Current Concepts

# Arthroscopic Treatment of Femoroacetabular Impingement

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**Abstract:** The etiology of degenerative joint disease of the hip remains unsolved. A precursor for some patients, especially younger ones, may be hip impingement. Repetitive microtrauma at maximal flexion can cause chronic pain from the abutment at the femoral head-neck junction caused by an abnormal offset. Chronic impingement from an aspherical head can lead to degenerative labral tears and acetabular chondral degeneration, which may contribute to the degenerative cascade. Arthroscopic treatment of hip impingement caused by an abnormal head-neck offset improves symptoms, restores hip morphology, and ultimately may halt the progression toward degenerative joint disease in certain patients. Early results show that if debridement of the impinging lesion and injured labrum is performed in the setting of normal femoral and acetabular articular surfaces, the results are promising. **Key Words:** Hip arthroscopy—Femoroacetabular impingement—Labral tear.

The causes of hip pain range from intra-articular loose bodies and labral injuries to extra-articular sources originating from musculotendinous injuries, nerve entrapment, bursal inflammation, or referred pain. The acetabular labrum has gained increased interest because its degeneration frequently is found in association with early osteoarthritis of the hip.[1-3] Most recently, femoroacetabular impingement (FAI) has received attention as a structural abnormality associated with hip pain.[4-6] An altered femoral neck morphology has been implicated as a cause of chronic hip pain in younger patients without obvious degeneration. Theoretically, repetitive microtrauma from the neck abutting against the acetabular rim can lead to labral lesions and acetabular cartilage delamination. This mechanical impingement of the hip is believed to originate from either a "pistol grip" femoral neck or a retroverted acetabulum[4] (Fig 1).

Previously, open exposures and removal of the impingement areas have been described.[5] Some patients with FAI, those with decreased femoral head-neck offset on the anterolateral neck (pistol grip deformity), can be successfully treated arthroscopically. In addition, patients with lesser degrees of acetabular retroversion can also be treated arthroscopically. Arthroscopic debridement of the anterolateral femoral neck along with treatment of concomitant intra-articular labral lesions attempts to re-establish the normal head-neck relationship and restore hip biomechanics.

The causative link between FAI and degenerative joint disease remains unknown. On the other hand, several studies have shown an association between labral tears and osteoarthritis[3] as well as labral tears in the setting of impingement.[4,7] It is possible that treating the structural abnormality can lead to the resolution of hip pain and potentially halt the progression of a hip at risk for future degenerative changes.

## BACKGROUND

A nonspherical femoral head has been associated with early development of osteoarthritis of the hip.[8,9]

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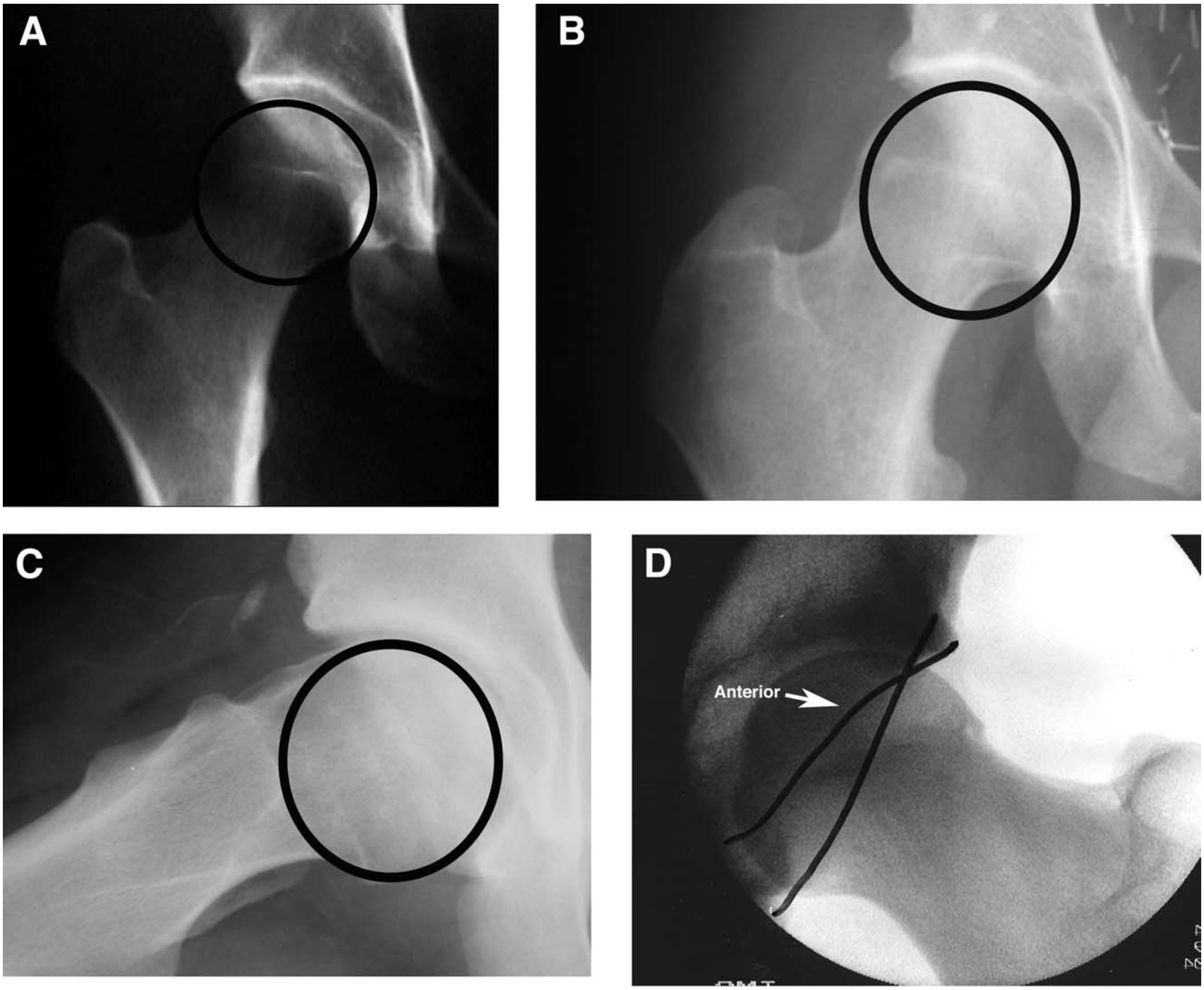


**FIGURE 1.** (A) Normal AP radiograph indicating a central position of the head on the femoral neck. (B) Femoral head-neck junction in a patient with offset. (C) Frog lateral view of the patient in Fig 1B. Note the significant offset of the head center. (D) AP radiograph of a patient with significant acetabular retroversion. Note the overlap of the anterior and posterior acetabular walls.

