterior portal of this right hip. This indicates sublaminar shearing of the articular cartilage associated with pathological cam impingement. Unroofing the blister may reveal partial or full-thickness articular loss (© J. W. Thomas Byrd, reprinted with permission)

After completing arthroscopy of the central compartment, the cam lesion is addressed from the peripheral compartment. A capsulotomy is created by connecting the anterior and anterolateral portals (Fig. 11). The posterolateral portal is removed and the anterior and anterolateral

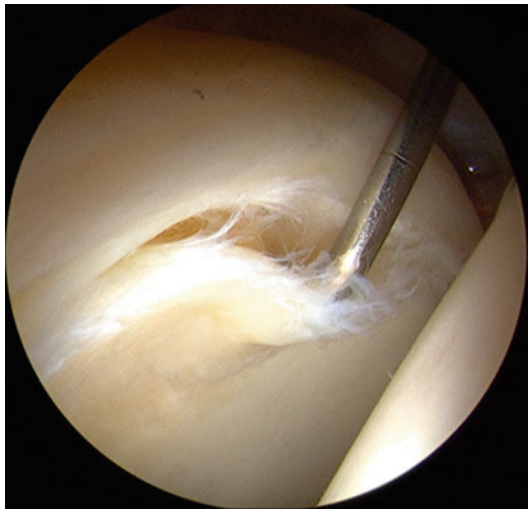

Fig. 10 Viewing a right hip from the anterolateral portal, a probe identifies articular delamination consistent with pathological cam impingement (© J. W. Thomas Byrd, reprinted with permission)

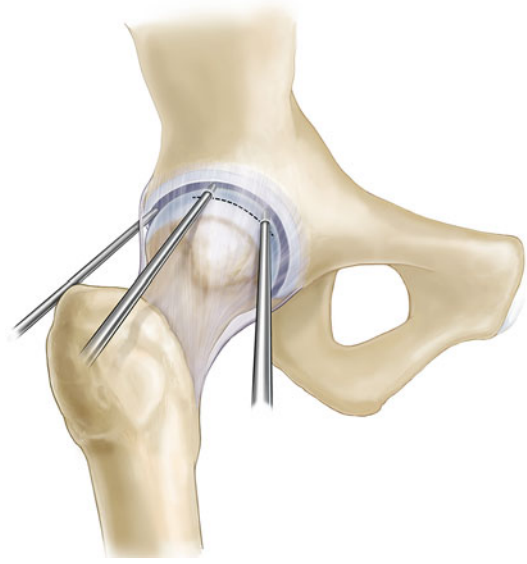

Fig. 11 A capsulotomy is performed by connecting the anterior and anterolateral portals (*dotted line*). This is geographically located adjacent to the area of the cam lesion. This capsulotomy is necessary in order for the instruments to pass freely from the central to the peripheral compartment as the traction is released and the hip flexed (© J. W. Thomas Byrd, reprinted with permission)

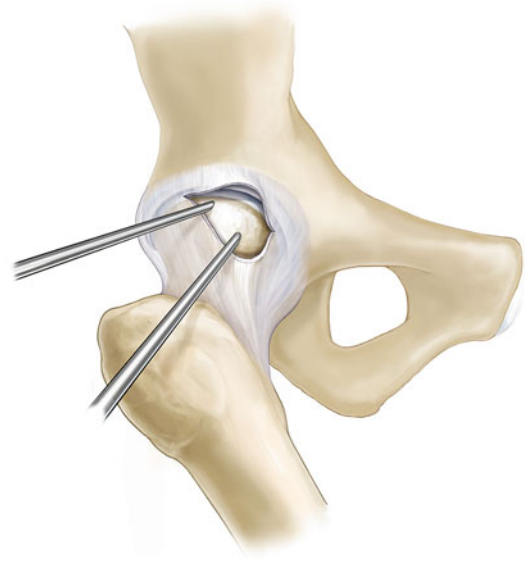

Fig. 12 With the hip flexed, the anterolateral portal is now positioned along the neck of the femur. A cephalad (proximal) anterolateral portal has been placed. These two portals allow access to the entirety of the cam lesion in most cases. Their position also allows an unhindered view with the c-arm (© J. W. Thomas Byrd, reprinted with permission)

cannulas are simply backed out of the central compartment. The traction is released and the hip flexed approximately 35°. As the hip is flexed under arthroscopic visualization, the line of demarcation between healthy femoral cartilage and abnormal fibrocartilage that covers the cam lesion can usually be identified.

