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Hip Arthroscopy Made Simple, Easy, and Elegant. A Novel Variant of the Outside-In Technique

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Abstract

Hip Arthroscopy (HA) is considered to be a demanding surgery with a steep and slow learning curve. Adequate HA instrumentation is required to perform a reproducible surgery. The technique most commonly used to access the hip is through the central compartment or from the "Inside-Out" with continuous distraction and specialized access equipment. Newer techniques start from the peripheral compartment called "Outside-In" techniques, these techniques have a safer access with a more controlled environment avoiding iatrogenic scuffing of the acetabulum, labrum or femoral head. The purpose of this surgical and novel variant technique from the "Outside-In" which we call *simple, easy, and elegant* is an excellent choice and can be part of the armament for young surgeons who are initiating in hip arthroscopy and preservation, our technique has been very reproducible and reliable with good to excellent results with very few complications.

Keywords: hip arthroscopy, peripheral compartment first, hip arthroscopy without fluoroscopy, simple hip arthroscopy, outside-in technique for hip arthroscopy

1. Introduction

The hip joint anatomy is known to be surrounded by a strong soft tissue mantle and muscles; this deep and constrained anatomy makes hip distraction very difficult. Hip arthroscopy (HA) is considered to be a demanding surgical procedure compared to other joint arthroscopies and is known to have a steep and very slow learning curve (**Figure 1**) [1, 2].