The effect of asphericity on the acetabular labrum and the consequent degeneration that ensues has received attention in the literature because labral degeneration may lead to early osteoarthritis.[1,3,10] McCarthy et al.[3] showed that the relative risk of significant chondral erosion approximately doubles in the presence of labral lesions.

Whereas the asphericity seen in dysplastic heads can lead to arthritis as a result of the contact of a dysplastic head directly with the acetabular chondral surface, aspherical heads stemming from altered head-neck junction morphology can contribute to degenerative joint disease by a different mechanism. Repetitive abutment of a neck with increased radii, or decreased femoral head-neck offset at extreme ranges of motion, can lead to labral and chondral injuries from shearing stresses. Labral lesions from impingement have been shown to be located almost exclusively in the anterosuperior region of the acetabulum.[1]

Murray[11] first introduced the theory of hip impingement as the underlying cause of degenerative joint disease. The terms head tilt or pistol grip deformity were developed to describe the radiographic findings. Decreased femoral head-neck offset contributes to abutment of the proximal neck with flexion, often with a variable degree of adduction and internal rotation. The repetitive contact can damage the adjacent labrum and create chondral injuries. Leunig et al.[1] showed that acetabular rim degeneration is a constant finding in the aged hip and they believed that FAI begins the process. Beck and his colleagues[5] reported that all their patients treated operatively for impingement had labral lesions in the anterosuperior quadrant and that lesions correlated with an absent anterolateral offset.

The etiology of a decreased head-neck offset is not completely understood. The pistol grip deformity has been attributed to either a form of subclinical slipped capital epiphysis[8] or to a growth disturbance of the proximal femur.[12,13] Overall, several theories exist to explain the FAI phenomenon, but there is no agreement on the inciting event.

In patients with altered morphology of the femoral head or acetabulum, less motion is required before abutment between the neck and acetabulum occurs. Ganz has et al.[4] described 2 distinctive types of impingement, cam and pincer. Cam impingement occurs when a nonspherical head abuts against the acetabulum, usually with hip flexion. This creates shear forces causing an outside-in abrasion of the acetabular labrum in the anterosuperior quadrant. The acetabular articular surface experiences increased shear and subsequent chondral delamination, while the labral tearing is relatively superficial and localized only to the area of the impingement lesion (Fig 2). Pincer impingement occurs as a result of linear contact between the acetabular rim and the head-neck junction. The source of pincer impingement is the acetabulum, often from anterior overcoverage (acetabular retroversion) or, in some cases, an anterior osteophyte (Fig 3). In these cases, the labral tearing occurs from direct compression of the neck and causes significant fraying.

## CLINICAL PRESENTATION

### *History*

Although degenerative arthritis is the most common diagnosis for hip pain of intra-articular origin, FAI should be considered, especially in younger individuals. The typical patient is a middle-aged, athletic individual complaining of groin pain with activity. This often occurs during activities requiring hip flexion. Simple activities such as walking may aggravate symptoms in some, and sports may aggravate them in others. Symptoms range from mild to severe and are often intermittent. The groin pain can become activity limiting, especially in athletes.

Patients often have been seen by multiple physicians and have been given a wide range of diagnoses, such as a sports hernia, tendonitis, and synovitis. Most have failed conservative treatment because this morphologic abnormality is structural. Modalities such as stretching often fail and frequently exacerbate the symptoms.

### *Physical Examination*

For anterosuperior impingement, the most common form of FAI, patients often exhibit a decrease in both internal rotation and adduction while the hip is in a flexed position. These maneuvers are often accompanied by pain. The impingement test, done by passively flexing the adducted hip and gradually internally rotating, will often elicit groin pain. This moves the proximal and anterior part of the femoral neck into contact with the rim of the acetabulum.[14] Leunig et al.[15] have shown that positive impingement tests correlate with labral tears on magnetic resonance imaging (MRI) arthrograms, corresponding to the location of impingement. A complete examination of the limb and lumbar spine to rule out other sources of hip pain, such as bursitis, nerve entrapments, and referred pain, will help ascertain the diagnosis. In addition, a great overlap exists in the presentation of hernias. A thorough examination of the lower abdominal musculature should be undertaken, or referral to a general surgeon should be considered in cases where the diagnosis is questionable.

### *Imaging Studies*

Although many patients will have been previously told that their hip radiographs are normal, subtle abnormalities may be present and should be suspected. An anteroposterior (AP) pelvis view allows a gross comparison of both proximal femora, with particular attention given to the head neck offset. The radiograph should be analyzed with respect to symmetry to assure that a true AP view of the pelvis is obtained. The critical assessment includes that the coccyx and symphysis pubis be directly overlying with no greater than 2 cm of separation between the 2 structures.