A cephalad anterolateral portal is established approximately 5 cm above the anterolateral portal, entering through the capsulotomy that has already been established. These proximal and distal anterolateral portals work well for accessing and addressing the cam lesion (Fig. 12). The anterior portal can be removed or maintained if it is needed for better access to the medial side of the femoral neck.

Most of the work for performing the recontouring of the cam lesion (femoroplasty) lies in the soft tissue preparation. This includes capsular debridement as necessary to assure complete visualization of the lesion and then removal of the fibrocartilage and scar that covers the abnormal

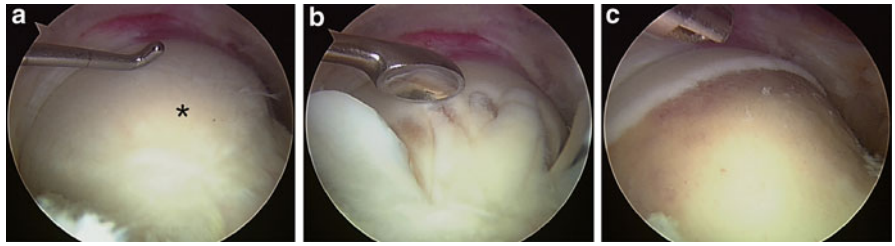

Fig. 13 The right hip is viewed from the anterolateral portal. (**a**) The cam lesion is identified, covered in fibrocartilage (*asterisk*). (**b**) An arthroscopic curette is used to denude the abnormal bone. (**c**) The area to be excised has been fully exposed. The soft tissue preparation aids in precisely defining the margins to be excised (© J. W. Thomas Byrd, reprinted with permission)

bone (Fig. 13a–c). With the hip flexed, the proximal portal provides better access for the lateral and posterior portions, while the distal portal is more anterior relative to the joint and provides best access for the anterior part of the lesion. The lateral synovial fold is identified as the arthroscopic landmark for the retinacular vessels and care is taken to preserve this structure during the recontouring (Fig. 14). Switching between the portals is important for full appreciation of the three-dimensional anatomy of the recontouring.

Once the bone has been fully exposed, recontouring is performed with a spherical burr. The goal is to remove the abnormal bone, identified on the preoperative CT scan, and recreate the normal concave relationship that should exist where the femoral neck meets the articular edge of the femoral head. It is best to begin by creating the line and depth of resection at the articular margin. The resection is then extended distally, tapering with the normal portion of the femoral head (Figs. 15a, b and 16a, b). It is recommended that the resection begin at the lateral/posterior limit of the cam lesion with the arthroscope in the more distal portal and instrumentation in the more proximal portal. The posterior extent of the resection is usually the most difficult; the resection is also the most critical to avoid notching the tensile surface of the femoral neck; and particular attention must be given to avoiding and preserving the lateral retinacular vessels. Then, switching the arthroscope to the proximal portal, the burr is introduced distally, and the reshaping is completed along the anterior head and neck junction. Lastly, attention is given to make sure that all bone debris is removed as thoroughly as possible to lessen the likelihood of developing heterotopic ossification. The quality of the recontouring is assessed, and preservation of the lateral retinacular vessels is confirmed (Fig. 17a–c).

