Hip Arthroscopy for Space-Occupying Lesions Within the Acetabular Cotyloid Fossa

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Abstract: Standard hip arthroscopy emphasizes access to disease within the peripheral compartment. The author describes precise access to the central compartment for removal of space-occupying lesions within the cotyloid fossa. These lesions can compromise the space available for the ligamentum teres and possibly contribute to the development of cam/pincer lesions and articular-sided labral tears by altering the congruency of the hip joint. Importantly, this novel approach does not impair the ability to complete the more widely known surgical techniques used within the peripheral compartment. [Orthopedics. 2014; 37(7):461-465.]

Hip arthroscopy is increasingly recognized as a treatment option for patients with cam/pincer lesions and labral tears. Importantly, recent articles by Shindle et al, Larson et al, and Philippon et al characterize guidelines that one could use in selecting and deselecting patients for hip arthroscopy. Current consensus suggests that patients 50 years or older with 2 mm or less of joint space are unlikely to benefit from surgery. While this may be true, emphasis has not been placed on improving access to the hip joint in patients selected for surgery. Specifically, the role of the central compartment in the development of cam/pincer lesions, labral tears, and/or chronic hip pain remains unknown. Current recommendations for treatment of these lesions exploit surgical techniques that focus on the peripheral compartment. This singular approach may unduly narrow the surgeon’s understanding of hip disease across a broad adult age range, particularly in patients with chronic hip pain when more obvious cam/pincer and/or labral tears are not apparent on radiographs or magnetic resonance imaging (MRI).

Materials and Methods
When evaluating patients with hip pain, a clinical history and physical examination is completed with emphasis on range of motion of the hip joint and elucidation of symptoms. A useful maneuver is the so-called cotyloid test, wherein the patient is lying supine with the hip and knee in full extension. In this position, the physician strikes the heel in both internal rotation (IR) and external rotation (ER). This maneuver is thought to simulate axial weight bearing of the hip joint with the ligamentum teres (LT) in both lax (IR) and taut (ER) positions, and should be repeated in the operating room under fluoroscopy, save striking the heel. A positive maneuver is thought to induce pain deep within the hip joint and should be correlated with standard maneuvers that elicit femoroacetabular impingement (FAI) at the extremes of motion. Plain radiographs and MRI are obtained and carefully reviewed. While acetabular retroversion, a positive cross-over sign, and an abnormal alpha angle have been described on radiograph, one should additionally look for medial extension of the sourcil into the cotyloid fossa (Figure 1). Medial extension of the sourcil is readily observed on radiograph and such observation may imply insufficient space within the cotyloid fossa for the LT (Figure 2). A contrast MRI may accentuate a labral tear; however, emphasis should not be placed on this observation.
alone, as the contents of the central compartment should be assessed as well. On proceeding to hip arthroscopy, the affected hip is reexamined while under anesthesia with the aid of fluoroscopy. The surgeon should perform the cotyloid maneuver under anesthesia and ascertain consistent dynamic congruency of the hip joint throughout its ranges of motion. An axial load is applied to the extremity with the knee in full extension and the hip in full extension to 15° of flexion. The surgeon should obtain and then compare the various anteroposterior fluoroscopic images, serially evaluating the congruency of the hip joint. Frequently, only 4 to 5 images are required. By using the cotyloid maneuver under fluoroscopy, the surgeon attempts to assess consistent congruency of the hip joint during the gait cycle and the role the cotyloid fossa may play in the pathomechanics of disease.

Below, the author describes a novel technique for access to the central compartment of the hip joint by expanding on the case report of Brannon, with the view that space-occupying lesions within the cotyloid fossa may induce hip pain and be associated with both cam/pincer lesions and labral tears within the peripheral compartment.

**SURGICAL TECHNIQUE**

**The Anterolateral Portal**

The patient is placed in the hemi-lithotomy position. This position allows the surgeon to obtain a lateral view of the acetabulum, ensuring that the anterolateral portal is placed within the anterior one-third of the hip joint. In the hemi-lithotomy position, a bisector of the patella must face the ceiling at 90°. After traction is applied to the affected extremity, a sagittal line is drawn inferiorly from the anterior superior iliac spine. If the suction seal must be overcome to distract the joint, the labral mechanism is functioning and its takedown for rim trimming of the acetabulum should be carefully considered. The presence of the suction seal does not exclude a labral tear at the acetabular rim. If the suction seal is reexamined while under anesthesia, the surgeon should proceed with rim trimming of the acetabulum, ensuring that the anterior one-third of the hip joint is overlapped by no more than one-eighth of the femoral head. Use of the 3.2-mm blunt wire avoids the inadvertent penetration of the labrum often anticipated with blind insertion of a 17-gauge needle under fluoroscopy. A capsulotomy may increase maneuverability of the arthroscope and instrumentation, but it also allows extravasation of fluid into the surrounding soft tissue. Excessive fluid extravasation will shorten the effective working length of the arthroscope and increasingly restrict surgery to the peripheral compartment as the procedure progresses. The soft tissue is dilated around the 3.2-mm blunt wire and the 6-mm clear cannula, without distal or proximal threads, is then inserted deep into the central compartment over the 3.2-mm blunt wire (Figure 4). The 3-mm 30° arthroscope, having a 5-mm outer sheath, is inserted through...
the clear cannula and into the hip joint. Inflow and outflow are provided through this single anterolateral portal, allowing the surgeon to immediately achieve visual clarity (Figure 5).