There are several measurements that can be obtained for evaluation of subtle hip dysplasia. The first is the lateral center edge angle (CE angle of Wiberg), which is determined with a line from the center of the femoral head vertically, and a line from the lateral rim to the center of the head. An angle less than 20° is consistent with dysplasia; an angle greater than 25° is considered normal. Angles between 20° and 25° are considered borderline. The acetabular index of the weight-bearing surface (acetabular index) is the angle formed by the acetabular roof "eyebrow or sorcil."[16]

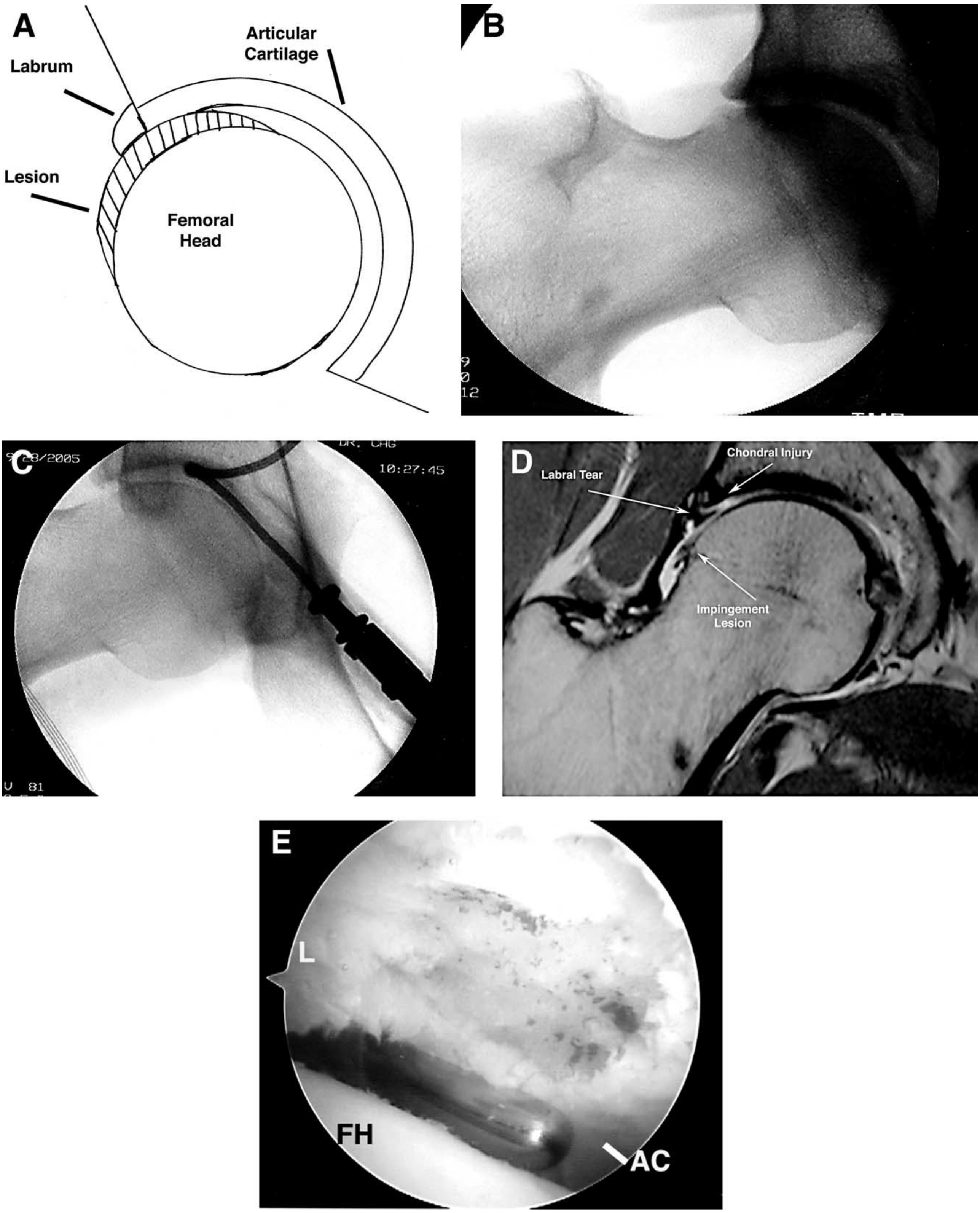


**FIGURE 2.** Cam impingement: (A) Diagrammatic representation of the mechanism thought to be responsible for the observed pathology. The lesion articulates with the labrum and acetabular cartilage with flexion and internal rotation, leading to degenerative tearing of the labrum and delamination of the articular margin. (B) Fluoroscopic view of patient with cam impingement with the leg in flexion and internal rotation. Note the proximity of the femoral neck prominence to the acetabular margin. (C) Postresection view of the above patient. Note the lack of bony impingement at the acetabular margin. (D) T1-weighted MRI with intra-articular gadolinium of the above patient. Note the deformity of the head-neck junction, the labral detachment, and the significant chondral defect shown in the image. (E) Intra-articular visualization of the anterolateral corner of the acetabulum in the above patient. Note that the area between the labral margin and the normal acetabular chondral surface shows a complete loss of articular cartilage. The image is of a right hip, visualized from the anterolateral portal (FH, femoral head; A, acetabular cartilage; L, labrum).

