

Hip Arthroscopy: An Emerging Technique and Indications

Ehud Rath MD¹, Oren Tsvieli MD² and Ofer Levy MD MCh(Orth)³

¹Minimally Invasive Orthopedic Surgery Unit, Orthopedic Division, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel

²Department of Orthopedics, Soroka Medical Center and Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer Sheva, Israel

³Reading Shoulder Unit – Royal Berkshire Hospital, Orthopaedic Surgery Research and Learning Centre, Brunel University, London, UK

ABSTRACT: Hip arthroscopy is one of the most rapidly evolving arthroscopy techniques. It combines the benefits of a minimally invasive procedure and a short rehabilitation period. Improved instrumentation and technical skills have advanced our ability to accurately diagnose and treat various conditions. The role of this procedure continues to evolve with new indications that might change the outcome of degenerative joint disease of the hip joint. Hip arthroscopy is indicated for both traumatic and atraumatic intra and extra-articular conditions. Femoroacetabular impingement (FAI) is increasingly recognized as a disorder that can lead to progressive articular chondral and labral injury. A variety of arthroscopic techniques allows the treatment of labral and acetabular rim pathology as well as peripheral compartment femoral head-neck abnormalities. It is now recognized that labral tears that were traditionally treated with simple debridement are often associated with underlying FAI. Hip arthroscopy is also being used for surgery to the structures surrounding the hip as snapping hip syndromes, greater trochanteric pain syndrome, and arthroscopic repair of abductor tendon tears. Better understanding of the arthroscopic anatomy, improved operative techniques, lowered complication rate and objective outcome measuring tools will further define the optimal role of hip arthroscopy and improve its outcome.

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In 1929 Burman thought "it might be possible to see the interior of joints directly through a proper instrument introduced into the joint" [1]. His concept challenged Bircher's assumption in 1922 that only the knee joint was suitable for endoscopic examination. Bircher called the procedure "arthroscopy." Burman reported that it was "impossible to insert a needle between the head of the femur and the acetabulum." However, he determined that the visualization of what we now call the "peripheral

Hip arthroscopy is a minimally invasive technique with a high safety profile, especially when the "open" alternative is considered

compartment" to be an unusual success. He emphasized that "it is not at all difficult to see into the hip joint and that it is the neck of the femur which here commands our interest." More than 70 years later the peripheral compartment is a major working field in hip arthroscopy for the treatment of femoroacetabular impingement [2-4]. Improvements in the understanding of hip anatomy, pathophysiology and treatment options have enabled the health care team to better diagnose and treat pathologic hip conditions.

AN EMERGING TECHNIQUE

The frequency of hip arthroscopies has been increasing explosively over the past years, leading to a hugely improved technique and greater understanding of the arthroscopic anatomy of the hip joint. Arthroscopic hip procedures can successfully treat conditions previously unrecognized or only treatable by open procedures. Improvements in technology have made the procedure accessible and reproducible. Arthroscopy for intra-articular conditions and endoscopy for periarticular pathologies continue to evolve. With the increased understanding of hip pathology and the onset of new concepts such as femoroacetabular impingement, the need for an arthroscopic access not only to the central compartment of the hip but also to the periphery became evident.

The patient is positioned on a fracture table either supine or in the lateral decubitus position, as dictated by the surgeon's preference [5-7]. An extra-wide well-padded perineal post is important to protect the perineum from excessive pressure by distributing the traction forces over a greater area. To gain access to the central compartment of the joint, fluoroscopic controlled traction is mandatory. Adequate joint distraction of at least 10 mm head-socket separation allows safe portal placement. Traction is released for peripheral arthroscopy [Figure 1]. Cannulated obturators allow passage of a cannula-obturator system over a guide wire. Angled instruments may be needed to go around the femoral head. A slotted cannula facilitates passage of these instruments [8]. Thermal devices with various tip shapes allow removal of soft tissue, shrinkage and stabilization of chondral flaps, and hemostasis.

