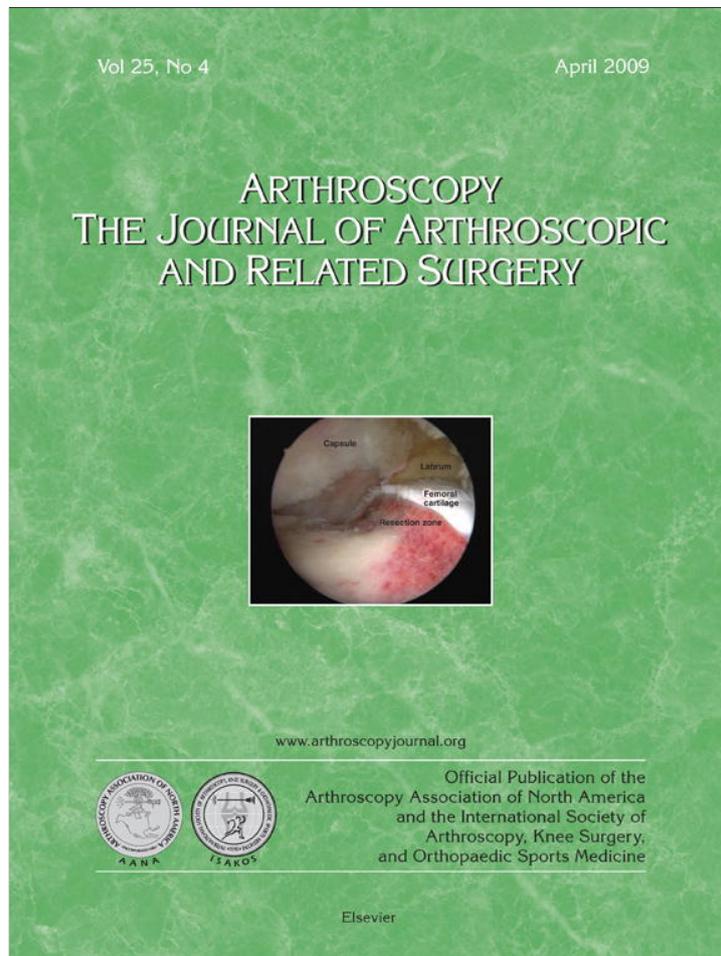


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Level V Evidence

The 23-Point Arthroscopic Examination of the Hip: Basic Setup, Portal Placement, and Surgical Technique

James L. Bond, M.D., Zakary A. Knutson, M.D., Andrew Ebert, M.D., and Carlos A. Guanche, M.D.

Abstract: The 23-point arthroscopic examination of the hip has been used for more than 400 arthroscopic hip procedures. It ensures that all components of the hip are carefully inspected and allows for proper documentation. It is vital that a precise knowledge of hip anatomy and common portal placement is coupled with proper patient selection, sound preoperative planning, and a consistent arthroscopic technique in order to maximize clinical outcomes. The 23-point arthroscopic examination of the hip uses 3 standard portals (anterior, anterolateral, and posterolateral) that provide a systematic method of examination of the key structures of the central and peripheral hip joint. The points are divided up into groups based on the portal through which they are viewed. The 23-point arthroscopic examination of the hip is reproducible, and offers some standardization within the evolving field of hip arthroscopy. It provides a consistent routine for hip arthroscopy that has yet to be published. Using this standardized examination can assist with the diagnostic accuracy of hip arthroscopy. **Key Words:** Arthroscopy—Examination—Hip—Portal placement—Surgical technique.

Even though arthroscopy of the hip was introduced as early as 1931,¹ its clinical application has developed rather slowly.^{2,3} There is currently an unprecedented enthusiasm for hip arthroscopy. Improved arthroscopic equipment and techniques have allowed surgeons to make diagnoses and implement treatments that would otherwise have required an open procedure. This can lead to shorter recovery times and a more rapid return to activity. Clinical assessments of the hip are improving, and arthroscopic indications are expanding. With new techniques being developed, it is vital that a precise

knowledge of hip anatomy and common portal placement is coupled with proper patient selection, sound preoperative planning, and a consistent arthroscopic technique in order to maximize clinical outcomes.⁴⁻⁶ Arthroscopic point examinations have been developed previously for other joints, including the shoulder and ankle, with great success.^{7,8} They allow a consistent, efficient, and reproducible method for approaching each joint.

SURGICAL TECHNIQUE

Arthroscopic Setup

Our basic setup for hip arthroscopy places the patient in the supine position on a fluoroscopic table. The arthroscopic and fluoroscopic towers are placed on the opposite side of the surgical extremity, with the fluoroscopic monitor at the foot of the patient and the C-arm image intensifier centered over the operative hip. A well padded perineal post is attached to the operating table and positioned as lateral as possible on the operative extremity to provide an optimal moment arm for

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distraction once weight is applied. The arthroscopic tower is placed at the head of the table slightly distal to the anesthesia cart. With this setup, it is necessary to radiographically visualize the hip and pelvis before definitive positioning.

Most surgeons prefer general anesthesia for hip arthroscopy because it provides adequate muscle relaxation for distraction, but regional anesthesia can be a helpful adjunct in postoperative pain management. We prefer a lumbar plexus block because it has provided adequate pain control without any negative clinical sequelae in more than 400 cases. After the patient is properly positioned and the regional pain block is administered, the extremity is prepped and draped in the standard fashion and a sterile leg sleeve is applied. There are several options available for positioning the patient in the supine position. Regardless of the distraction system used, it is important that the system allow for adequate flexion, abduction, and/or adduction of the hip. Maneuverability and ease of adjustment are vital to allow for adequate visualization. Once our distraction device is assembled, 50 pounds of traction are applied for access to the central compartment of the hip (Fig 1).

We use a 70° arthroscope for the 23-point diagnostic examination. If any pathology is noted during the diagnostic examination, and a different perspective is necessary, a 30° arthroscope can be used to increase visualization. Flexible probes, extra long cannulas, shavers, burrs, and loose body retrievers have all increased the ability to arthroscopically treat a wide variety of hip pathologies and should be available. Figure 2 shows all of the instruments we



FIGURE 1. The patient is placed in the supine position on a fluoroscopic operating table. The arthroscopic and fluoroscopic towers are placed on the opposite side of the surgical extremity and the C-arm image intensifier is centered over the operative hip.



FIGURE 2. The basic back table setup with the instruments necessary for hip arthroscopy: 30° and 70° arthroscopes; 2 6-inch, 16-gauge spinal needles; 2 nitinol guidewires; cannulated dilators and trochars for portal placement; 4.5-, 5.0-, and 5.5-mm cannulas; an extra long probe, graspers, and a loose body retriever; and routine suture passing and retrieving instruments.

use for hip arthroscopy as they are laid out on the back table. The basic back table setup with the instruments necessary for hip arthroscopy are as follows: 30° and 70° arthroscopes; 2 6-inch, 16-gauge spinal needles to gain access to the hip joint;

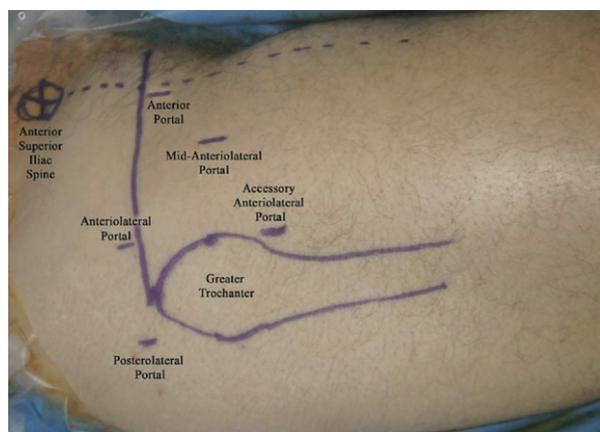


FIGURE 3. Common portals used for hip arthroscopy. The *anterolateral portal* is the most common introductory portal at the superior margin of the greater trochanter in line with its anterior border. The *anterior portal* is typically 1 cm lateral and 1 cm distal from the intersection of a sagittal line drawn down the middle of the anterior thigh and a transverse line drawn from the superior border of the greater trochanter to the superior aspect of the pubic bone. This portal is established under direct visualization from the anterolateral portal while aiming approximately 45° cephalad and 30° toward the midline from the skin entry site. The *posterolateral portal* is the superior margin of the greater trochanter in line with its posterior border. The *midanterolateral portal* is halfway between the anterior and anterolateral portals, about 2 cm distal to a line connecting the 2 portals. The *accessory anterolateral portal* is positioned approximately 3 to 5 cm distal to the anterolateral portal along the anterior border of the greater trochanter.