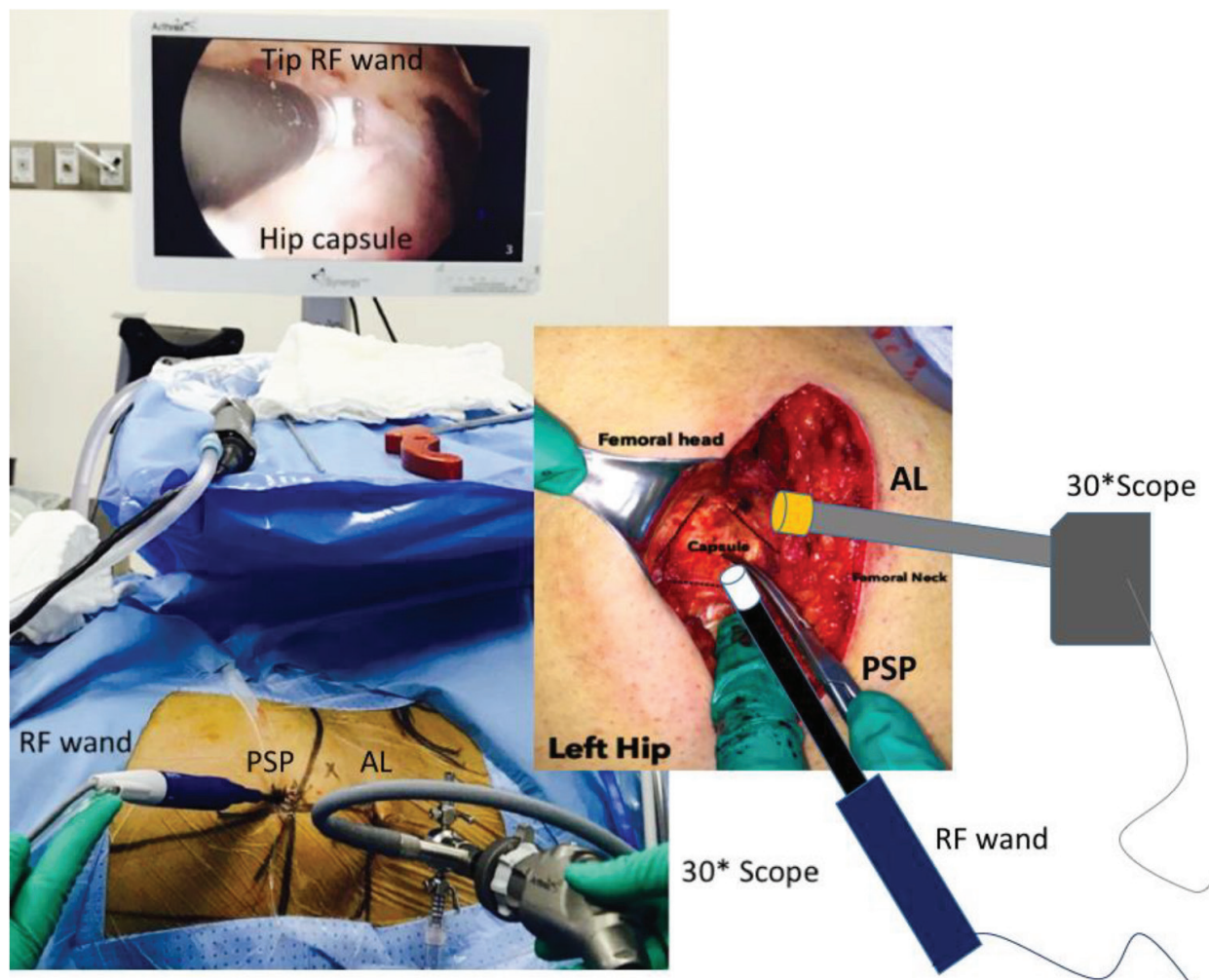


Figure 1. Left hip arthroscopy demonstrating the hip capsule. Observe the radiofrequency (RF) wand placed in the peritrochanteric space portal (PSP) and the 30° scope placed in the anterolateral portal (AL). Observe an open left hip (right quadrant picture) demonstrating the hip capsule, where the instruments are placed to perform the capsulotomy.

Hip arthroscopy is a unique specialty, which initiated in the nineteenth century. The last decade has seen an exponential rise in the number surgeries performed worldwide [3]. The procedure itself has evolved throughout this years.

Michael Burman was responsible for first cases describing hip arthroscopy in cadavers in 1931. He had developed a device comprised of a 4 mm trocar and a 3 mm arthroscope. Burman used this to examine 20 hip joints and after this, He then stated “it is manifestly impossible to insert a needle between the head of the femur and acetabulum.” He could never entry to the central compartment of the hip as all his surgeries were without traction. Later, Takagi in 1939 reported the first clinical application of hip arthroscopy in four patients: two with Charcot’s joint, one with tuberculosis, and one with septic arthritis [4].

Hip arthroscopy is a rapidly expanding procedure that has been gaining popularity in the medical field since the 1980s. Initially, the indications for hip arthroscopy were much more limited than for other joints because the hip joint anatomy which is known to be surrounded by strong soft tissue and muscles, which presents additional challenges to access and have

adequate maneuverability inside the hip. With improved instruments, hip distractors, patients positioning, equipment, hip capsular management and hip exposure techniques, the indications for hip arthroscopy have greatly expanded. In experienced and trained hands, this minimally invasive procedure may offer the potential for reduced iatrogenic neurovascular lesions [5, 6].

The most used arthroscopic surgical technique and worldwide used is the called “Inside-Out technique” which enters the hip joint through the central compartment (CC), with continuous distraction. This technique needs the aid of hip cannulated needles, a specialized hip access system, fluoroscopy and a hip fracture table (HFT) or distractor, adequate distraction is important in HA to avoid surgical iatrogenic complications like labral penetrations, labrum resections and also scuffing of the femoral head cartilage [7, 8].

Newer techniques have been published in performing HA from the “Outside-In” to approach the hip joint extra-articularly and starting from the peripheral compartment (PC) first, other techniques do not use specialized cannulated needles or a hip access system; and others have developed radiographic and anatomic landmarks to approach the anterior capsule without fluoroscopy (**Figure 2**) [7, 9, 10].

This “Outside-In” techniques have been developed to perform HA simple, safely, reproducible and more reliably; but what is most important they have been developed to avoid iatrogenic cartilage lesions while accessing the hip joint. As we all know HA has the disadvantage of being difficult and demanding because of his steep learning curve, is a very tedious procedure to perform and the operating room staff must be familiarized positioning the patient on a hip fracture table. Another very important factor is that this procedure has too much radiation burden from fluoroscopy [11].

