Peripheral Compartment as the Initial Access for Hip Arthroscopy in Complex Cases: Technical Note

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Abstract: When performing arthroscopic procedures, the hip joint is divided into central and peripheral compartments. Currently, both compartments are evaluated in most of the procedures, but the procedures are usually started by accessing the central compartment. When a direct approach to the central compartment is significantly impeded, it is necessary to perform the initial arthroscopic approach to the hip from the peripheral compartment using either an intracapsular technique or an extracapsular technique. The technical pearls that might be required in these patients are discussed, and typical clinical cases are presented.

In 1988, Dorffmann et al. divided the hip joint space into 2 compartments—central and peripheral—that were separated by the acetabular labrum. In its initial conception, these 2 compartments were addressed differently, and, characteristically, the peripheral compartment was accessible without the need to establish traction. This division in central and peripheral compartments is artificial, and in most cases, both compartments need to be evaluated and accessed sequentially, although the procedures are usually started through the central compartment. Recently, a lateral compartment around the hip joint has also been used to assess peritrochanteric and sciatic pathology. To access the central compartment, it is essential to have an adequate joint distraction because it facilitates portal placement and atraumatic cannulae positioning and eases the intra-articular displacement of surgical instrumentation. Thus the conditions that hinder an easy approach to the central compartment have been considered a relative contraindication to hip arthroscopy.

The traditional way to address the peripheral compartment after the central compartment (repositioning the anterolateral portal after removing the arthroscope and removing traction, flexing the hip, and restarting the approach under fluoroscopy) has been replaced by performing, under direct arthroscopic vision, a progressive shift of the instruments from the central to the peripheral compartment while the traction is diminished.

Cases exist in which an initial central approach is not the best alternative; this happens when the central access is difficult or impossible and when the underlying pathology lies outside the central compartment or the joint itself. In these cases, it is possible to use an initial approach to the peripheral compartment, directly accessing the intracapsular anterior joint under fluoroscopic control and evaluating the central compartment afterward.

Other authors have proposed an extracapsular approach to the peripheral compartment; the anterior extracapsular space of the hip is blindly defined initially with the aid of fluoroscopy, then the anterior capsule is identified under arthroscopic visualization and a capsulotomy is performed to access the peripheral compartment.

The purpose of this study was to discuss the circumstances in which initial access to the peripheral compartment would be more desirable than initial access to the central compartment. The surgical techniques of the 2 alternate approaches to the peripheral compartment are presented.
compartment (extra- and intracapsular) are reviewed, and the potential advantages of each technique are discussed. Clinical cases representative of the circumstances in which such procedures are necessary are also presented.

**Surgical Technique**

Both procedures can be performed either in the lateral decubitus or supine position, depending on surgeon preference. A standard hip arthroscopy equipment set is necessary, including 70° and 30° optics, interchangeable cannulae, blunt rods, and specific shaver terminals and radiofrequency devices. In the peripheral compartment, the 70° optic is not always necessary, and adequate visualization of the relevant structures is possible with a 30° optic. A fluoroscope is essential, although it is usually only necessary to obtain a good anteroposterior view of the hip to begin the procedure and establish the first 2 portals.

**Extracapsular Technique to Access the Peripheral Compartment**

The extracapsular technique follows the peripheral compartment approach described by Sampson and Horisberger et al., popularized recently in Spain under the denomination outside-in approach. It is performed without skeletal traction and with the hip in 0° of extension. First, the greater trochanter tip is identified with fluoroscopic control, and an anterolateral portal incision is created in the skin 1- to 2-cm anterior and proximal to the tip of the greater trochanter. Then, while under fluoroscopic guidance, a blunt rod is placed through the fascia lata and aimed toward the center of the middle of the anterior femoral neck, sliding over the joint capsule and trying not to pierce through it.

A second distal anterior accessory portal is developed 5 to 8 cm distal to the anterolateral portal, in line with the longitudinal axis of the femoral neck, and another blunt rod is placed; then both instrument tips are made to converge. The arthroscope is placed at this level through 1 of the portals, the precapsular space is defined, and the iliofemoral ligament is identified with the help of motorized shavers and radiofrequency. Then, a longitudinal 1- to 2-cm capsulotomy is performed in line with the iliofemoral ligament fibers; the peripheral compartment is entered through the capsular incision. This capsulotomy can be lengthened as necessary to assess the full head-neck junction.

A third anterior portal can be made at the craneo-caudal level of the anterolateral portal and 1 to 2 cm lateral to a longitudinal line descending inferiorly from the anterosuperior iliac spine. The safety of the described portals has been clearly established, but attention to the position of the neurovascular structures is always mandatory. After the procedure, it is usually not required to suture the joint capsule, except in patients with extreme laxity (Figure 1).

A second distal anterior accessory portal is developed under direct visualization.