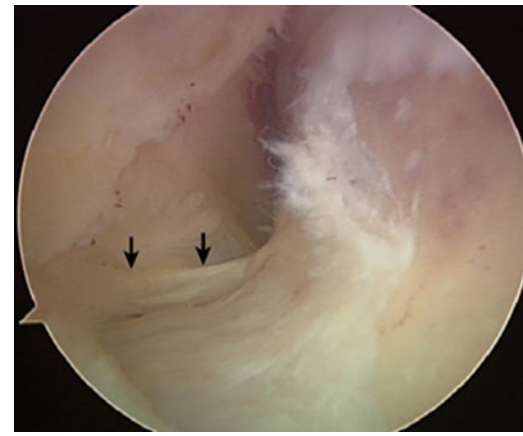

Fig. 14 Viewing laterally, underneath the area of the lateral capsulotomy, the lateral synovial fold (*arrows*) is identified along the lateral base of the neck, representing the arthroscopic landmarks of the lateral retinacular vessels (© J. W. Thomas Byrd, reprinted with permission)

Thoughtful capsular management is important in respect to the risk of creating iatrogenic instability. The slit created by connecting the anterior and anterolateral portals is approximately 1.5 cm and unlikely to be a problem. The capsulotomy is often extended for exposure, and, in some tight hips, this is transformed into a more formal capsulectomy with the hope of providing better mobility. If instability is a concern, most of the capsule can be preserved and closed when the case is completed. This may be a concern in cases

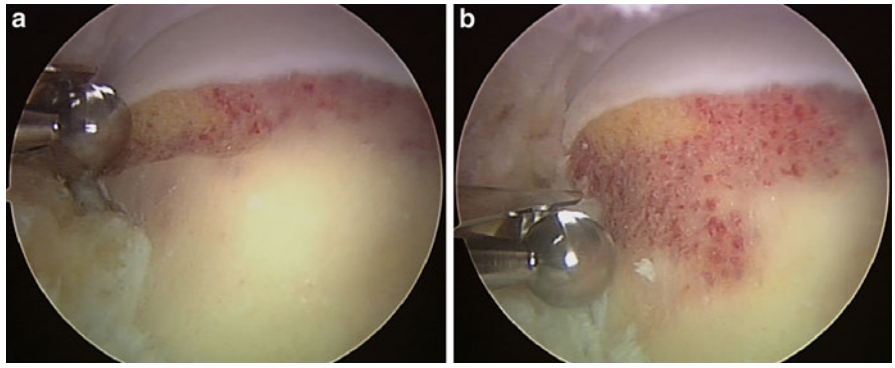

Fig. 15 The arthroscope is in the more distal (anterolateral) portal with the instrumentation placed from the proximal portal. (**a**) Bony resection is begun at the articular margin. (**b**) The resection is then carried distally, recreating the normal concave relationship (© J. W. Thomas Byrd, reprinted with permission)

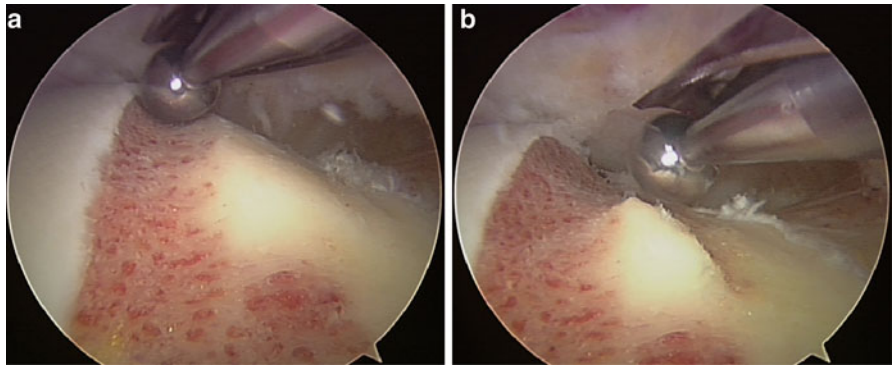

Fig. 16 The arthroscope is now in the proximal portal with the instrumentation introduced distally. (**a**) The line of resection is continued along the anterior articular border of the bump. (**b**) The recontouring is completed (© J. W. Thomas Byrd, reprinted with permission)

where (1) a cam lesion is corrected in conjunction with a shallow acetabulum, (2) patients have global laxity, (3) individuals are returning to activities that require extreme range of motion, and (4) there are some large cam lesions where decompression results in a relative increased capsular volume. With capsular closure, #2 absorbable sutures are used to avoid retained foreign material that can result in capsular scarring and thickening.