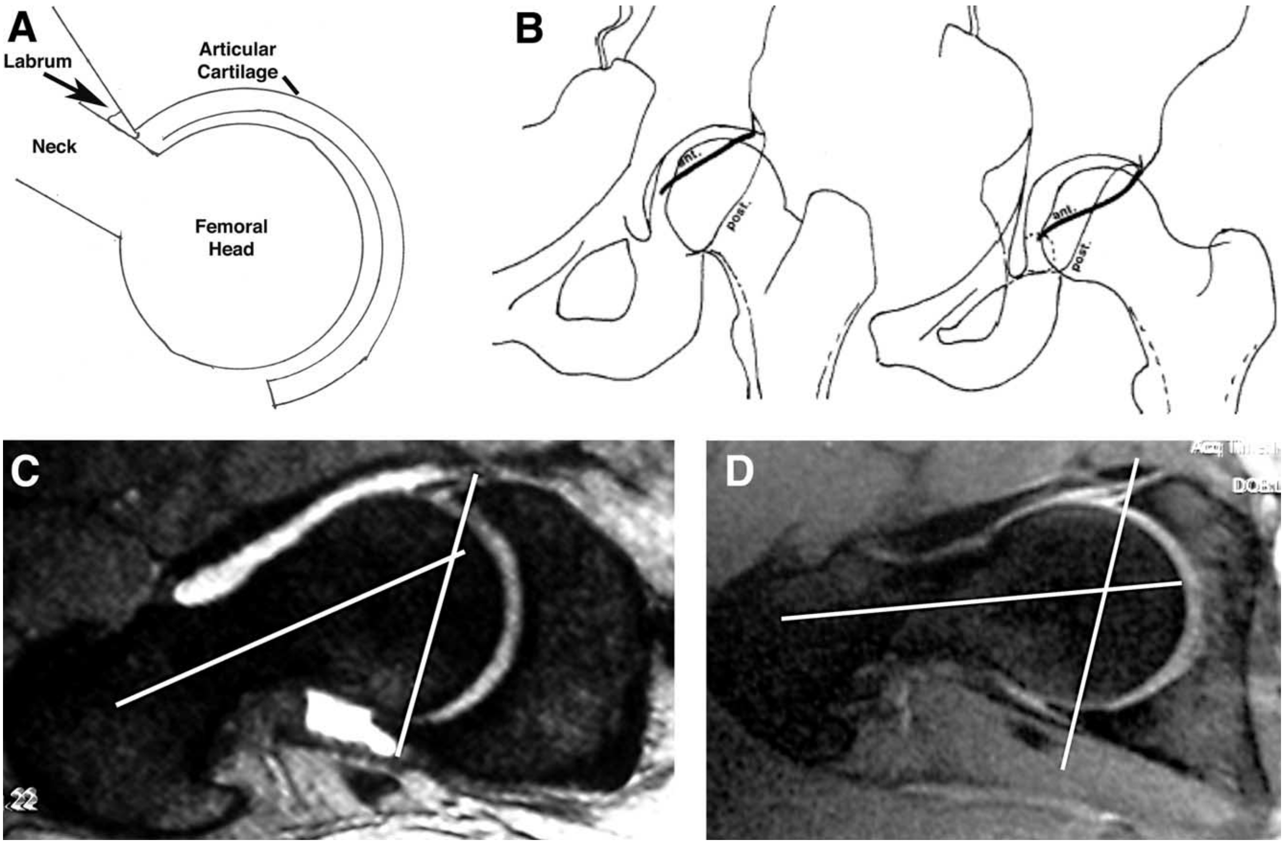


**FIGURE 3.** Pincer impingement: (A) Diagrammatic representation of the mechanism responsible for pincer impingement. Note the crushing of the labrum that occurs. There is minimal damage to the chondral surface of the acetabulum. (B) Diagrammatic representation of normal version (left diagram) and retroversion. The figure-of-8 sign as a result of the overlap of the anterior and posterior surfaces is marked. (C) MRI view of normal acetabular anteversion. (D) MRI view of acetabular retroversion in a symptomatic athlete.

Normal values are from 4° to 10°. Greater than 10° is consistent with dysplasia. Finally, the neck-shaft angle can be measured. Angles greater than 140° are considered to be consistent with dysplasia (Fig 4).

Acetabular version can also be measured.[16] Lines are traced from the anterolateral edge of the acetabulum along the anterior and posterior projections of the rim. If the posterior line is traced more laterally than the anterior wall, the acetabulum is anteverted (normal). If the anterior wall is more lateral than the posterior wall, the acetabulum is retroverted. A figure-of-8 sign appears when the anterior wall crosses the posterior wall on a tracing. This is consistent with an excess anterior bony rim (causing a relative retroversion), which may cause impingement at the femoral head and neck junction[17] (Fig 3).

Beyond the measurements discussed above, other subtle abnormalities may be present. Obviously the joint should be assessed for any significant decrease in joint space or degenerative changes. The contour of the anterolateral neck should be compared with that of the unaffected side. A normal superior neck will have a distinctive concave appearance, with the concave contour takeoff at the head-neck junction through the neck-greater trochanter region. Lack of this curvature decreases head-neck offset, which can lead to impingement. Flattening and increasing radius of the anterosuperior or anterior portion of the head identifies a nonspherical head. A cross-table lateral radiograph is essential in the workup for impingement. A properly taken image will show the femoral neck along its anterolateral aspect (Fig 5).[16]

In some cases, the morphology of the acetabulum or proximal femur requires further delineation by MRI or computed tomography scanning (Fig 6). Attention should be given in these studies to acetabular version as well as soft-tissue impingement along the anterolateral femoral neck. Specifically, acetabular version is best evaluated on sagittal or coronal views in the plane of the hip (Fig 7). A computed tomography scan

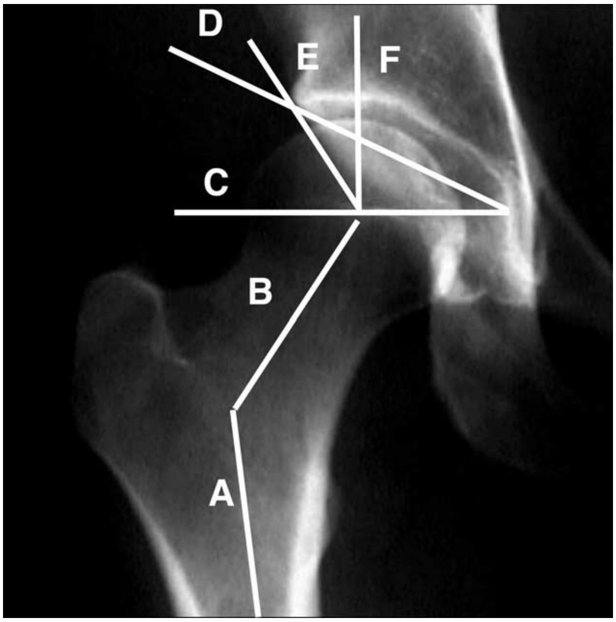


**Figure 4.** Typical angles that are measured in the assessment of FAI: angle AB, femoral neck-shaft angle; angle CD, acetabular index; angle EF, center-edge angle.

with 3-dimensional reconstructions should be considered in patients with significant bony deformities. Furthermore, MRI arthrography can detect labral pathology in addition to fully assessing the femoral head, neck, and acetabulum.[18]