TABLE 1. Summary of the 23 Arthroscopic Points, Their Normal Anatomic Structures, and the Associated Pathology

Point	Normal Anatomy	Abnormal/Significant Findings
Central compartment—Anterolateral portal		
1	Cotyloid fossa, pulvinar, ligamentum teres	Synovitis, tears of the ligamentum teres
2	Posterior medial acetabulum and labrum	Chondral injury, labral tears
3	Anterior triangle—anterior capsule, anterior labrum, femoral head	Landmark for establishment of anterior portal, labral tears
4	Anterior labrum, paralabral sulcus	Common area for labral tears and degeneration
5	Lateral labrum, capsular sulcus	Labral tears
6	Posterior capsule, zona orbicularis	Labral tears, loose bodies
7	Femoral head	Chondral injury
Central compartment—Anterior portal		
8	Ligamentum teres	Primary position to see tears of the ligamentum teres
9	Posterior transverse ligament, posteromedial labrum	Loose bodies, labral tears
10	Anterior transverse ligament, anterior labrum	Loose bodies, labral tears
11	Superior articular cartilage	Chondral injury
12	Lateral labrum	Primary position for treatment of most labral tears, point of entry of anterolateral portal
13	Posterolateral capsule	Posterolateral portal placed in this view
Central compartment—Posterolateral portal		
14	Inferior gutter	Loose bodies
15	Weight-bearing dome of the acetabulum	Chondral injury
16	Anterolateral labrum	Labral tears
17	Femoral head	Chondral injury
Peripheral compartment—Anterolateral portal		
18	Medial femoral neck, orbicular ligament, medial synovial fold	Synovitis, loose bodies
19	Medial gutter	Loose bodies, synovitis
20	Anterior labrum	Labral tears
21	Lateral labrum	Labral tears
22	Lateral femoral neck, orbicular ligament	Cam lesions, visualized impingement
23	Anterior femoral neck, anterior synovial fold	Synovitis

2 nitinol guidewires for portal establishment; cannulated dilators and trochars for portal placement over the nitinol wires; 4.5-, 5.0-, and 5.5-mm canulas; an extra long probe, ring graspers, regular

graspers, and a loose body retriever; and routine suture passing and retrieving instruments that can pierce labral tissue and retrieve sutures after anchor placement.

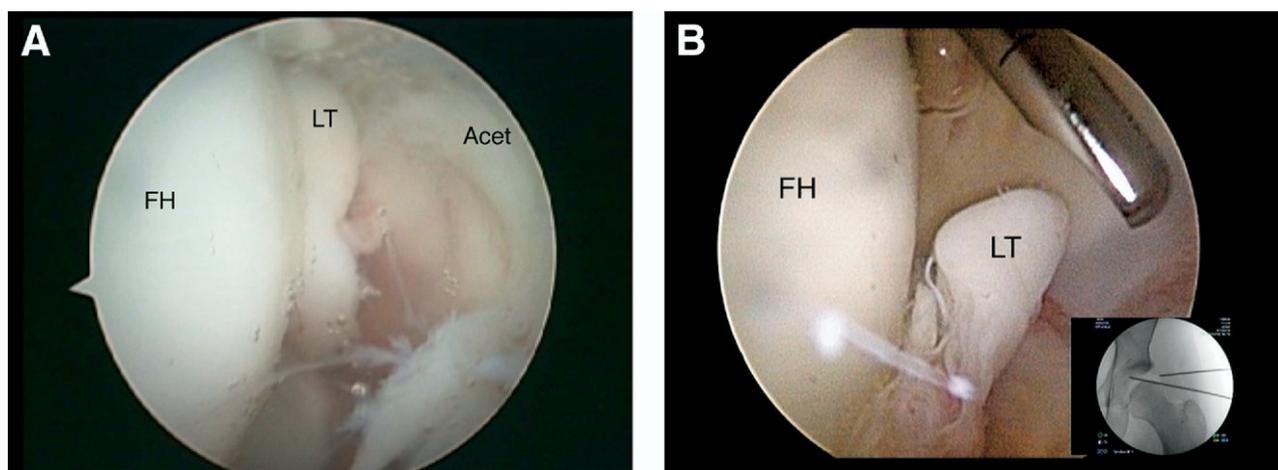


FIGURE 4. (A) Point 1—Medial wall of the acetabulum, cotyloid fossa, the pulvinar, and the ligamentum teres. (B) A complete tear of the ligamentum teres, as seen from point 1. (Acet, acetabulum; FH, femoral head; LT, ligamentum teres.)

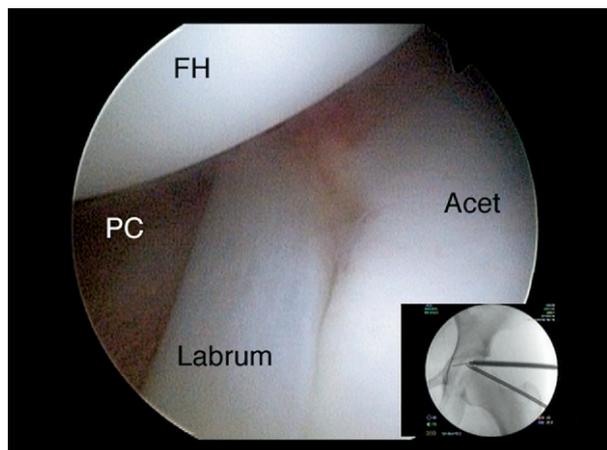


FIGURE 5. Point 2—Posterior medial horn of the acetabular labrum, cartilage, and posterior capsular reflection. (PC, posterior capsule.)

Portal Placement

After the extremity is placed in traction (Fig 3), the principal landmarks, including the greater trochanter, anterior superior iliac spine (ASIS), the pubic symphysis, and the femoral shaft are identified. Three portals are routinely established in hip arthroscopy: the anterolateral (AL), anterior, and posterolateral (PL) portals. The AL portal is used as the introductory portal for virtually all routine hip arthroscopy.^{9,10}

The anterior portal has been described with slight variations by numerous authors.^{9,11-16} The spinal needle is aimed approximately 45° cephalad and 30° toward the midline from the skin entry site,¹⁰ but

differing anatomic variations necessitate the aid of direct visualization from the arthroscope in the AL portal when establishing the anterior portal. The nick and spread technique should also be used when creating this portal to protect the medial branch of the lateral femoral cutaneous nerve (LFCN).

The PL portal is placed at the superior margin of the greater trochanter in line with its posterior border. Establishment of this portal is also facilitated by direct visualization, because this portal is approximately 3 cm from the sciatic nerve at the level of the posterior hip capsule. It is important to avoid external rotation and excessive hip flexion while using this portal, because these positions can place the sciatic nerve at significant risk of injury.^{14,17}

The accessory AL portal (AALP) is positioned approximately 3 to 5 cm distal to the AL portal along the anterior border of the greater trochanter. This portal is not used for the routine examination of the central compartment, but does allow for additional access to the peripheral compartment and is always established under direct arthroscopic and fluoroscopic guidance.