**Intracapsular Technique to Access the Peripheral Compartment**

The intracapsular technique is the classical approach to the peripheral compartment. The technique is performed without skeletal traction with the hip flexed to 45°. Initially, the same anterolateral portal is used; while under fluoroscopic guidance, a needle is placed through it and aimed at the most inferior and medial femoral neck, sliding through the joint capsule (Figure 2). Then, following the usual sequence of nitinol wire, dilators, cannula, and arthroscope, the peripheral compartment is visualized. A second anterior portal is developed under direct visualization.

In both techniques, once the work on the peripheral compartment is finished and after debridement or removal of the obstacle that prevents the access to the central compartment, the traction is established and the arthroscope and instrumentation are slid under direct vision inside the joint (Figure 2F), avoiding further injury of the labrum. Finally, the necessary surgical procedures at the central compartment are performed.
Hip arthroscopy is a technique that has developed greatly in the past 2 decades and is effective in the management of multiple pelvic problems. The surgical technique is hard to learn, and even experienced surgeons may have difficulties accessing the joint space in certain cases. Various conditions hindered the initial approach to the central compartment and, thus, are better accessed through an initial approach to the peripheral compartment. Furthermore, in other conditions, a peripheral approach is preferred because the pathology is located outside the joint, and an initial access to the peripheral approach seems a better option (Table).

Depending on the etiology, either an extracapsular or an intracapsular approach is preferred to solve the problem. If the pathology lies extra-articularly (heterotopic calcifications or anteroinferior iliac spine avulsions) or the capsule has lost its normal characteristics (previous hip arthroplasty), an extracapsular approach is preferred. If the pathology is intra-articular (large labral tears, slipped capital femoral epiphysis sequelae, coxa profunda, or hip osteoarthritis), an intracapsular approach avoids the need for extended capsulotomies.

### Os Acetabuli
Os acetabuli are small bone fragments detached from the acetabular rim that are often associated with hip impingement, acetabular dysplasia, and concomitant detachment of the labrum. Sometimes, their size may create a Pincer impingement. If they are located in the most cranial part of the acetabulum, they hinder the direct approach to the central compartment (Figure 1). These cases are especially difficult to manage because a common association often exists: the obstacle (caused by the bone fragment) and labral instability with a torn labrum. A central compartment primary approach might be performed, but a peripheral approach allows the surgeon to identify the bony obstacle and labral injury without causing further damage. After complete debridement and removal of the osseous, the central compartment can be accessed, the reattachment of the labrum can be performed (if necessary), and the surgeon can proceed with the remaining surgical maneuvers required in each case.

### Degenerative Labral Tears
Some patients, especially those with significant pincer-type femoroacetabular impingement or mild or moderate hip dysplasia, present with a large degenerative or torn labrum. When the lesions...
are situated in the anterosuperior labrum, it is possible to
damage the labral tissue when
a central compartment ap-
proach is performed. Although

techniques and tips exist to
avoid this complication,24 it is
often difficult to avoid a large,
detached, or severely damaged
labrum. Both the intra- and
extracapsular technique allow
for a safe and direct evalua-
tion of the labral and chondral
pathology without causing fur-
ther labral damage (Figure 2).

**Slipped Capital Femoral
Epiphysis Sequelae**

A slipped capital femoral
epiphysis may cause a cervi-
occephalic deformity that con-
ditions a cam impingement
(Figure 3).25,26 This is often the
case when significant displace-
ment of the physisal fragment
exists and epiphyseal fusion has
been performed in situ or the

The deformity makes a direct
approach to the central com-
partment difficult; furthermore,
early arthritic changes often ex-
ist, and adequate joint distrac-
tion for a safe approach to the
central compartment is difficult
to obtain. In these cases, either
an extra- or intracapsular
technique to access the peripheral
compartment can expose the
area of cervical dysplasia and
allow for a controlled anterior
resection. Then, it is possible to
enter the central compartment of
the joint.

**Periarticular Heterotopic
Ossifications**

Different types of hetero-
topic ossifications can appear
in the joint capsule and sur-
rounding areas and can cause pain or functional limitation of the
joint (Figure 4). These
calcifications may not have a
clear etiology or can present in
the context of previous surgery
of the hip, such as osteotomy,
arthroplasty or hip arthrosco-
py.27 The ossifications may be
obstacles for a direct approach
to the central compartment and
it is better to access the
peripheral compartment, with
an extracapsular technique
because the ossifications often
lie in the capsule itself and, if
an intracapsular technique is
attempted, the surgeon risks
colluding with the obstacle or
entering the joint without be-
ing able to identify the ossifi-
cations from inside the joint.