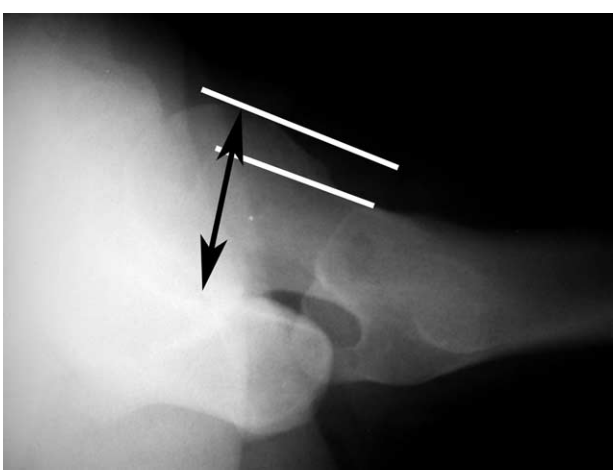

**Figure 5.** Cross-table lateral radiograph. White lines are along the femoral neck and parallel to the neck at the anterior margin of the femoral head. The black arrow indicates the total width of the femoral head. The ratio of the measured distance between the 2 white lines and the total head width is typically greater than 0.152 in anatomically normal hips. Numbers less than 0.152 indicate excessive posterior offset.[16]

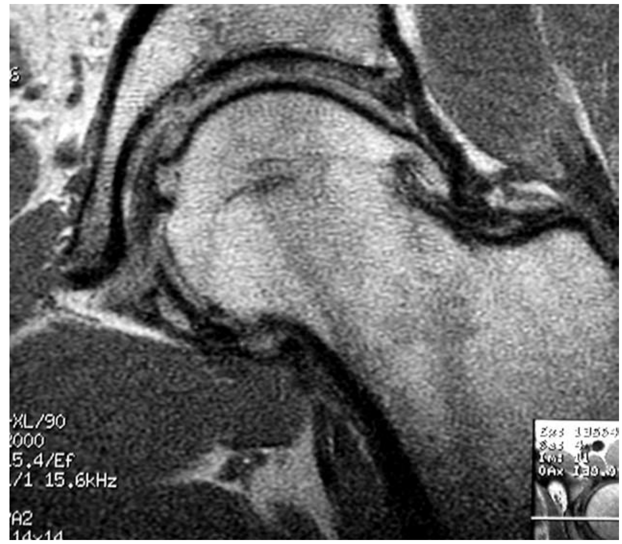

**Figure 6.** MRI (T1-weighted study without intra-articular contrast) showing both a tear involving the superior labrum as well as the anatomy of the superior neck.

## TREATMENT

### *Nonsurgical*

Conservative treatment modalities should be attempted for patients diagnosed with hip impingement. Anti-inflammatory medications and activity modification may improve or alleviate symptoms. Because hip impingement is a mechanical problem, conservative measures will not eliminate the source. Patients who fail conservative treatment are candidates for arthroscopic debridement of the femoral neck and the treatment of any significant labral lesions.

### *Surgical*

A complete arthroscopic examination of the hip includes visualization of the central and peripheral compartments. The central compartment includes the weight-bearing head, articular cartilage, acetabular fossa, and the ligamentum teres. The peripheral compartment contains the non–weight bearing head, the femoral neck, and the hip capsule, as well as the synovial folds and the orbicular ligament. Access to the anterolateral neck is through the peripheral compartment and visualization of the labrum though the central compartment.[19] Therefore, arthroscopic treatment of hip impingement requires entry into both compartments.

The setup for this procedure is similar to that for other hip arthroscopy procedures.[19] Although hip ar-

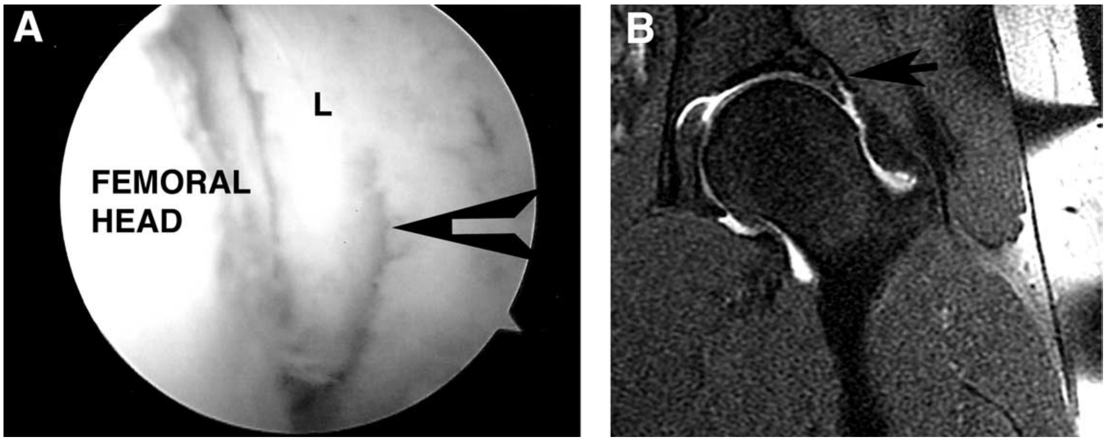


FIGURE 7. (A) Degenerative labral tear seen from the peripheral compartment. View is of a left hip and approximately the 3 o'clock position. Note the reactive synovial tissue laterally (arrow) (L, labrum). (B) T1-weighted MRI of lateral degenerative tear. Arrow indicates fragmentation of labral tissue.

throscopy can be performed in either the lateral decubitus or the supine position, the senior author (C.A.G.), as well as others, believes that peripheral compartment arthroscopy without traction is best performed in the supine position.[19,20] The traction apparatus should be available for examination of the central compartment and the leg draped so that the traction can be attached and removed without contaminating the surgical field. Hip and knee flexion without traction will relax the anterior capsule and allow easier access into the anterior peripheral compartment (Fig 8). There are 30° and 70° arthroscopes are available, but the 30° device is often the only one needed for peripheral arthroscopy.

FIGURE 8. Peripheral compartment arthroscopy with the hip out of traction and in 45° of hip flexion to relax the anterior capsule.

First, assessment of the labrum and other central compartment structures is performed. The traction apparatus is attached in the supine position and 50 lb of traction is added. A systematic visualization of the femoral head, acetabulum, labrum, and ligamentum is performed with the anticipation of labral pathology in the anterosuperior compartment. Labral and chondral injuries are addressed with the shaver through the anterior portal. The majority of labral lesions associated with hip impingement are degenerative lesions located in the anterosuperior quadrant. In the typical patient, the labrum has some peripheral fraying (in the avascular zone). These lesions are typically treated with debridement and are unlikely to warrant repair, although their treatment should certainly be individualized.