The midanterolateral portal (MAL) is halfway between the anterior and AL portals, about 2 cm distal to a line connecting the 2 portals. It is typically used in labral repairs because it allows for a better angle of approach for anchor placement. It is also a good portal for debridement of the femoral neck. It can be used for both the resection and visualization of the lesion while the AL portal is used for the debridement.

It is important to note that because of limited maneuverability within the hip joint, slight variations of

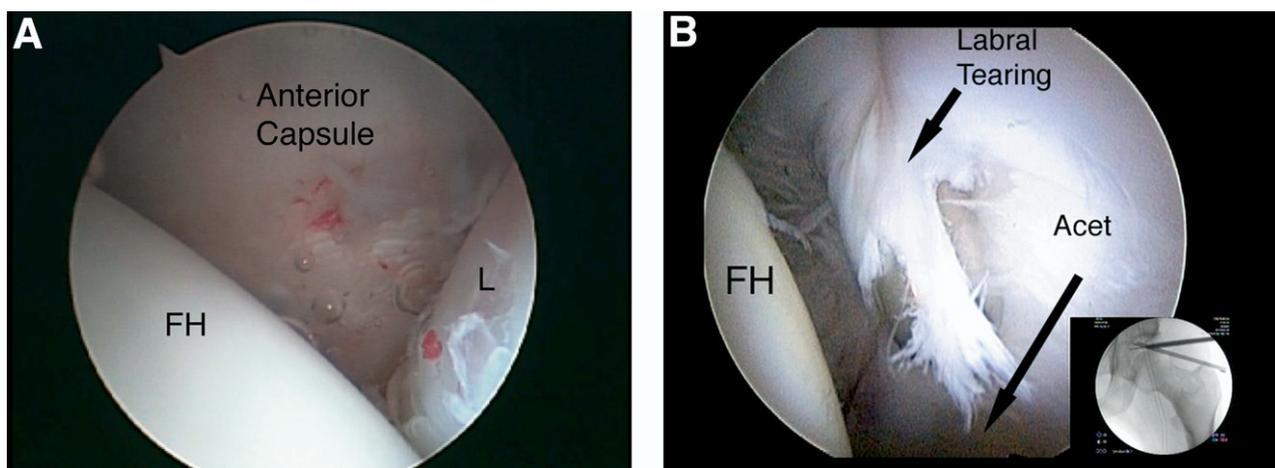


FIGURE 6. (A) Point 3—The anterior triangle of a left hip as seen from the anterolateral portal. The anterior triangle is composed of the anterior capsule, anterior labrum, and femoral head. (B) A labral tear seen at point 3. (L, labrum.)

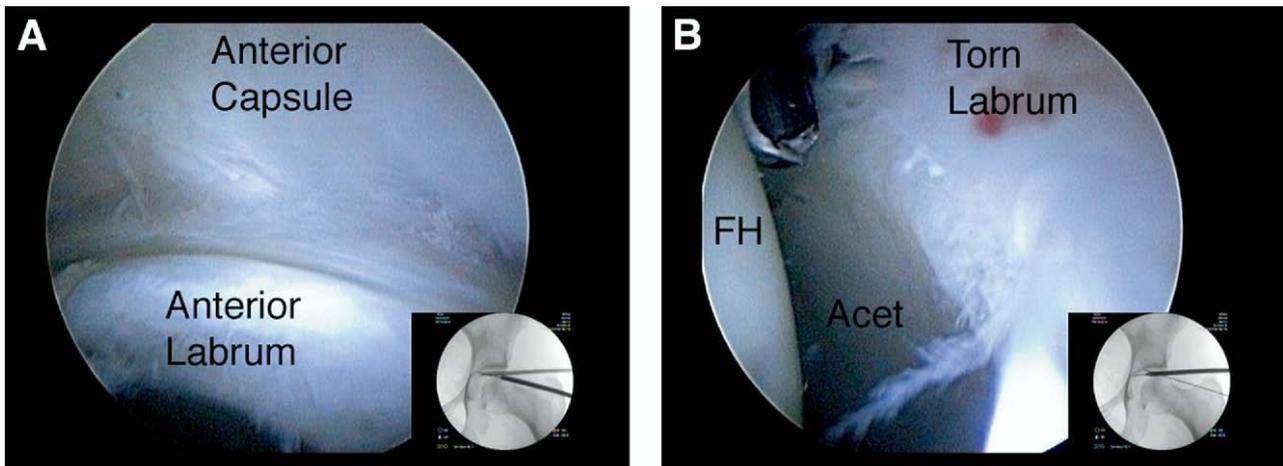


FIGURE 7. (A) Point 4—Anterior labrum and paralabral sulcus. From this point, the anterior portal can be established under visualization of a spinal needle. (B) Labral tear seen at point 4.

these portals or even additional portals may be necessary to provide adequate exposure of the hip joint, reemphasizing the necessity of a precise knowledge of hip anatomy before performing an arthroscopic examination.

Diagnostic Arthroscopy With a 23-Point Arthroscopic Examination of the Hip

We use a systematic 23-point arthroscopic examination of the central and peripheral compartments of the hip to increase accuracy and reproducibility. This standard approach ensures that all components of the hip are carefully inspected and allows for proper documentation. In addition, a methodical technique al-

lows us to compare arthroscopic findings with clinical presentations, further enhancing our diagnostic capabilities.

The AL portal is always established as the introductory portal because it is easier to access, reproducible, and presents less risk to the surrounding neurovascular structures. Under fluoroscopic guidance, the joint capsule is punctured with a 6-inch, 16-gauge spinal needle. Access to the central compartment of the hip joint is confirmed with an air arthrogram. A solution of 20 cc of 1% ropivacaine combined with 30 cc of sterile saline is infused into the joint, providing pre-emptive analgesia and further joint distension. The spinal needle is removed and then reintroduced

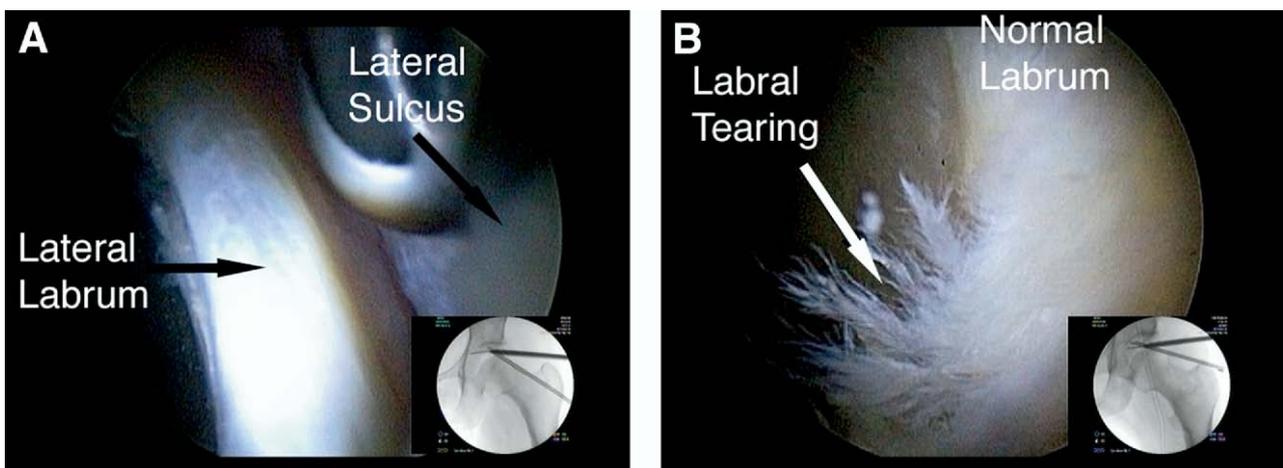


FIGURE 8. (A) Point 5—Lateral labrum with capsular sulcus seen with further retraction. (B) Labral tear seen at point 5.