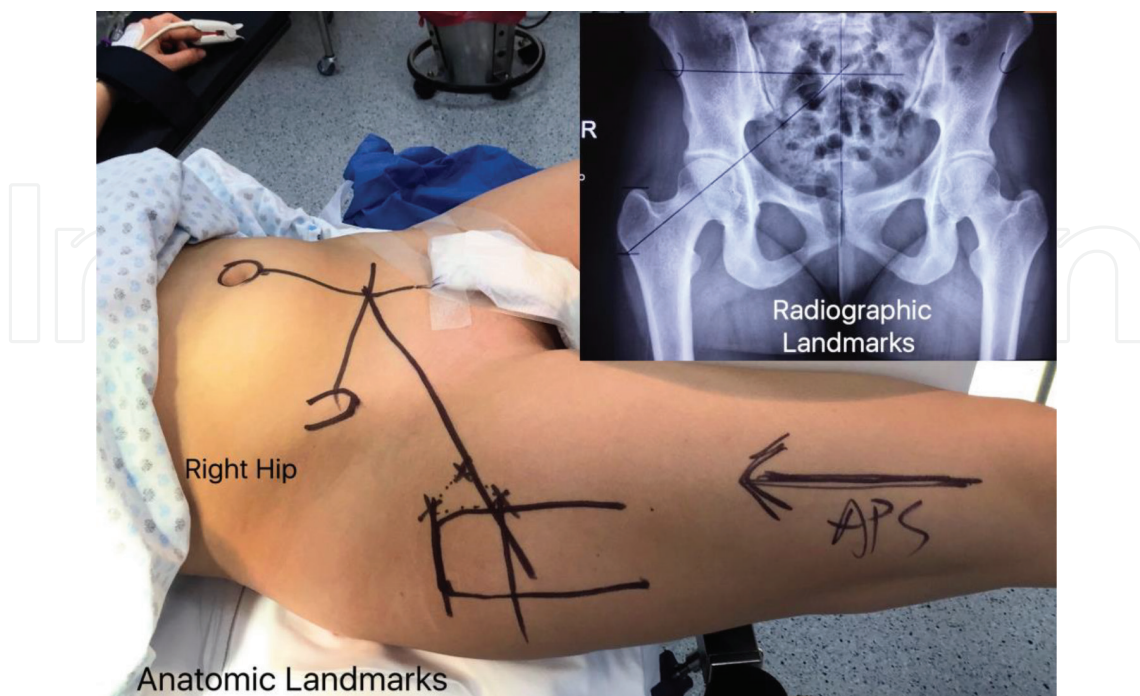


Figure 2. Radiographic landmarks (right upper corner X ray) and anatomic landmarks plotted in the patients right hip.

Performing HA reproducibly in third world countries has been challenging and the struggle in getting access to all HA equipment has made surgeons develop newer techniques; we developed this “Outside-In” technique which we call, *Simple*: Because we do not use any specialized access equipment or cannulated dilators or obturators to access the hip joint, *Easy*: Because we do not use fluoroscopy to aim the hip, instead we use radiographic and anatomic landmarks to approach the anterior capsule and *Elegant*: Because 90% of the case the operative hip is placed in a simple mayo table, which allows to perform a complete range of motion of the hip (flexion, extension, internal and external rotation) and allows access to almost every portion of the femoral head.

We started performing hip arthroscopy with this technique in January 2015–May 2017, 230 patients underwent HA, 116 patients with cam impingement, 55 Pincer impingement, 23 with mixt FAI, 4 internal snapping hips, 3 traumatic dislocation of the hip, 8 GII hip arthritis, 14 patients with avascular necrosis of the femoral head, 2 hip dysplasia, 3 Leg-Calve-Perthes and 2 patients with subspine impingement. Complications presented where, 1 patient with HA and core decompression presented erectile dysfunction who recovered at 6 weeks, 1 patient with numbness at the lateral thigh region who lasted 2 weeks, 1 patient presented a transitory femoral nerve palsy for 1 week, 1 patient developed a knee hematoma from traction, 1 patient developed a catastrophic supero-lateralization of the femoral head who underwent an uneventful THA (she had arthritis grade III and dysplasia), no infections, no instability. The follow-up of our patients was made at 2 years postoperatively.

2. Surgical technique

HA is performed in the modified supine position, with the patient supported on a conventional hip fracture table (HFT) (MAQUET GmbH, Rastatt, Germany), under general anesthesia, no muscle relaxants are used, although they may be added. Knee and shoulder instruments are used through the entire case (**Figure 3**). The padded counter traction post is applied against the proximal femur deliberately lateralizing this post, both feet and shins are also well padded. The foot of the operative hip is taking out the HFT clamp and afterwards positioned over the mayo table (Medical products Monterrey, Mexico) [12]. Radiographic landmarks are routinely marked in a simple AP pelvis and reproduced on the patient’s operative hip with anatomic landmarks. Portals are established to access the PC and CC: A anterolateral portal (AL) used for vision, immediately anterior to the trochanteric tip, a peritrochanteric space portal (PSP) used as a working portal, situated 3 cm distally from the AL and over the anterior trochanteric border, and a new modified mid- anterior portal which is located 1.5 cm above and between AL and PSP, which we call the trochanteric triangle portal (TTP) (**Figures 4 and 5**). A hip bursa resection is performed with a shaver or a radio frequency (RF) wand and posteriorly a longitudinal capsulotomy is performed to access the head–neck junction to perform a femoral osteochondroplasty (FOC) for the cam morphology, if there is a pincer impingement acetabuloplasty is performed without distraction. Afterwards an arthroscopic dynamic impingement test (ADIT) is performed with the help of the surgical assistant, fellow or nurse, and it will be useful to evaluate FOC. After finishing on the peripheral compartment a surgical assistant will place the free foot and attach it to the HFT clamp, this to distract the hip under