Figure 1. Fluoroscopic and arthroscopic views of the central (left) and peripheral (right) compartments



EMERGING INDICATIONS

Once considered an operation looking for an indication [9], arthroscopy of the hip is now a well-accepted technique. Dr. Harris’ premise that all cases of osteoarthritis begin because of some specific underlying cause [10] is now supported by the work of Ganz and others [4,11], on the role of femoroacetabular impingement as a cause of subsequent osteoarthritis. In the late 1980s and 1990s arthroscopic hip procedures were focused on traction techniques to facilitate access to the central compartment [7,12].

The indications for hip arthroscopy have emerged over the last two decades alongside the understanding of pathological processes. The recognition of hip pathologies is still advancing; therefore, there is no clear classification system for the wide spectrum of hip pathologies. Current indications for hip arthroscopy include intra-articular and extra-articular pathologies [Table 1].

PATIENT HISTORY FOR HIP AND PELVIS PAIN

A patient's history is the first step in making the differential diagnosis for patients presenting with hip and pelvis pain.

Table 1. Common indications for hip arthroscopy and endoscopy

Intra-articular	Extra-articular
Femoroacetabular impingement	Snapping iliopsoas
Chondral lesions	Snapping iliotibial band
Labral tears	Gluteus medius tear
Osteochondritis dissecans	Trochanteric bursitis
Ligamentum teres injuries	
Loose bodies	
Synovial diseases	
Infection	

Common indications for hip arthroscopy are both intra and extra-articular pathology. Femoroacetabular impingement is one of the main indications, as well as snapping syndromes, synovial diseases and many more

Key questions include whether the symptoms developed gradually or as a result of a traumatic episode. It is important to inquire about the primary location of the pain – is it the groin, lateral hip, posterior hip, buttock, or low back pain – and whether the pain is palpable or deep. Mechanical symptoms such as clicking, locking or giving way may be a result of a free body, unstable labral tear or chondral flap [13].

What is the pain associated with? Is it present when getting in and out of a car, rising from a sitting position, “cutting” or pivoting sporting activities, putting on shoes and socks. Is there pain at night? This may be associated with avascular necrosis of the femoral head or with advanced degenerative hip disease. Radicular pain, parasthesia and weakness suggest neurologic involvement.

The clinician should ask about previous treatments and injections – where and what was injected and what was the response? What kind of physical therapy and exercises alleviated or exacerbated the pain?

PHYSICAL EXAMINATION FOR EVALUATION OF HIP PAIN

A thorough physical examination for the assessment of hip pain includes inspection, gait evaluation, palpation, range of motion assessment, and a number of specific examination tests of both intra and extra-articular structures [14].

Examples for special tests include the flexion adduction internal rotation (FADDIR) test that may indicate anterior femoroacetabular impingement. The posterior impingement test is assessed by extension of the involved hip. The flexion abduction external rotation (FABER) test, commonly used to evaluate sacroiliac joint pain, is also positive in the case of pincer type FAI. One should note the distance between the knee at the figure of four position and the examination table and compare it to the contralateral hip [15]. This may indicate pincer-type FAI.

IMAGING STUDIES

Imaging of the painful hip includes a well-centered anteroposterior pelvis and lateral view of the affected hip [16,17]. Computerized tomography is excellent for bony structures. Three-dimensional CT scan is the best modality to show the head-neck junction in patients suspected of having FAI [Figure 2].

Magnetic resonance imaging offers a non-invasive method to screen patients with symptoms referable to the hip by revealing the presence of focal chondral lesions and labral tears. Magnetic resonance arthrography demonstrates greater sensitivity in detecting intra-articular pathology, including labral tears [18].