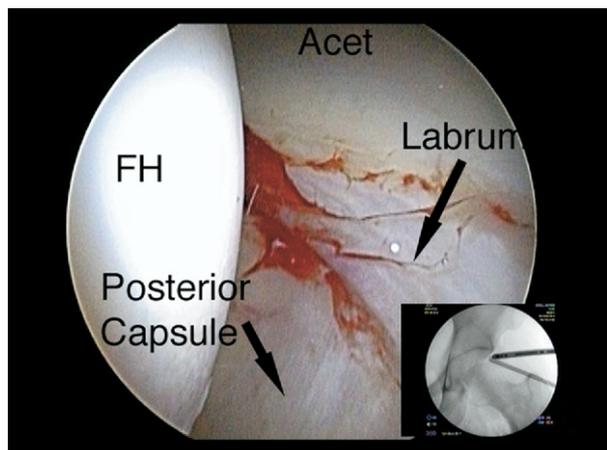


FIGURE 9. Point 6—Posterior capsule seen by superior rotation of the lens from point 5.

through the hip capsule. This technique of reentry after fluid distention decreases the incidence of iatrogenic damage to the AL labrum, because the needle often inadvertently penetrates the lateral labrum during the initial placement of the spinal needle into the central compartment.¹⁸

A stab incision is made on both sides of the needle. The needle is then removed over a guidewire, and a cannulated obturator is used to dilate the joint capsule. The cannula for the arthroscope is then placed into the joint over the guidewire. It is important to direct the various cannulas superiorly away from the convexity of the femoral head in order to avoid inadvertent articular scuffing.

THE ANTEROLATERAL PORTAL

With the arthroscope in the AL portal, the first 7 points of the arthroscopic examination of the hip can be seen (Table 1). For the sake of consistency of understanding of the images, all of the images herein are of a left hip. Once the arthroscope is introduced, *point 1* is easily located by slowly withdrawing the arthroscope to gain perspective on the constituents of the medial wall of the acetabulum, including the acetabular or cotyloid fossa, pulvinar, and ligamentum teres (Fig 4). It is important to use this point for general orientation. Synovitis of the acetabular fossa and tears of the ligamentum teres are commonly seen here.¹⁹

The camera is then moved posteriorly to view the posterior medial horn of the acetabular cartilage and labrum (*point 2*). With adequate distention, the posterior capsular reflection can also be observed in the background (Fig 5). The lens is then rotated superiorly and the camera is raised and retracted gently to view *point 3*, the anterior triangle, which is composed of the anterior capsule, anterior labrum, and femoral head (Fig 6).

This is a very helpful landmark allowing for direct visualization of the spinal needle when establishing the anterior portal. Once the anterior portal is established, the camera is further retracted to view *point 4*, the anterior labrum and paralabral sulcus. Normally, the triangular anterior labrum blends with the acetabular cartilage inferiorly and paralabral sulcus superiorly (Fig 7). This is a com-

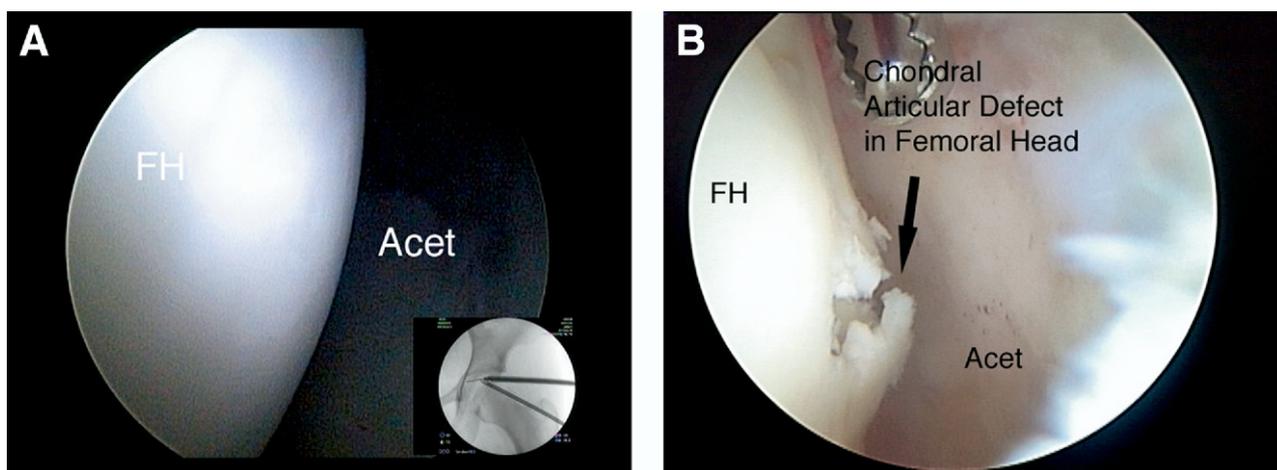


FIGURE 10. (A) Point 7—Femoral head examined from its inferior to superior margins. The leg is internally and externally rotated to aid in visualization. (B) Chondral articular injury on the weight-bearing femoral head.

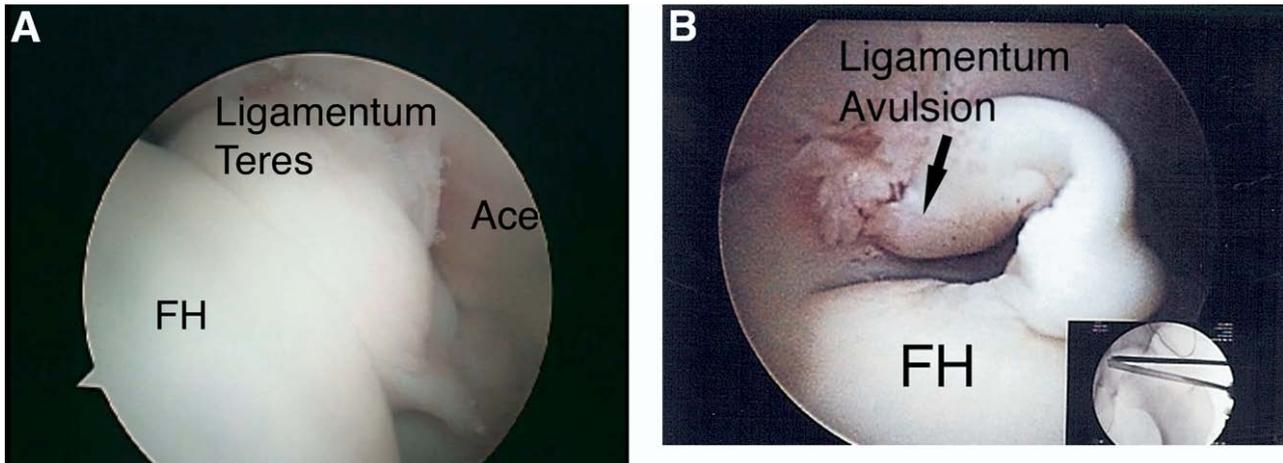


FIGURE 11. (A) Point 8—Primary view of the ligamentum teres. (B) Complete avulsion of the ligamentum teres.

mon area in which to find labral tearing and degeneration.²⁰⁻²⁸

After further retraction of the arthroscope, the lens can be rotated inferiorly to view *point 5*, the lateral labrum and its attachment to the capsular sulcus (Fig 8). By pushing the camera inferiorly and rotating the lens superiorly to *point 6*, the posterior capsule from its acetabular attachment to the concentric fibers of the zona orbicularis at the junction of the femoral head and neck can be seen (Fig 9). *Point 7* is obtained by pulling back the camera so that the cartilage of the femoral head can be examined from its inferior to superior margins (Fig 10). The leg is gently rotated internally and externally during this view to provide as much perspective as possible.