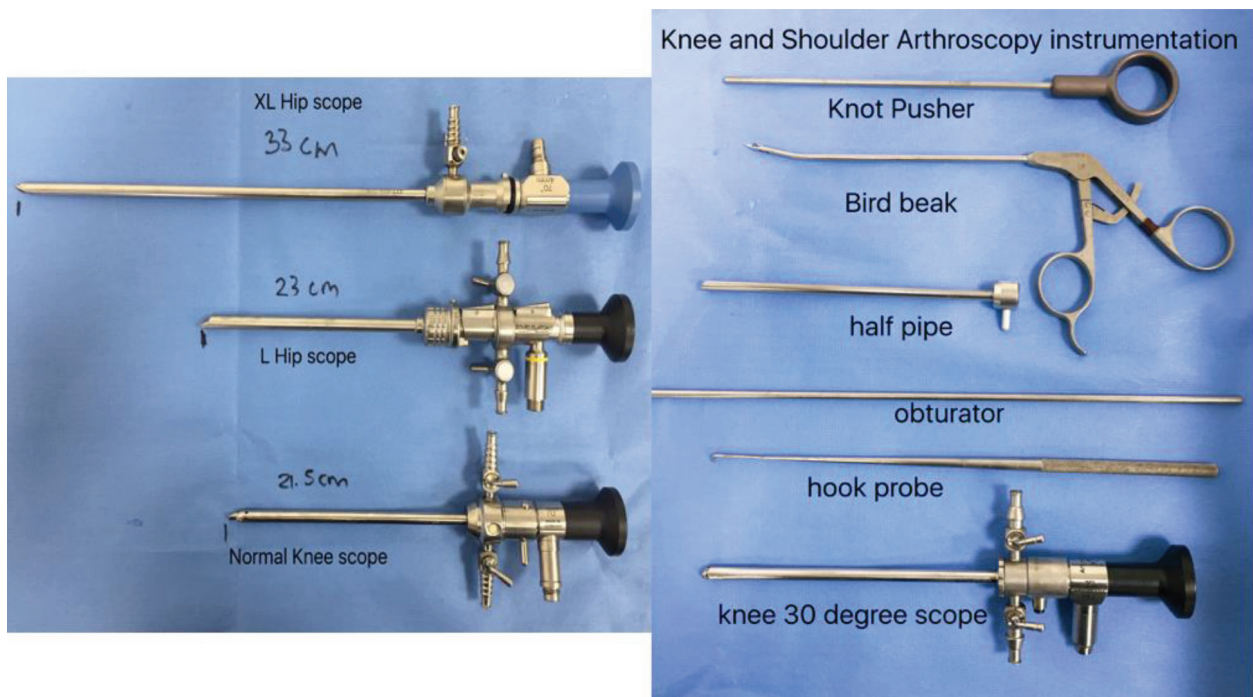


Figure 3. Three different arthroscopes and sheaths in different lengths, knee and shoulder instruments are used in every case. The 30° scope is used in 90% of the case to work in the peripheral compartment.