Case Reports

A 20-year-old hockey player with a 40-year history of worsening right groin pain was evaluated. Examination revealed diminished internal rotation of both hips (10°). Forced flexion, adduction, and internal rotation of the right hip recreated the characteristic pain that he experienced with activities (Fig. 18a–g).

A 15-year-old female level 10 gymnast presented with a 6-month history of left hip pain unresponsive to conservative treatment including a protracted period of rest. Examination revealed a 20° loss of motion of the left hip compared to the right with pain recreated on flexion, adduction, and internal rotation (Fig. 19a–g).

Rehabilitation

Formal supervised physical therapy begins within 1 or 2 days following surgery. An emphasis is on optimizing range of motion with early

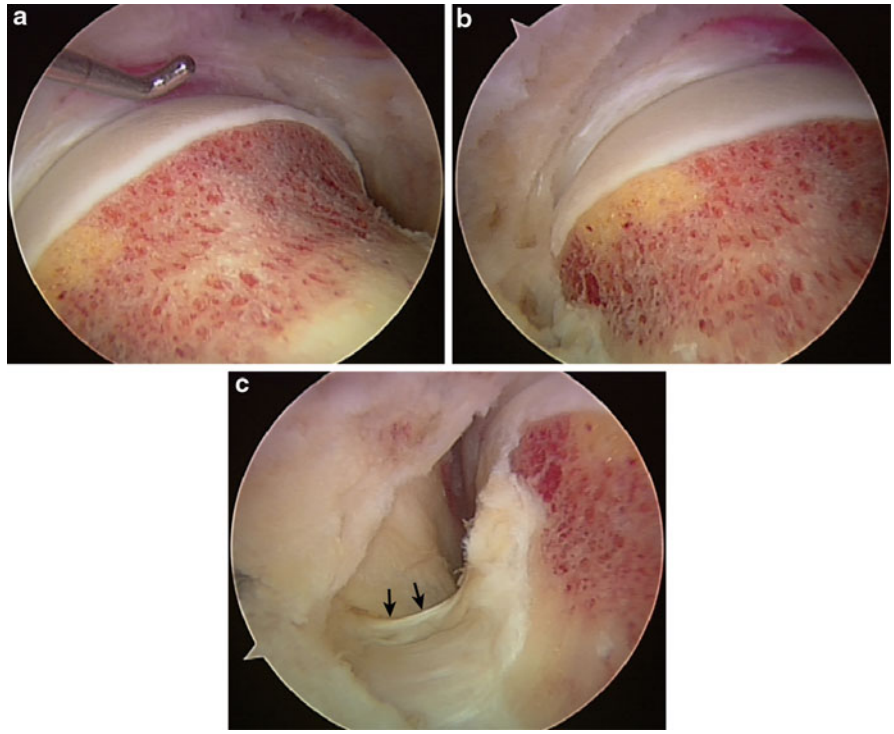

Fig. 17 The arthroscope has been returned to the distal portal for final survey. (**a**) Viewing medially; (**b**) viewing laterally; (**c**) confirming preservation of the lateral retinacular vessels (*arrows*) (© J. W. Thomas Byrd, reprinted with permission)

implementation of closed chain joint stabilization and core strengthening exercises. The patient is allowed to weight bear as tolerated, but crutches are used for 4 weeks as a precautionary measure to protect the femoroplasty site against any awkward twisting episodes. Once normal muscle tone and response patterns have been regained, these will adequately protect the joint for normal forces. Impact loading is avoided for 3 months while the bone fully remodels. The rehab protocol is modified for microfracture by keeping the patient on a strict protected weight-bearing status for 2 months. The patient is allowed to place the weight of the leg on the ground which provides optimal neutralization of forces across the joint. Also, if a labral repair has been performed, excessive flexion and external rotation are avoided for the first 4 weeks. A formal structured rehab protocol is continued for 3 months. For athletes, functional progression is then advanced as tolerated. While some athletes may resume unrestricted activities quickly, it is anticipated that, usually, another 1–3 months are necessary for full participation.