THE ANTERIOR PORTAL

The second grouping of points (8 to 13) of the central compartment is viewed through the anterior portal. Similar to the AL portal, the anterior examination begins in the medial fossa of the acetabulum. From this vantage point, the best view of the ligamentum teres (*point 8*) is from where it arises from the posteroinferior margin of the acetabulum and inserts onto the medial aspect of the femoral head (Fig 11).^{3,10} From this perspective, even subtle tears can be diagnosed with gentle rotation of the lower extremity. With adequate distraction, the camera can be gently maneuvered posteriorly into *point 9*, where the posterior aspect of the transverse ligament blends into the

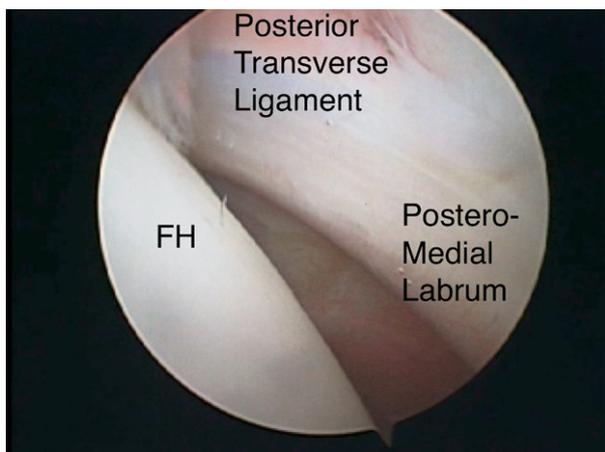


FIGURE 12. Point 9—The posterior aspect of the transverse ligament can be seen as it blends into the posterior medial labrum.

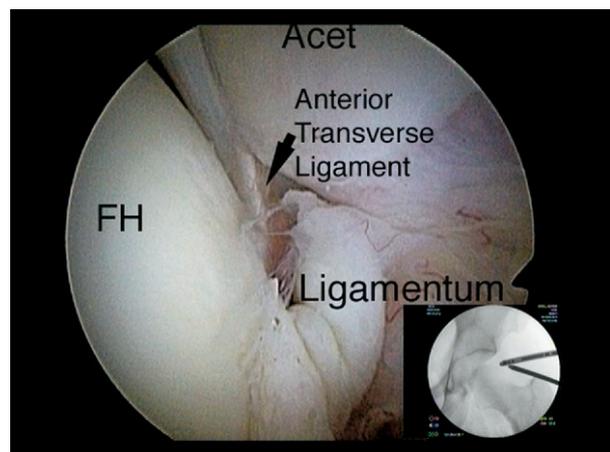


FIGURE 13. Point 10—Anterior aspect of the transverse ligament is seen at its attachment to the anterior labrum.

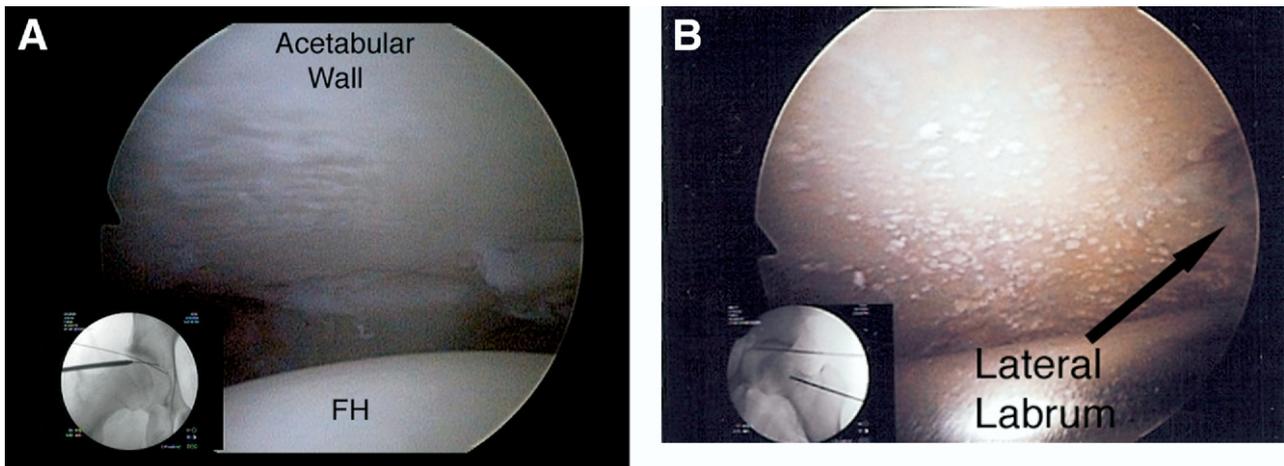


FIGURE 14. (A) Point 11—Superior acetabular cartilaginous surface. (B) Chondrocalcinosis of the articular surface of the acetabulum.

posteromedial labrum (Fig 12). This can be a place where articular loose bodies reside.

Pulling the camera back and anterior to the ligamentum allows for a view of *point 10*, which is the corresponding anterior aspect of the transverse ligament and its attachment to the anterior labrum (Fig 13). By rotating the lens laterally to *point 11*, the superior acetabular cartilage can be seen (Fig 14). This inspection ends at *point 12*, the lateral labrum and point of entry for the AL portal (Fig 15). This perspective provides an excellent viewpoint to aid in diagnosis, and debridement or repair of most labral tears. The camera is then pushed past the AL portal and *point 13* comes into view, the PL capsule. From

this perspective, precise PL portal placement can be established under direct visualization (Fig 16).

THE POSTEROLATERAL PORTAL

The third and final grouping of points (14 to 17) in the central compartment is examined through the PL portal. Once the arthroscope is placed in the PL portal, it is slowly withdrawn and moved inferiorly over the posterior labrum into *point 14*, the inferior gutter, which runs from the posterior capsular attachment to the thickened cylindrical sleeve of the orbicular ligament that surrounds the femoral neck (Fig 17). The lens is then rotated cranially and advanced to see *point*

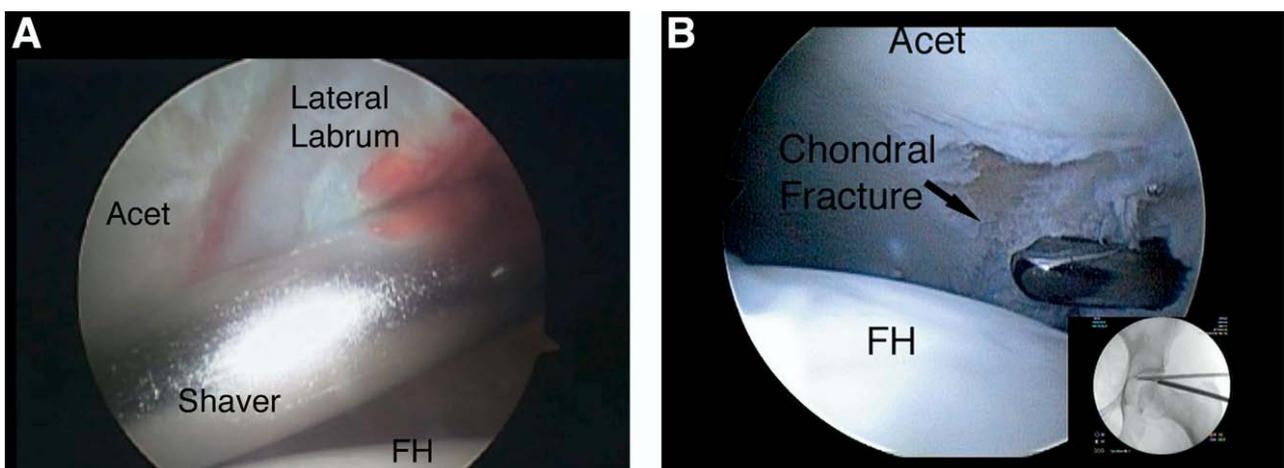


FIGURE 15. (A) Point 12—Lateral labrum plus the point of entry for the anterolateral portal. (B) Chondral articular injury of the acetabular wall following debridement.