Acetabular chondral injuries may be addressed by chondroplasty, drilling, or microfracture of the affected areas in order to stimulate a fibrocartilaginous response, similar to the process used in the knee. These lesions are not uncommon and tend to extend about 5 to 7 mm in width along the length of the impingement lesion. In most cases of FAI, the femoral articular surface is intact. Nonetheless, the articular surface should be examined and probed to assure normal surfaces.

Areas of chondral delamination of the acetabular surface should be addressed at this time.[16] In some cases, a concomitant acetabular rim excision is indicated where a significant anteversion or peripheral osteophyte impinges with the femoral neck. The debridement of this portion should be undertaken first, with the peripheral arthroscopy performed later. In these situations, consideration should be given to acetabular takedown in a sharp fashion, followed by reattachment once the debridement has been completed, as has been documented in open approaches.[5]

Peripheral compartment visualization is performed through a standard anterolateral portal. Access into this compartment is gained by use of a guidewire and a cannulated trocar system after removing either all of the traction and placing the leg in a position of about 45° of flexion or simply placing the leg in balanced suspension with about 20 lb of traction. Documentation of appropriate guidewire placement with fluoroscopy is recommended. Dienst et al.[20] described a systematic diagnostic examination of the peripheral compartment beginning anteriorly. The examination proceeds in a counterclockwise direction beginning with the anterior neck and proceeding through the medial neck, medial head, anterior head, lateral head, and the posterior area. Use of the anterolateral portal allows visualization of nearly the entire peripheral compartment.

In cases where the more lateral and posterior portions are not well visualized, an accessory anterolateral portal can be considered. The standard portal is placed about 2 cm proximal to the greater trochanter at the anterior margin of the prominence in the coronal plane. The accessory portal is 2 to 3 cm distal to the standard anterolateral portal on the same coronal plane. In some cases this portal can be used for loose body removal in the more distal peripheral compartment. It can also be used for visualization of the more lateral aspects of the neck while using the anterolateral portal as the working portal.

In addition, in severe cases, a posterolateral portal can be established (in those cases where a posterolateral portal has not already been established) to complete the more posterior and lateral impingement lesions. This portal is located about 2 cm proximal to the greater trochanter at the posterior margin of the prominence in the coronal plane. The most important consideration in these cases is to fluoroscopically and visually assess the entire femoral neck from the 12 o'clock to 6 o'clock position to assure a complete decompression.

After completing the diagnostic examination, outside-in development of the working portal is established. This portal corresponds to the same skin incision for the anterior working portal in the central compartment. The landmarks for this portal are the intersection of a line drawn from the anterior, superior iliac spine down the femoral shaft, and a line drawn across the level of the greater trochanter. The working portal is best established while viewing the anterior neck. A shaver is introduced through the working portal and both the arthroscope and shaver are moved laterally. The capsule is excised over the area of the impingement osteophyte for complete visualization before bony resection. Capsular excision is performed with a combination of a shaver and a tissue ablator. The area of resection is typically about $2 \times 2$ cm in dimension. The resection is limited to the area overlying the bony prominence and does not add significant morbidity because there is still continuity of the majority of the capsule. Gaining access to the lateral neck is often more difficult than the anterior and medial neck because of a tight zona orbicularis. Dienst recommends keeping the hip flexed to approximately 45°, abduction of 20° to 40°, and slight external rotation of the hip.[20] Once in the area of the lateral neck, fluoroscopic confirmation of the location on the neck is recommended. A burr (4.5 mm round) is now used for the bony resection (Fig 9). Fluoroscopic visualization is important before beginning the neck contouring. The most predictable technique is to outline the proposed area of bony resection and then resect between the margins.[17]

The goal of the debridement is to restore the appropriate contour of the anterolateral neck, proceeding in a systematic fashion low on the neck toward the head to restore the normal concavity. The ultimate range of flexion should be between 110° and 115° of flexion. We recommend real-time fluoroscopic examination of the hip through a range of motion to confirm a complete debridement. In addition, arthroscopic visualization should also be undertaken to document full clearance in flexion and rotation.

One concern with femoral neck debridement is the vasculature responsible for nutrition of the majority of the femoral head.[21] The medial femoral circumflex artery, the main supply, originates from distal to proximal and emerges from the obturator externus, piercing the capsule along the posterior superior neck. The intracapsular branches then divide into 2 to 4 subsynovial retinacular vessels and track into the femoral neck. To avoid damage to this area, the distal extent of the debridement should be limited to that area that impinges only, typically about 10 mm from the articular margin.

Finally, the guidelines for the depth of resection are sparse. One study analyzed the percentage of femoral neck resection as a fraction of the total neck size and performed compressive loading across the femoral head. The amount of resection that predictably ended in a fracture was greater than 30% of the femoral