FAI = femoroacetabular impingement

Figure 2. [A] Fluoroscopic image of combined cam and pincer FAI. **[B]** After osteoplasty of the femoral cam lesion and the acetabular pincer



CURRENT TRENDS OF ENDOSCOPIC HIP PROCEDURES

Femoroacetabular impingement: Ganz and colleagues [4] introduced the concept of FAI as a dynamic cause for osteoarthritis of the hip. Impingement within the hip joint is a mechanical conflict between the bone of the femur and the acetabulum. It can be developmental as a result of childhood conditions such as Legg-Calvé-Perthes disease [19] and slipped capital femoral epiphysis, traumatic changes in inclination and anteversion angles [20], decreased femoral head-neck ratio and/or overgrowth of the acetabular rim. The cam (abnormal femoral head-neck junction) or pincer (acetabular abnormality) deformity causes breakdown of marginal edges of the articular cartilage adjacent to the labrum often with associated labral tear [Figure 3].

The surgical goal is to eliminate impingement of the femoral head-neck junction on the anterior aspect of the acetabular rim by removing the excessive bone from the femoral head-neck junction and/or the anterior-lateral aspect of the acetabulum [21]. This can be achieved either by open

surgery or arthroscopy. Arthroscopic management of FAI provides excellent visualization, minimizes surgical trauma and enhances recovery. Additional data are needed to define the long-term clinical impact of arthroscopic management on the natural history of FAI.

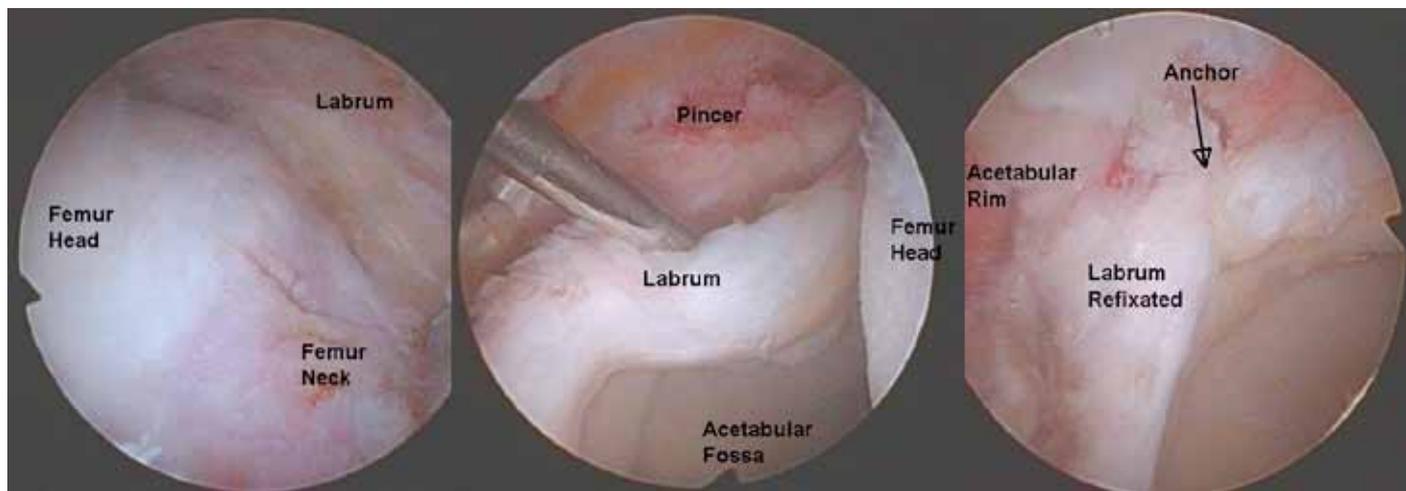
Labral tears: The acetabular labrum acts as a seal, ensuring more constant fluid-film lubrication within the hip joint and limiting the rate of fluid expression from the articular cartilage layers of the joint. It contributes to the stability of the hip joint by its valve effect and assists in load sharing. Labral tears can result from trauma, FAI, degenerative or unknown (idiopathic). Diagnosis of labral tears is based on the clinical presentation and MR arthrography. The decision whether to resect the torn labrum or repair it is based on the quality of the labral tissue and blood supply. Labral preservation is important [22]. Labral repair is associated with less progression of degenerative change in the hip [23]. Arthroscopy allows easier access to the labrum for resection and repair with significantly less morbidity than open surgery.