The peripheral and central compartments may be explored by telescoping the arthroscope into and out of the clear cannula. The quality of the pulvinar is evaluated, and space-occupying lesions within the cotyloid fossa should be identified after this process is completed. The presence of a tear of the LT or hypertrophy thereof is documented. Blistering at the rim of the acetabulum can be easily observed and implies rim loading of the acetabulum (Figure 6). The chondrolabral junction should be evaluated for the presence of an articular-sided labral tear.

The Lateral Portal

Using the targeting guide, the lateral portal is established with the 3.2-mm blunt wire or a 17-gauge needle under direct arthroscopic visualization (Figure 7). The 8° entry slot of the targeting guide is often used, as it creates a trajectory from anterolateral to anteromedial, achieving a triangular apex with the lateral portal within the cotyloid fossa. The anterior portal creates the anterior arm of the arthroscopic triangle.

The lateral portal is the workhorse for thorough debridement and reshaping of the cotyloid fossa. This portal can also be used for rim trimming and labral repairs/debridement of the posterior acetabulum up to its mid-coronal plane. The anterior portal is used for rim trimming and labral repairs/debridement from the mid-coronal plane to the anteromedial margin of the acetabulum (Figure 9). Once the femoral head is located, the hip is flexed and internally and externally rotated for debridement of anterior and posterior cam lesions within the peripheral compartment.

Discussion

When completed safely, hip arthroscopy can provide significant relief of hip pain in patients with mechanical impingement of the femoral head-neck junction against the rim of the acetabulum (ie, FAI). In 2011, Larson et al reported on 227 hips, having been divided into 2 groups: (1) 169 FAI hips and (2) 58 FAI-osteoarthritis (OA)
hips. Using the Harris Hip Score (HHS) and the Short Form-12 (SF-12), Larson et al\(^2\) observed an overall failure rate of 52% in the FAI-OA group at a minimum of 12 months. By comparison, only a 12% failure rate was observed for the FAI group. Larson et al\(^2\) correctly observed joint space narrowing by characterizing the relationship of the femoral head to the acetabulum at the lateral sourcil, the middle sourcil, and above the fovea. However, Larson et al\(^2\) did not recognize that extension of the medial margin of the sourcil to the medial wall of the acetabulum may imply the presence of heterotopic bone within the cotyloid fossa. Mofidi et al\(^2\) called this observation the saber tooth sign, a finding consistent with early OA. In 2012, Philippon et al\(^3\) reported on their prospective study of 153 patients and included age older than 50 in their analysis. When using the Modified HHS (MHHS), the Hip Outcome Score (HOS), and the SF-12 to document outcome, Philippon et al\(^3\) observed a total hip replacement rate (THR) of 20% (31 of 153). When Philippon et al\(^3\) controlled for age and days from injury to surgery, a preoperative MHHS of less than 60 and joint space narrowing of 2 mm or less were identified as independent risk factors for a THR ($P \leq .001$). Philippon et al\(^3\) reported a mean time of conversion to a THR of 1.6 years (range, 3 months to 4 years). Both Larson et al\(^2\) and Philippon et al\(^3\) sought to improve surgical outcomes by deselecting certain patients going forward, using a defined surgical approach to the peripheral compartment.

Space-occupying lesions within the cotyloid fossa may compromise its function by altering the congruency of the hip joint. Indeed, the labral mechanism mitigates this tendency; however, space-occupying lesions within the cotyloid fossa may compromise its function by altering the congruency of the hip joint. Poor coverage and the absence of congruency is well recognized in the dysplastic hip; however, how a normal hip maintains congruency throughout its range of motion is not well understood, as most measurement tools focus on static relationships between the hip and the femoral head (eg, the center edge angle of Wiberg). It is the author’s belief that the suction seal provided by the labrum is dynamic, called on when the inertia of the femoral head or distraction forces oppose its congruency within the hip joint. Indeed, the labral mechanism mitigates this tendency; however, space-occupying lesions within the cotyloid fossa may compromise its function by altering the congruency of the hip joint.

Recently, Konan et al\(^6\) described access to the central compartment, yet what they achieved surgically once therein was not described. These authors focused on improving op-
copy places emphasis on safely achieving surgical access to the central compartment so that the cotyloid fossa can be thoroughly debrided by performing an intra-articular saucierization. Intra-articular saucierization of the acetabular cotyloid fossa may include removal of heterotopic bone, loose bodies, a fibrotic pulvinar, and shrinkage\(^7\) of the LT. This extensive debridement technique increases the space available for the LT and may mitigate loss of congruency of the hip joint during the gait cycle. Importantly, using the techniques described here, cam and pincer lesions can be easily addressed, as they lie within the arthroscopic triangle (Figure 10).

CONCLUSION
Reported outcomes may correctly deselect patients with FAI-OA pathology; however, the standard arthroscopic approach for FAI has the unintended effect of preventing access to treatable pathology within the central compartment. As surgical skills improve among surgeons, observations and experiences that are the result of alternative approaches, and expand one’s knowledge base should be considered.

REFERENCES