Results

This author reported on 200 patients (207 hips) with 100 % follow-up at 1–2 years.[1] The average age was 33 years (range 13–63). There were 138 males and 62 females with 120 right and 87 left hips. 163 patients underwent femoroplasty to correct cam impingement alone while 44 patients underwent femoroplasty in combination with correction of associated pincer impingement. Overall, the average improvement was 20 points (preop 66; postop 86). 83 % were improved with 83 % good and excellent results using the Harris classification. Viewing the results over time (Fig. 8), continued improvement was noted throughout the first year with results

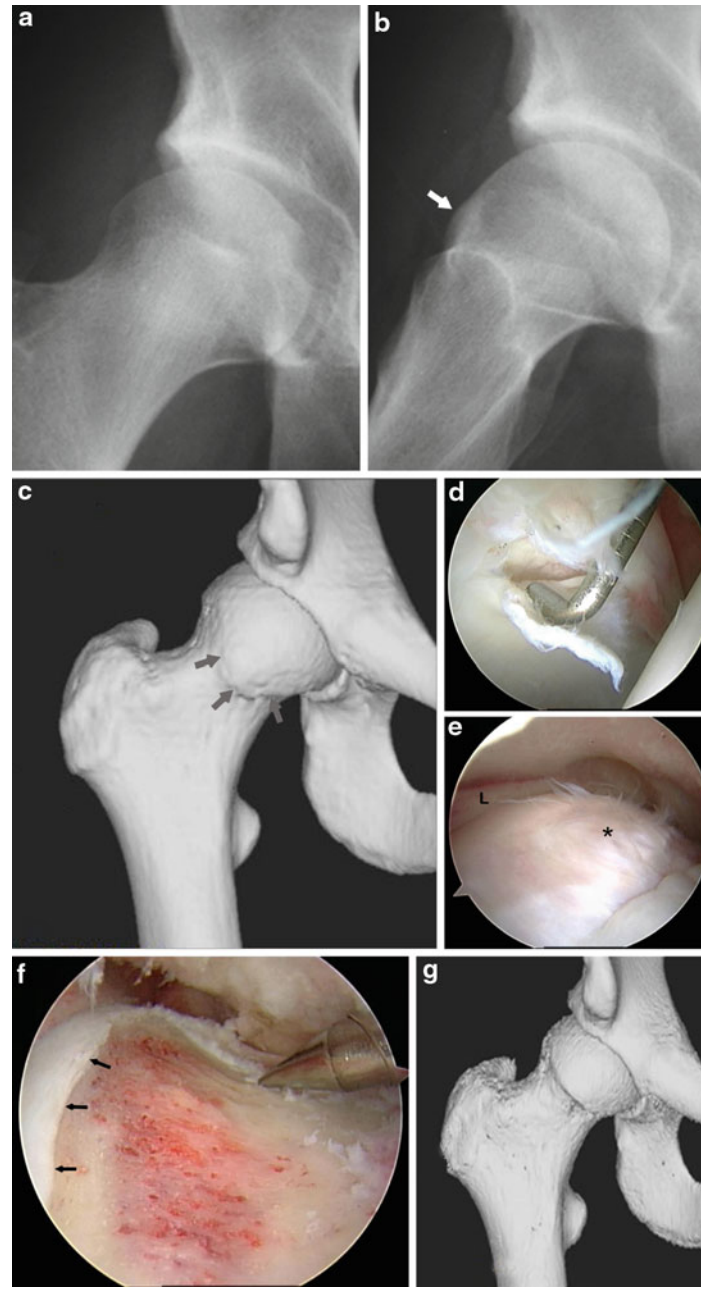

Fig. 18 Images illustrate the case of a 20-year-old hockey player with a 4-year history of right hip pain. (**a**) AP radiograph is unremarkable. (**b**) Frog lateral radiograph demonstrates a morphologic variant with bony buildup at the anterior femoral head/neck junction (*arrow*) characteristic of cam impingement. (**c**) A 3-D CT scan further defines the extent of the bony lesion (*arrows*). (**d**) Viewing from the anterolateral portal, the probe introduced anteriorly displaces an area of articular delamination from the anterolateral acetabulum characteristic of the peel-back phenomenon created by the bony lesion shearing the articular surface during hip flexion. (**e**) Viewing from the peripheral compartment, the bony lesion is identified (*asterisk*) immediately below the free edge of the acetabular labrum (*L*). (**f**) The lesion has been excised, recreating the normal concave relationship of the femoral head/neck junction immediately adjacent to the articular surface (*arrows*). Posteriorly, resection is limited to the midportion of the lateral neck to avoid compromising blood supply to the femoral head from the lateral retinacular vessels. (**g**) A postoperative 3-D CT scan illustrates the extent of bony resection (© J. W. Thomas Byrd, reprinted with permission)

maintained in those with 2-year follow-up. Most had Outerbridge Grade IV (107) or Grade III (83) articular damage on at least one side of the joint. Fifty-eight underwent microfracture with an average 20-point improvement (preop 65; postop 85). Comparing the results of cam and combined lesions, the results were comparable with 20- vs. 19-point improvement while the cam patients tended to be slightly younger, with an average age of 33 vs. 35 for combined lesions. A bimodal age distribution was identified with a peak at age 20 and a second peak at age 43. Ninety-four (45 %) were athletic related. For those patients under age 30 ($n = 88$), 62 (70 %) were associated