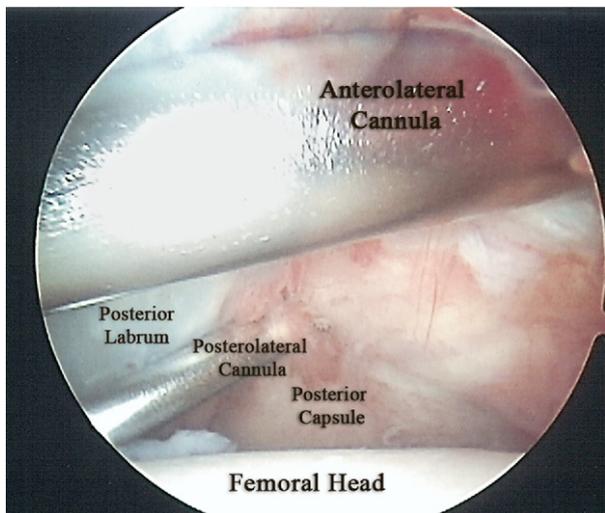


FIGURE 16. Point 13—Posterior capsule. Establishment of the posterolateral portal is possible while viewing from the anterior portal of a left hip.

15, the weight-bearing dome of the acetabulum (Fig 18). This area is often where cartilage degeneration within the acetabulum is best appreciated. The camera is then translated superiorly to gain another vantage point of the AL labrum, or *point 16* (Fig 19). Finally, by rotating the lens to *point 17*, another perspective can be had of the femoral head (Fig 20). The camera should slide tangentially along the cartilage surface in an effort to observe as much of the femoral head as possible. This concludes the arthroscopic evaluation of the central compartment of the hip.

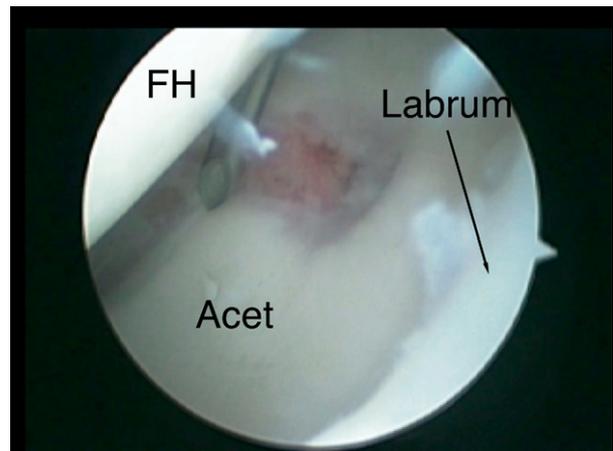


FIGURE 18. Point 15—Weight-bearing dome of the acetabulum.

THE PERIPHERAL COMPARTMENT

After the appropriate treatment of any pathology diagnosed in the central compartment, the extremity is taken out of traction and the hip is positioned in approximately 45° of flexion. The knee is held either by the first assist or a traction bar. The leg is allowed to remain dynamically flexible to allow for various amounts of rotation and abduction to obtain the best view possible of various points of the peripheral compartment. The degree of flexion relaxes the anterior capsule and ligaments and allows for an adequate inspection of the peripheral compartment, which includes points 18 to 23. Similar to the method described by Dienst et al.¹⁹ and Byrd,²⁹ a long spinal

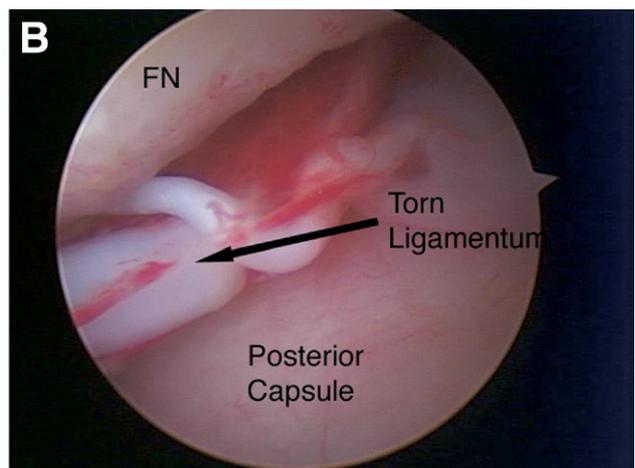
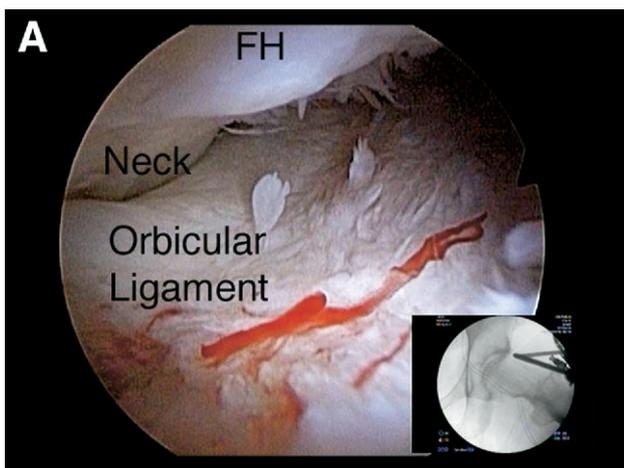


FIGURE 17. (A) Point 14—Now viewing from the posterolateral portal, the inferior gutter can be seen as it runs from the posterior capsular attachment to the thickened cylindrical sleeve of the orbicular ligament. (B) Chronic avulsion of the ligamentum teres. The majority of the avulsed fragment was only found after visualization of the posterior aspect of the joint.

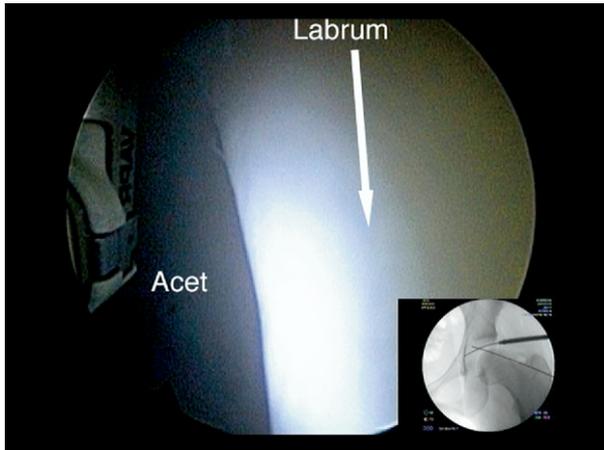


FIGURE 19. Point 16—Superior translation of the lens allows visualization of the anterolateral labrum.

needle is directed from the AL portal toward the medial physeal scar of the femoral head. Once the capsule is entered with the needle, a return of arthroscopic fluid confirms entry into the peripheral compartment. The capsule is then dilated over a guidewire. The visual flow once inside the peripheral compartment is from medial to lateral along the femoral head and then from lateral to medial along the femoral neck.