**Hip Osteoarthritis**

Although the indication
for an arthroscopic procedure
in patients with significant
degenerative changes of the
hip is controversial,28,29 some
patients might benefit from it.30,31 In these cases, the pro-
cedure is technically more
complex (Figure 5). Traction
is often useless to establish a
joint distraction that would
permit the development of direct access to the
central compartment. An in-
tracapsular approach to the
peripheral compartment allowed for identification
of the cervical deformity, and a femoroplasty was performed (B). Afterward, the
central compartment was accessed, and the chondral lesion was treated. At 17
months postoperatively, the patient was asymptomatic and returned to sports.

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**Coxa Profunda**

Patients with a coxa pro-
funda or protrusio acetabularis
present conditions that cause a
global femoroacetabular impingement that increases the chances of having long-term degenerative changes (Figure 5). These patients are candidates for surgery to prevent the occurrence of such problems. The arthroscopic approach is complex and technically demanding and usually requires extensive resection of the acetabular rim. Typically, the acetabular rim makes it impossible to access the central compartment directly, and the described direct approach techniques to the peripheral compartment are an excellent alternative.

**Avulsion of the Anterior Inferior Iliac Spine**

Avulsions of the anterior inferior iliac spine are rare disorders. The anterior inferior iliac spine can be avulsed by traction from the rectus femoris muscle, or a calcification of the proximal rectus muscle tendon can develop with time. This problem has also been described as a secondary complication of periacetabular osteotomies. Acute avulsions with large bone fragments may be amenable for osteosynthesis, but more chronic lesions often require a resection that can be performed arthroscopically (Figure 6).

The displaced spine makes a primary approach to the central compartment nearly impossible, but an extracapsular peripheral compartment approach can identify the bone formation and allow for complete resection (Figures 6A-D). It is not usually required to perform a formal tenotomy of the rectus femoris.

**Painful Hip Arthroplasty**

Occasional, patients with a painful hip arthroplasty are candidates for hip arthroscopy. The main indications are related to the presence of periprosthetic psoas tendonitis, instability, or persistent pain without a clear cause. Using arthroscopy for hip arthroplasty is considered a central compartment procedure, but a primary approach to the

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**Figure 5:** Patient 4. A 53-year-old man presented with significant hip osteoarthritis secondary to global pincer impingement caused by coxa profunda and periacetabular hyperostosis. The patient’s main concern was severe range of motion limitation, with flexion limited to 70°, –10° of extension, and locked 10° of internal rotation. Simple anteroposterior pelvis radiograph showing significant osteophyte formation in the left hip and bilateral coxa profunda; the articular space was partially maintained (A). An extracapsular approach to the peripheral compartment allowed for identification and resection of the osteophytes (asterisk) and rim resection (B). In the immediate postoperative period, calcification prophylaxis was initiated with indomethacin. At 5-month follow-up, range of motion in flexion-extension was 0°-100°, and the patient had regained some rotation.

**Figure 6:** Patient 5. A 17-year-old amateur soccer player presented with hip pain in extreme flexion and internal rotation that impaired his participation in sports. No clear traumatic event was recorded. Simple anteroposterior radiograph showing the avulsed spine (A). With the hip in traction, adequate joint distraction was observed, but the deformity hindered the approach to the central compartment (B). After an extracapsular peripheral compartment approach, the bony prominence was identified; the labrum was trapped inside the bone (C). The bone resection was performed (D). A labral reinsertion was performed (E). One year postoperatively, the patient regained normal function, range of motion, and level of activity.
The peripheral compartment is often more appropriate because, unless the indication is caused by loose bodies, disorders are located in the peripheral compartment, and the use of excessive traction can be avoided (Figure 7).

A tenotomy of the psoas tendon can be performed in its insertion into the minor trochanter or at the level of the joint. Tenotomy is performed near the edge of the acetabular component in cases in which obvious engagement exists. If not, it is performed in the lesser trochanter with the hip in maximum external rotation and 45° of flexion. In some cases, psoas irritation is secondary to osteophytes, and it is not necessary to perform a tenotomy but only an osteo-phyre resection osteoplasty. Arthroscopy in a painful hip arthroplasty is not reliable for identifying cases of micromobility of prosthetic implants, but it may be useful to diagnose infection by obtaining samples for culture.

**CONCLUSION**

Some conditions make an initial arthroscopic access to the peripheral compartment of the hip a better option than a central compartment access, including patients with os acetabuli, calcifications, or ossification of the labrum, slipped capital femoral epiphysis sequelae, hip osteoarthritides, isolated osteophytes, avulsion, or calcifications of the anterior inferior iliac spine or psoas tendinopathy after total hip arthroplasty. An initial access to the peripheral compartment, either with an intra- or an extracapsular technique, allows surgeons to adequately handle these complex cases.

**REFERENCES**


30. Griffin D. The role of arthroscopy in hip osteoarthritis. XXIX Meeting of the Spanish Arthroscopy Association; 2011; Santa Cruz de Tenerife, Spain.