Chondral lesions: Articular surface derangement in the hip may be acute, chronic, or degenerative and may be partial or full thickness. It can result from acute trauma, repetitive micro-trauma as in FAI, dysplasia, the presence of loose bodies, or osteonecrosis of the femoral head [24].

Arthroscopic options may include abrasion chondroplasty, microfracture, mosaicplasty, autologous chondrocyte implantation, and peripheral rim trimming for lesions located on the acetabular rim [23]. The long-term benefit of these various methods to treat chondral defects in the hip has yet to be demonstrated.

MR = magnetic resonance

Figure 3. Pincer-type FAI, before osteoplasty. Notice femoral neck erosion and synovitis (left), in the process of separating the labrum from pincer, to make room for pincer osteoplasty (center), and (right) following pincer osteoplasty; labrum has been re-fixed with an anchor to the now reshaped acetabular rim.



PERIARTICULAR HIP ENDOSCOPIC SURGERY

Greater trochanteric pain syndrome is a term used to describe chronic pain overlying the lateral aspect of the hip. This relatively new term includes greater trochanteric bursitis, gluteus medius, and minimus pathology and external snapping hip. Recalcitrant hip pain and lack of response to conservative management with a presumed diagnosis of trochanteric bursitis may reveal a previously unappreciated tear of the gluteus medius [25]. Endoscopic repair of gluteus medius tendon tears of the hip appears to provide pain relief and return of strength in selected patients in whom conservative measures failed.

Snapping hip is characterized by an audible or visual snap around the hip joint during hip flexion and extension. External snapping or iliotibial band friction syndrome is particularly common in athletes. It is caused by repetitive movement of the iliotibial band over the greater trochanter. Internal snapping is produced by the iliopsoas tendon snapping over the iliopectineal eminence or the femoral head. Surgical treatment is indicated only for symptomatic cases that do not improve with conservative measures. Endoscopic iliotibial band release and iliopsoas tendon release are effective in resolving these problems [26,27].

KNOWN COMPLICATIONS OF HIP ARTHROSCOPY

Hip arthroscopy is considered a safe procedure, but like any other surgical procedure it has complications. Most reported complications are associated either with traction injuries or patient positioning, or other surgery-related injuries. Traction can cause nerve palsy or neuropraxia, mostly transient, in about 2% of patients [28,29]. Other traction-related complications include perineal integument injuries and genitoperineal skin necrosis [30,31]. Surgery-related complications include lateral femoral cutaneous nerve or sciatic nerve injury upon introducing the posterolateral portal [32]. Some rare complications can occur: Hip dislocation due to overcorrection, especially in a dysplastic joint [33,34], extravasation of fluids into the retroperitoneal or abdominal cavity [35-37], iatrogenic intra-articular foreign body due to surgical apparatus breakage, and labral and chondral iatrogenic induced damage [28,29]. A late potential postoperative complication of hip surgery, less known in hip arthroscopy, is heterotopic ossification [38], although the rate is unknown. Suggested treatment and prevention is by radiation, non-steroidal anti-inflammatory drugs and colchicine [39].

SUMMARY

Hip arthroscopy has evolved tremendously in the last decade. Advances in hip arthroscopic techniques improved the diagnosis and treatment of intra-articular hip problems that were previously unrecognized. The indications for hip arthroscopy continue to grow. Improvements in technology have made the procedure accessible and reproducible. Improved clinical correlations of symptoms to pathology will influence further

evolution of endoscopic techniques for better management of hip conditions.

Corresponding author:

Dr. O. Tsvieli

59/1 Avraham Avinu Street, Eilat 88303, Israel

email: tsvieli@gmail.com

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