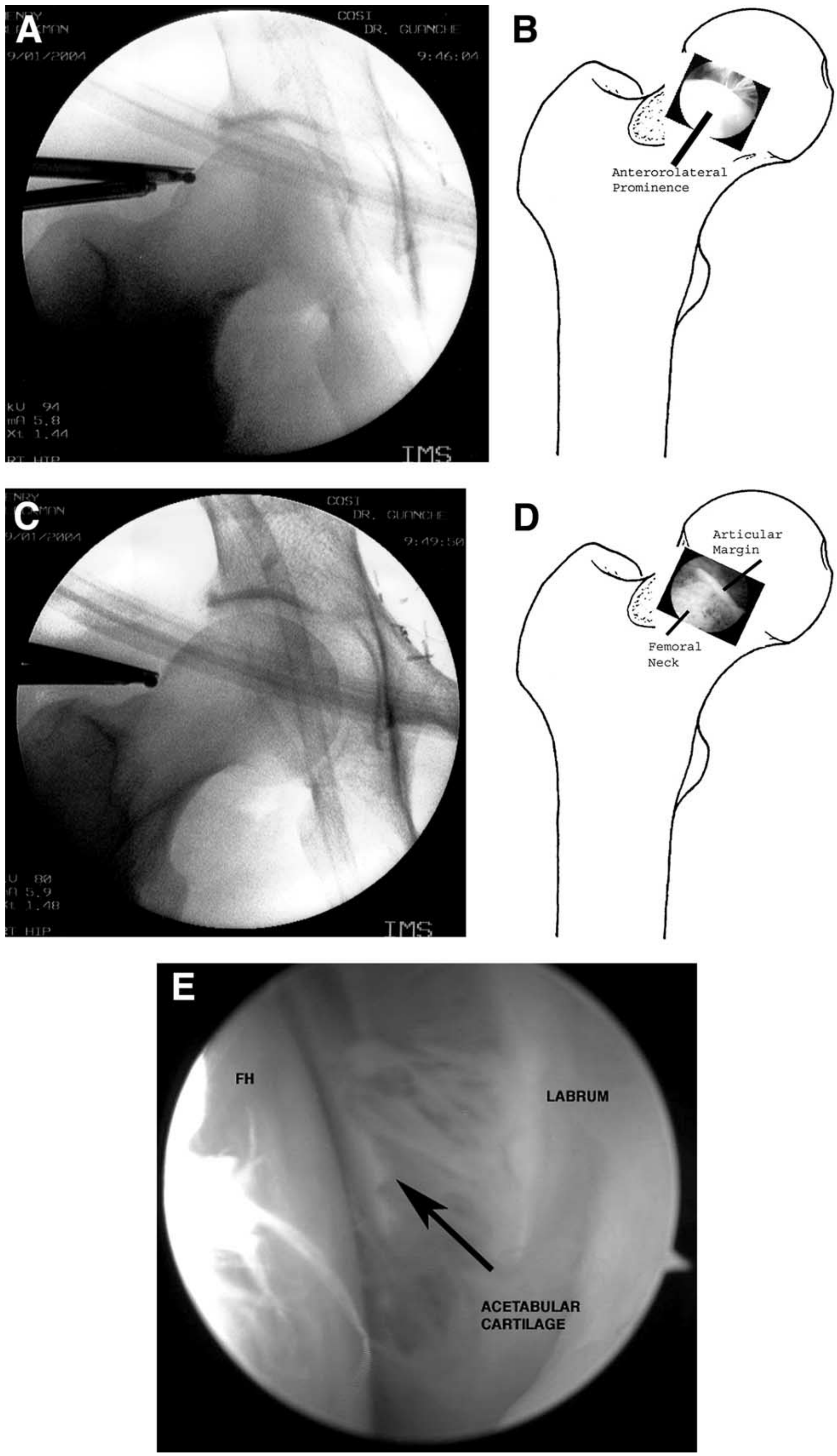


**FIGURE 9.** (A) Fluoroscopic view of the femoral neck, the arthroscope and burr in position before debridement. (B) Arthroscopic view of the femoral neck lesion. (C) Final fluoroscopic view of the neck following burring. (D) Final arthroscopic view after femoral neck debridement. (E) Central compartment arthroscopy shows a degenerative tear of the anterosuperior labrum (FH, femoral head). Note the acetabular cartilage (arrow) and the exposed subchondral bone between the remaining cartilage and the labrum.

neck.[22] For this reason, no more than approximately 20% of the width of the neck should be resected. Preoperative measurement of the overall width of the neck allows the surgeon to plan for as conservative a resection as is possible.

In addition to the complications germane to femoral neck resection, the common complications associated with hip arthroscopy should be noted. Most common are neural injuries, with lateral femoral cutaneous nerve lesion the most frequent. These occur as a result of the proximity of this nerve to the anterior portal position. In addition, traction injuries to the sciatic nerve may occur with excessive traction the extremity.[23] Finally, there have been cases of excessive fluid extravasation causing significant neural injuries.[24]

*Postoperative Protocol*

Weight bearing restrictions following the debridement take into consideration the risk of postoperative femoral neck fracture. Toe-touch weight bearing for 4 weeks is maintained and followed by full weight bearing. No high-impact activities are allowed for at least 6 weeks. Most patients resume high-impact athletic activities by 12 weeks postoperatively. The importance of early protected weight bearing cannot be overemphasized—there have been 2 documented cases of femoral neck fractures following neck resection.[17]

## RESULTS

*Open Debridement*

Initial reports on the treatment of FAI have involved the use of open surgical dislocation techniques. In the largest series to date,[25] the open surgical dislocation approach was performed on 19 patients with a mean age of 36 years and an average follow-up of 4.7 years. The authors[25] documented good results in 14 of 19 patients with no cases of osteonecrosis. They concluded that the surgical dislocation approach yielded good results in patients with early degenerative changes, but was not beneficial to those with advanced degenerative changes or extensive cartilage damage.

Another study assessed a group of 23 hips in 23 patients treated by open surgical debridement for impingement.[26] Follow-up ranged from 2 to 12 years. At the most recent evaluation, 7 patients had been converted to total hip arthroplasty, 1 had arthroscopic debridement of a recurrent labral tear, and 15 patients had had no further surgery. No hips developed osteonecrosis. Of the 7 patients who were converted to total hip arthroplasty, 3 failed early and 4 recovered and functioned well for between 6.4 and 9.5 years after debridement. The authors proposed that the procedure effectively treats hips with impingement and maintained their normal hip in most cases.

*Arthroscopic Debridement*

There are no series to date that have analyzed the outcome of the arthroscopic procedure in a group of patients. In the senior author's experience, 10 consecutive patients treated arthroscopically for FAI were evaluated. Follow-up averaged 16 months (range, 9 to 24 months). The average patient age was 34 years. The McCarthy scoring scale for the nonarthritic was used.[27] Eight patients with evidence of FAI and no intra-articular cartilage degenerative disease did substantially better than the 2 patients who had degenerative disease diagnosed at the time of arthroscopy. The nonarthritic scores averaged 75 preoperatively and 95 at follow-up (Fig 10).

Sampson[17] has reported on a series of 90 patients treated arthroscopically for FAI. In his experience, nearly all patients had elimination of the impingement sign (pain on flexion and internal rotation) and were happy with their results. One patient did sustain a nondisplaced femoral neck fracture and required screw fixation. The early results, in his estimation, approached those of the open procedure.