Upon entering the peripheral compartment from the AL portal, the initial view is typically of the medial neck. If the camera is oriented so that it is looking down upon the femoral neck, *point 18* is a very consistent landmark, comprised of the orbicular liga-

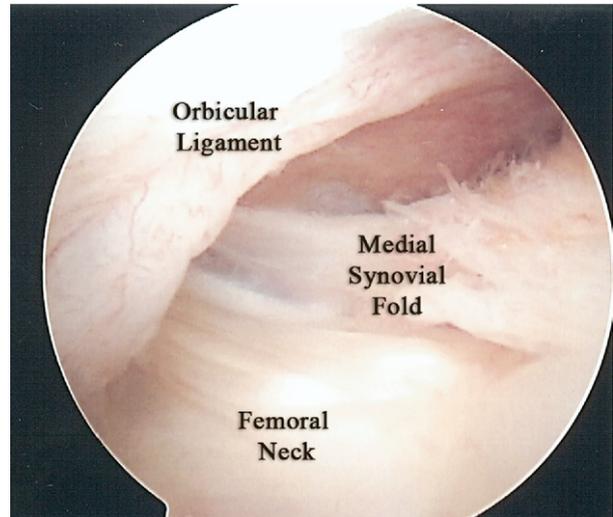


FIGURE 21. Point 18—Within the peripheral compartment of a left hip and with the leg out of traction, the medial femoral neck is first encountered. Also seen are the orbicular ligament and medial synovial fold.

ment, medial synovial fold, and femoral neck (*Fig 21*). Like the acetabular fossa and the ligamentum teres in the central compartment, the medial synovial fold and orbicular ligament serve as excellent orientation landmarks.

From the medial neck, the camera is directed superiorly and slowly retracted as it is gently maneuvered under the orbicular ligament, sliding into *point 19*, the medial gutter (*Fig 22*). It is not uncommon for loose bodies to be hidden in this area. After viewing the

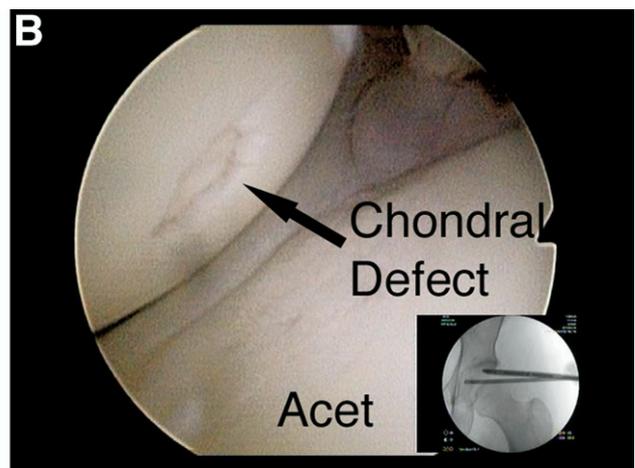
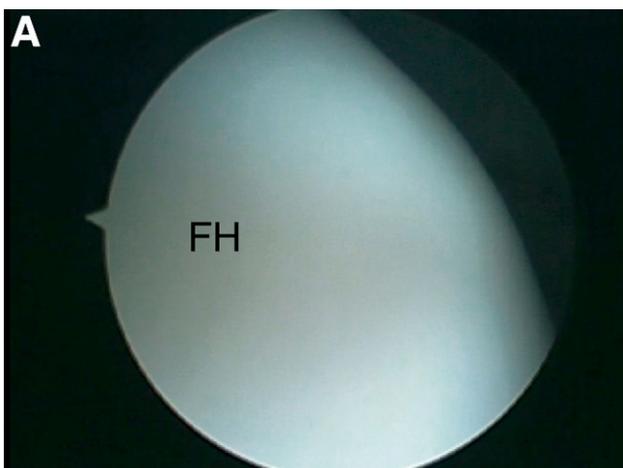


FIGURE 20. (A) Point 17—Another perspective of the femoral head seen by rotating the lens. (B) Focal articular cartilage injury sustained after a dislocation episode.

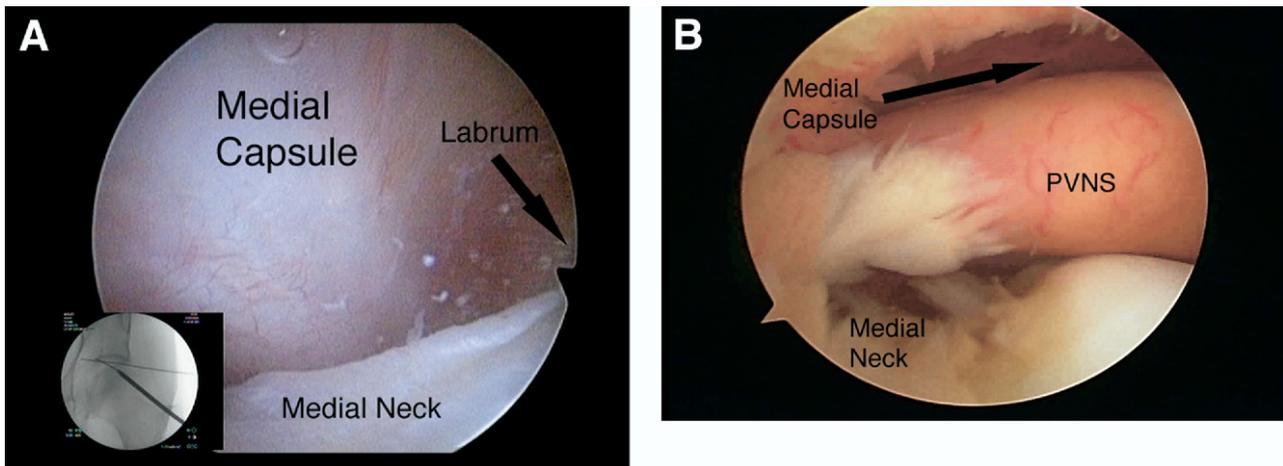


FIGURE 22. (A) Point 19—The medial gutter, which should be examined for loose bodies. (B) Visualization of medial gutter filled with pigmented villonodular synovitis (PVNS) in a 23-year-old patient.

medial gutter, the scope can be rotated laterally, sliding along the entirety of the anterior femoroacetabular interface to visualize the anterior and lateral labrum (*points 20 and 21*; *Figs 23 and 24*).

The anterior capsule is usually too stiff to allow inspection past the lateral aspect of the labrum into the lateral gutter. Therefore, the PL aspect of the peripheral compartment is not a point on our routine examination. On rare occasions, however, the hip can be flexed to 60° and abducted to 45°, allowing the arthroscope to pass between the lateral synovial fold and the orbicular ligament into the PL gutter.

This area is small, because the posterior joint capsule insertion is 2 to 3 cm proximal to that of the anterior capsule.³⁰

From the lateral aspect of the femoral head, the camera is withdrawn distally to arrive at *point 22*, the lateral aspect of the femoral neck (*Fig 25*). From here, the fibers of the orbicular ligament can be seen from the peripheral compartment side and correspond nicely to the previous view from the central compartment. This is also the most common area for the cam lesion commonly seen with femoroacetabular impingement.³¹⁻³⁵ With a view of the lateral femoral

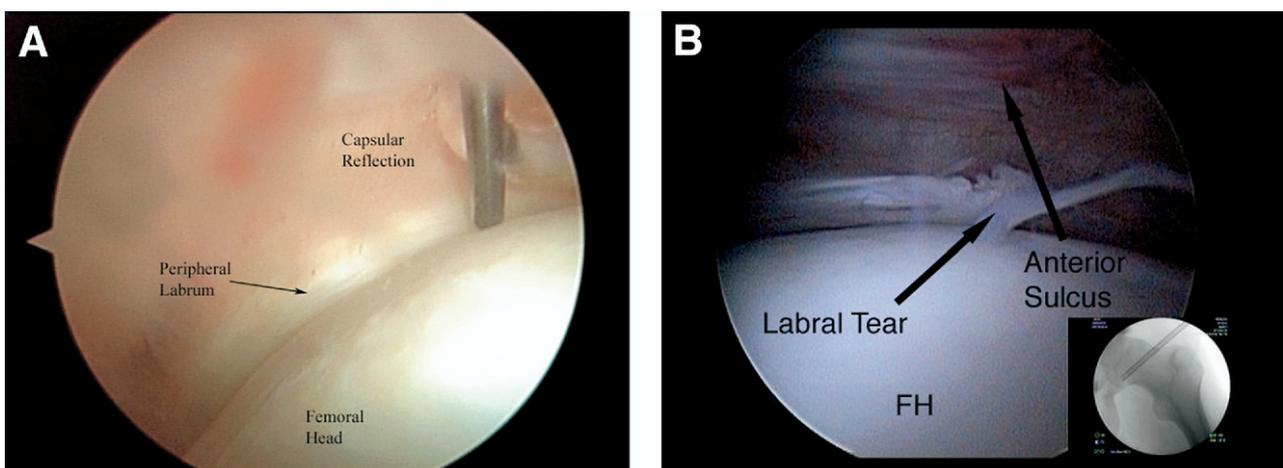


FIGURE 23. (A) Point 20—Anterior labrum, seen by sliding the arthroscope along the anterior femoroacetabular interface. (B) Torn labrum that is seen only after entering the peripheral compartment. Central visualization did not reveal any pathology in that area.