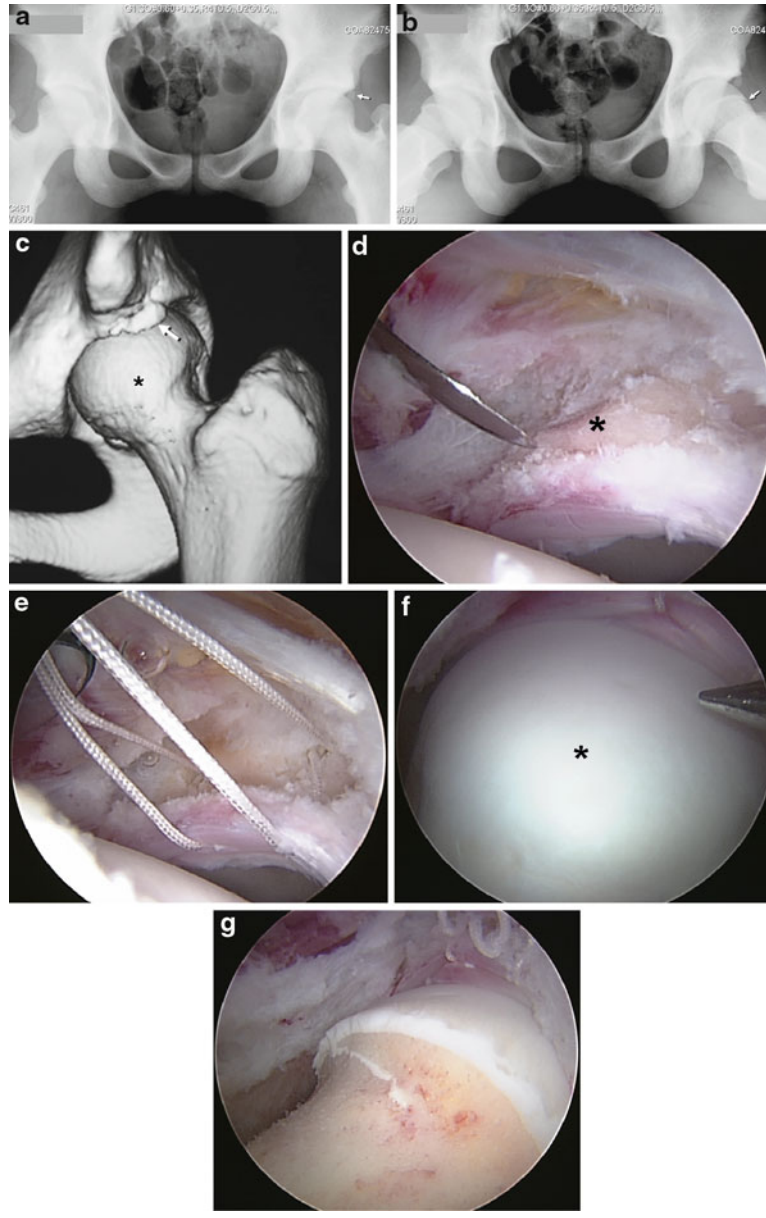

Fig. 19 (**a**–**g**) Images illustrate the case of a 15-year-old female gymnast with pain and reduced internal rotation of the left hip. (**a**) AP pelvis radiograph demonstrates a crossover sign of the left hip with an associated os acetabulum (*arrow*). (**b**) Frog lateral view illustrates asymmetric cam lesion (*arrow*) present in the left hip and not the right. (**c**) A 3-D CT scan further defines the pincer lesion with os acetabulum (*arrow*) and cam lesion (*asterisk*). (**d**) Viewing from the anterolateral portal, the pincer lesion and os acetabulum (*asterisk*) are exposed, with the labrum being sharply released with an arthroscopic knife. (**e**) The acetabular fragment has been removed and the rim trimmed with anchors placed for repair of the labrum. (**f**) Viewing from the periphery, the cam lesion is identified (*asterisk*) covered in fibrocartilage. (**g**) The cam lesion has been excised, recreating the normal concave contour of the head/neck junction adjacent to the site of labral refixation (© J. W. Thomas Byrd, reprinted with permission)

with athletic activities, while after the third decade ($n = 119$) only 30 (25 %) were associated with athletics. The under 30 group was also more male-dominated with a male to female ratio of 3.1:1 compared to the over 30 group with a ratio of 1.9:1. One patient (0.5 %) was converted to a total hip arthroplasty and three patients underwent a second arthroscopic procedure. There were three complications, but none significant. There was one each of a transient neuropraxia of the pudendal nerve and lateral femoral cutaneous nerve, which resolved uneventfully. One case was incidentally noted to have developed heterotopic ossification within the capsule, which did not preclude a successful outcome.

Looking at a more recent cohort of athletes, 163 had cam-type FAI (141 isolated; 22 combined with pincer) in which there was 100 % minimum