## DISCUSSION

Hip impingement can be a difficult entity to diagnose and treat. The current literature suggests that FAI plays a role in the cascade of hip osteoarthritis in some patients—those with structural proximal femoral head-neck abnormalities.[3-7] This entity usually appears in younger and more physically active adults and can be debilitating. Subsequent labral and chondral lesions have been linked to the repetitive microtrauma caused by the deformity of the femoral neck or acetabulum.[14] Because labral and chondral lesions are seen more frequently in early osteoarthritic hips, early recognition and treatment of this entity may halt the unfortunate progression toward osteoarthritis in younger patients.

Once the diagnosis of impingement is made, isolating the source will help determine the appropriate course of treatment. Conservative treatment should be attempted for all patients. If this treatment fails, the location of pathology will dictate the surgical plan. Acetabular overhang and other acetabular pathology

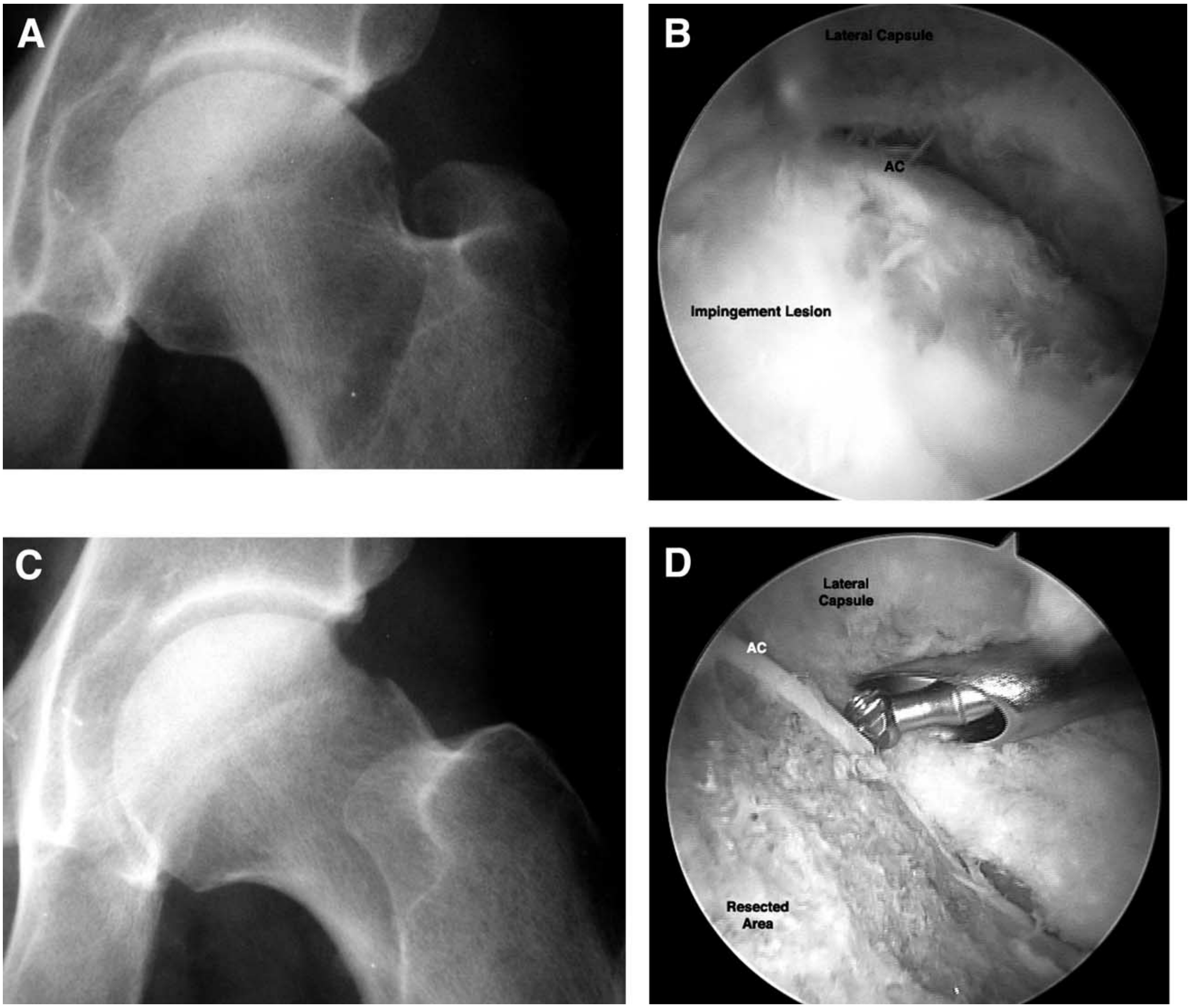


**Figure 10.** Typical case of FAI in a 19-year-old collegiate basketball player. (A) AP radiograph showing the significant femoral head-neck junction prominence. (B) Arthroscopic view of the typical lesion (AC, acetabular cartilage). (C) AP radiograph following resection of the head-neck junction. (D) Arthroscopic view of the final resection at the head-neck junction (AC, acetabular cartilage).

may require simple debridement and partial acetabular resection, or in some cases a labral takedown and subsequent repair of the affected labrum after the bony resection is completed. Arthroscopic assessment and debridement of nonspherical femoral heads with decreased head-neck offset causing impingement offers a minimally invasive treatment option to restore hip mechanics at the extremes of motion, eliminate the repetitive microtrauma to the acetabular labrum, and potentially curb the progression of osteoarthritis. Contouring of the femoral head and neck to a more normal anatomy removes the offending source of impingement. The debridement, although performed arthroscopically, is fraught with significant complications including the possibility of femoral neck fracture and avascular necrosis of the femoral head. The surgical approach should be well planned and the amount of resection gauged carefully.

We currently do not fully understand the progression of nontraumatic degenerative joint disease of the hip. Although FAI, leading to subsequent labral and chondral injuries, has been associated with early osteoarthritis of the hip,[1,3,4] this cascade has yet to be definitely proven. While the early results of arthroscopic debridement of FAI are promising, additional studies analyzing the clinical and long-term benefit of arthroscopic debridement of the femoral neck to restore head-neck offset and hip clearance are necessary.

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