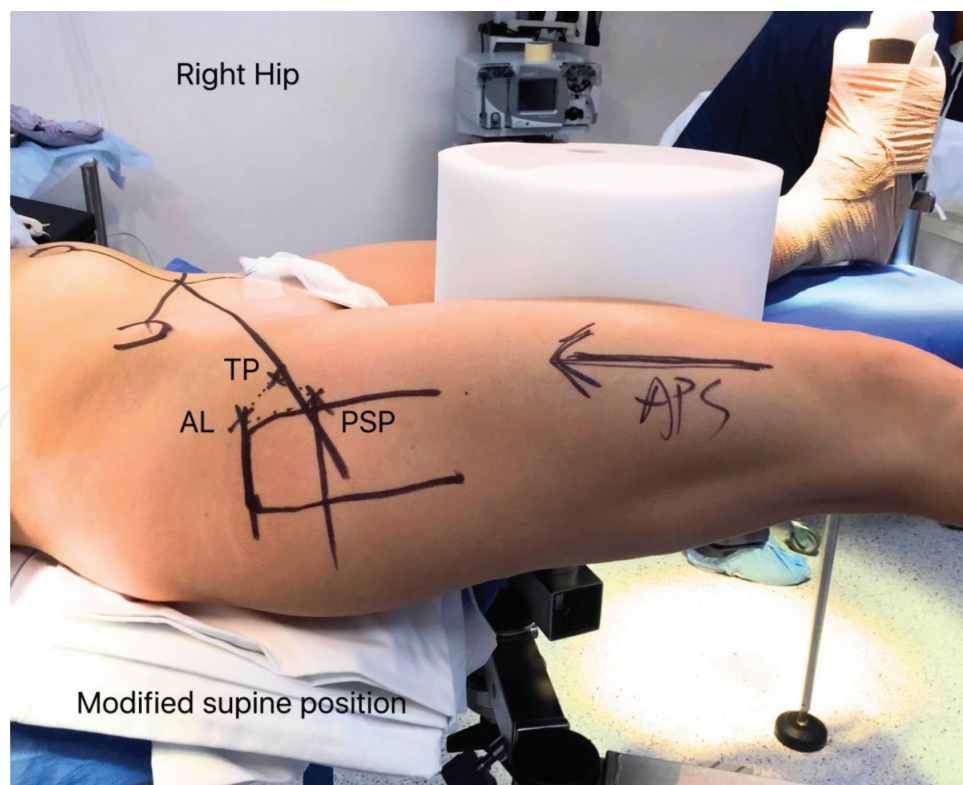


Figure 4. Right hip in the modified supine position. Observe the vision portal (AL) and the working portals (peritrochanteric space and triangle portal).



Figure 5. The left foot (operative hip) is out of the hip fracture table (HFT) clamp 90% of the case. Posteriorly clamped for hip distraction. Observe the left foot/hip over the cushioned mayo table, which allows the surgeon to manipulate and perform maximal hip range of motion.

controlled arthroscopic vision. A thorough evaluation in the CC is performed. Labral repair is tackle from the TTP portal if needed, ligamentum teres injuries or tears are also treated. A capsule closure is performed if the patient presents with generalized ligamentous laxity. A 30° arthroscopic lens is used throughout the peripheral compartment to perform a femoral osteochondroplasty, an exchange to a 70° arthroscope is done to enter the CC and if a labral repair is needed. The entire case of HA is performed without fluoroscopy.

3. Results

Two hundred and thirty patients underwent an uneventful HA through the same surgical approach from the outside-in technique which we call “simple, easy, and elegant,” none of the patients presented with iatrogenic scuffing of the femoral heal, labral resection or penetrations, no infections, avascular necrosis or instability was presented.

4. Discussion

HA is evolving tremendously over these past years, more reliable and reproducible techniques are being described and published with excellent results; this described arthroscopic technique has allowed us to create a more practical environment outside and inside the hip joint,

better maneuverability to the hip when the boot/foot is out of the HFT clamp, we have found easier access to the hip with no needles or cannulated obturators, also less iatrogenic chondral damage and zero radiation to the surgical team. Dienst et al. has mentioned that portal placement to the hip joint is probably the most demanding step during HA and extreme care must be taken in these critical steps which are related to the thick soft-tissue mantle; less force of traction is applied when the capsulotomy is done prior distraction, their published results demonstrated that soft tissue injuries and nerve dysfunction are extremely rare. Doron et al. describes an extracapsular technique for the non-distractable hip, but they still use fluoroscopy to establish the AL portal. Salas AP. describes a technique accessing the anterior capsule fibers with radiographic and anatomic landmarks without using a fluoroscope, performing a capsulotomy to tackle the cam morphology [13].

The author (APS) started HA with the “Inside-Out” technique and difficulty was encountered in every case due to lack of arthroscopic disposables, materials and access systems; but the passion in performing HA and to develop a simple, reproducible and reachable technique for all surgeons was the goal. Our technique called *Simple, Easy and Elegant: A Novel Variant of The Outside-In Technique* is now our daily battle horse to approach the hip and the vast majority of its pathologies and morphologies.

Care should be considered in dysplastic hips with generalized ligamentous laxity because iatrogenic instability can occur, a labral repair, capsule closure or tightness is recommended in these cases. With this developed technique we want to demonstrate that HA is accessible and it can be performed in a simple and safely way, that the expensive hip disposables and hip instrumentation are not a barrier to start HA.

5. Conclusion

Hip Arthroscopy is difficult and becomes a challenge to the young Orthopedic Surgeons, this technique made *Simple, Easy and Elegant: A Novel Variant of The Outside-In Technique* is an excellent choice in hip arthroscopy and preservation and can be part of the armament for hip surgeons; our technique has been very reproducible and reliable with good to excellent results.

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