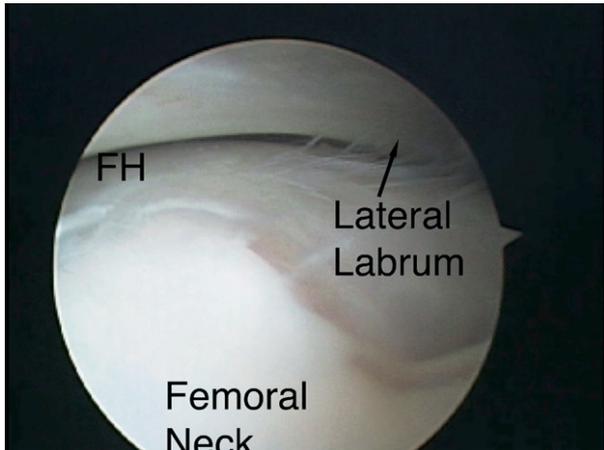


FIGURE 24. Point 21—Lateral labrum, seen by sliding the arthroscope along the anterior femoroacetabular interface.

neck, the leg is flexed and internally rotated to document impingement of the femoral neck with the lateral acetabulum.

From the lateral neck, the arthroscope is rotated medially to view *point 23*, the anterior neck (Fig 26). Unlike the medial and lateral synovial folds, the anterior synovial fold is tightly adherent to the anterior femoral neck and rarely a distinct anatomic entity. The arthroscope is then pushed toward the medial neck where the orbicular ligament and medial synovial fold

again come into view. This completes the round trip of the peripheral compartment and the 23-point arthroscopic examination of the hip.

DISCUSSION

Paramount to effective arthroscopy within any joint is careful preoperative planning, precise portal placement, knowledge of the potential complications, and a methodical sequence of arthroscopic examination, progressing from 1 part of the joint cavity to another in a systematic fashion. Unfortunately, a consistent routine within hip arthroscopy has yet to be published. The 23-point arthroscopic examination of the central and peripheral compartments ensures that all components of the hip are carefully inspected and increases the accuracy and reproducibility of diagnostic hip arthroscopy. This standard arthroscopic method also helps to identify both normal structures and their pathologic counterparts. In addition, it allows us to correlate arthroscopic findings with clinical presentations, enhancing our diagnostic abilities and providing better clinical outcome studies. As new indications and techniques evolve within hip arthroscopy, this standardized approach to diagnostic hip arthroscopy provides a reproducible technique to safely assess both central and peripheral compartment structures.

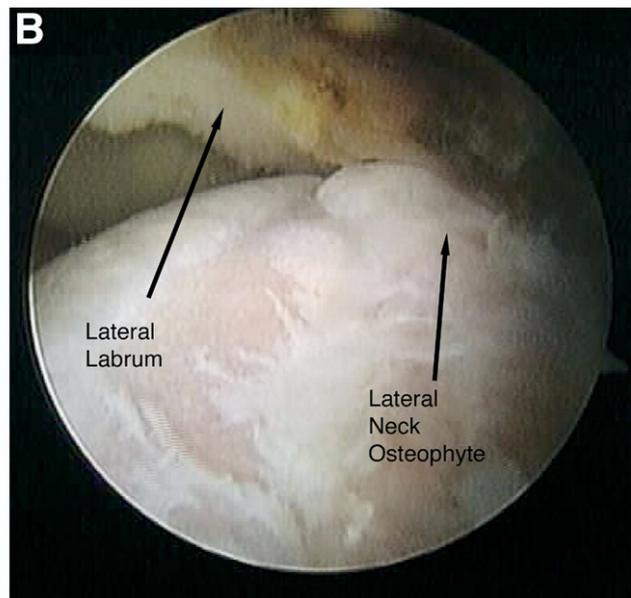
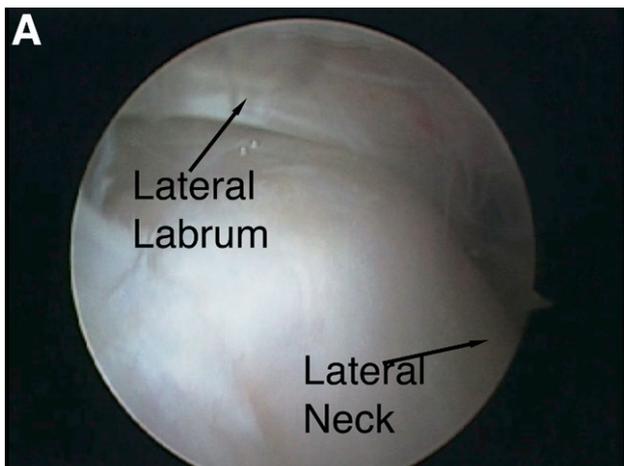


FIGURE 25. (A) Point 22—Lateral femoral neck. (B) Impingement osteophyte visualized over the lateral head-neck junction.

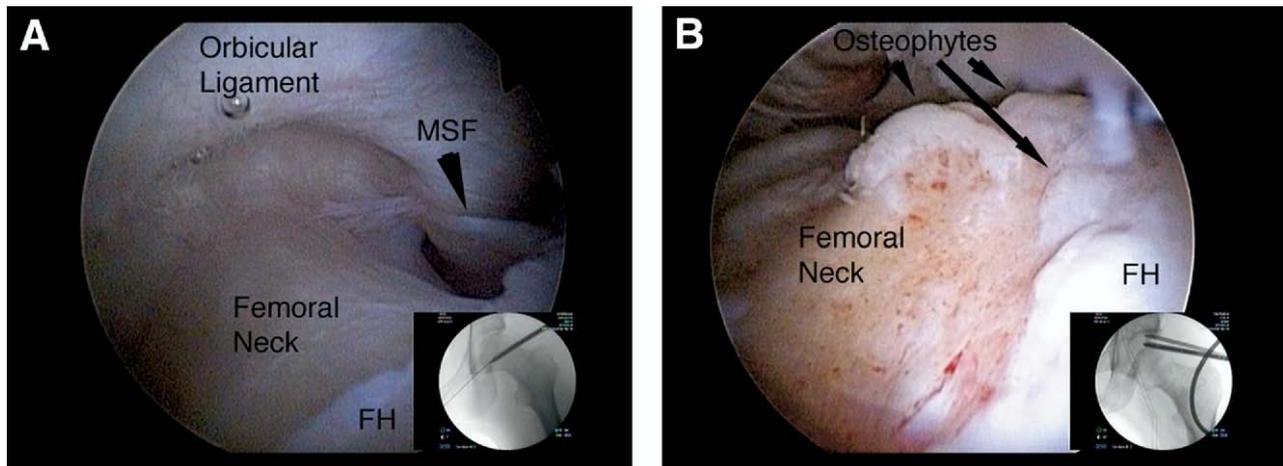


FIGURE 26. (A) Point 23—The anterior femoral neck is seen by rotating the arthroscope medially. The tightly adherent anterior synovial fold can be viewed from this position. (B) Femoral neck osteophytes seen in a patient with early arthritic changes. (Abbreviation: MSF, medial synovial fold.)

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