one-year follow-up [19]. The average age was 29 years with 119 males and 44 females. There were 18 professional, 49 intercollegiate, and 96 high school or recreational athletes. The average improvement was 22 points (preop 71; postop 93) with 89 % of professional and 90 % of intercollegiate athletes returning to their previous level of athletic competition.

Other authors have reported outcomes of arthroscopic management of FAI specifically in regard to correction of the cam lesion. Ilizaliturri, et al. reported improvement in 16 of 19 patients (84 %) with minimum 2-year follow-up [20]. Villar and coauthors reported on femoral osteoplasty in 24 patients with 1-year follow-up compared to a control group in which arthroscopic debridement was performed without excising the impingement lesion [21]. The modified Harris hip score was better in the study group (83) compared to the control group (77); and there was a significantly higher proportion of good/excellent results in the study group (83 %) compared to the control (60 %). Brunner, et al. reported on 45 athletically active individuals from whom 31 (69 %) were able to resume these activities with average 2.4 years of follow-up [22].

Summary

The arthroscope is instrumental in the treatment algorithm for cam impingement. Since cam morphology can exist in the absence of secondary associated joint pathology, the arthroscopic findings substantiate the need for correction of the underlying impingement. Most cases of cam impingement can be addressed arthroscopically. This is a technically demanding procedure that requires meticulous preparation for visualizing the cam lesion and careful orientation in recontouring of the bone to avoid inadequate or excessive resection. The results of the arthroscopic approach are at least comparable to those of the open method, with few complications. Successful results with low morbidity can be expected in the majority of patients, including athletes and individuals seeking to return to an active lifestyle.

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