



# Basic Hip Arthroscopy: Anatomic Establishment of Arthroscopic Portals Without Fluoroscopic Guidance

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Hip arthroscopy has gained popularity in recent years for diagnostic and therapeutic hip preservation management. This article details the establishment of arthroscopic portals of the hip, specifically the anterolateral and modified anterior portals without fluoroscopic guidance. The anterolateral portal is established anatomically, and the modified anterior portal is then established under arthroscopic guidance. A thorough understanding of the hip anatomy allows for these portals to be made both safely and reliably for hip arthroscopies in the modified supine positioned patient. The reduced use of fluoroscopy with this technique lowers the risk of ionizing radiation exposure to the patient and surgeon.

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**T**his article and [Video 1](#) show the establishment of arthroscopic portals based on periarticular anatomic referencing, palpation, and direct arthroscopic visualization, rather than fluoroscopic or ultrasound guidance. To reliably establish arthroscopic portals of the hip, the surgeon must have a thorough understanding of hip anatomy. There are several options of portal placement for central compartment hip arthroscopy: anterior, anterolateral, modified anterior, and posterolateral. This article concentrates on the anterolateral and modified anterior portals (MAPs), because these portals have minimal risk of iatrogenic trauma and most articular hip pathology can be

arthroscopically addressed with these 2 portals. Further, additional portals such as the posterolateral can be established under direct visualization with these 2 portals in place. A thorough preoperative evaluation will help the surgeon to determine if additional or alternative portals would be better suited to address a patient's pathology.

## Surgical Technique

The operative hip is placed in 15° of flexion with 0° of adduction and then prepped, draped, and placed in traction as detailed by Mannava et al.<sup>1</sup> To mark the patient's anatomy and portal sites, the surgeon starts with palpation of the anterior and posterior margins of the greater trochanter ([Video 1](#)). The location for the anterolateral portal is approximately 10 mm anterior and 10 mm distal to the greater trochanter ([Fig 1](#)). For ease in marking this position, the surgeon may place her hand in line with the greater trochanter with the tip of the middle finger at the superior greater trochanter and the index and ring fingers parallel to act as a fingertip guide. The anterolateral and posterolateral portals can be determined from this starting hand position ([Table 1](#)). On the basis of the acetabular morphology determined from preoperative radiographs, one can migrate these portals up to 10 mm distal to accommodate a deeper acetabulum (coxa profunda) or focal version (acetabular retroversion) ([Table 2](#)).

To determine the location of the MAP, the surgeon palpates the anterior superior iliac spine (ASIS) that we refer to as the "lighthouse of the hip." Although we do not routinely use the anterior portal for hip arthroscopy

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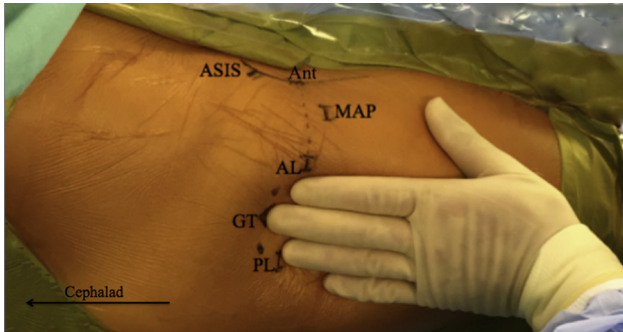
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**Fig 1.** External anatomy of portal placement during arthroscopic right hip surgery. The anatomic locations of the hip arthroscopy portals are shown, with the surgeon's long finger placed on the tip of the greater trochanter to guide placement. (AL, anterolateral portal; Ant, standard anterior portal location; ASIS, anterior inferior iliac spine; GT, greater trochanter; MAP, modified anterior portal; PL, posterolateral portal.) © 2016 Allston J. Stubbs. All Rights Reserved.

as described by Byrd et al.,<sup>2</sup> we determine its location to assist us with defining the appropriate location of the MAP. The location of Byrd's anterior portal is the perpendicular bisector of the longitudinal line from the ASIS to the superior pole of the patella and the transverse line from the anterolateral portal taken anteriorly. The location of the MAP is found by drawing a line connecting the location of the anterolateral portal to the location of the anterior portal. The MAP is approximately 10 to 20 mm distal to the midpoint of this line. To aid in creation of the MAP, an isosceles triangle may be drawn with the base vertices between the anterolateral and classic anterior portal locations and the lines

**Table 1.** Pearls and Pitfalls for Establishing Arthroscopic Portals Without Imaging

Pearls	Pitfalls
Palpation of the tip of the greater trochanter by the surgeon's long finger to allow the index finger to guide the approximate location of the anterolateral portal	Iatrogenic needle puncture of the labrum or articular cartilage
Determining the location of the anterior portal and drawing an isosceles triangle to demarcate the location of the modified anterior portal	Needle or wire breakage without fluoroscopic confirmation
Injection of saline into the joint and observation of backflow of fluid confirms that the spinal needle is in the joint space	Extra-articular puncture of femoral vessels or nerve
Use of the gentle push-pull technique of the Nitinol guidewire avoids incarceration within labrum and ensures wire contacts the base of the acetabulum	Greater surgical time caused by uncertain needle placement

**Table 2.** Hip Anatomy Requiring Adjustment of Portal Placement

Patient Anatomy	Adjustment of Portal Placement
Coxa profunda	+5-10 mm distal placement of portals to accommodate deeper socket
Retroversion of acetabulum	+5-10 mm distal placement of portals to accommodate deeper socket
SCFE	5°-10° of cephalad tilt rather than 15° caused by varus neck-shaft angle

SCFE, slipped capital femoral epiphysis.

extended to converge at the triangle's apex that is located at the MAP.

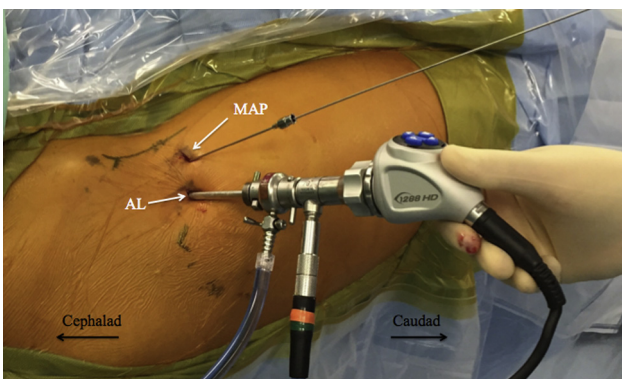
Once the surgeon has appropriately identified and marked the greater trochanter, ASIS, and portal locations, one is ready for incision. The skin is incised to a depth of 3 mm with a number 11 blade, at the anterolateral portal, and then a 6-inch, 17-gauge spinal needle (Smith & Nephew, Andover, MA) is angled approximately 15° posterior and 15° cephalad and inserted through the incision (Fig 2). The needle is directed to the soft spot of the hip capsule between the acetabular labrum and the femoral head created with the distraction force. The stylet is removed from the needle after tactile confirmation of penetrating the hip joint capsule. One may note that the venting of the joint creates an audible suction sound as well as a visible loss of the gluteal sling contour just posterior to the greater trochanter. A 60 mL syringe filled with agitated saline or lactated ringers is then attached to the spinal needle. Approximately 20 to 40 mL of crystalloid is injected into the joint. If the needle is intra-articular, there is reliable return of the plunger to its original position. The back flow of fluid may show debris or hemorrhage reflecting intra-articular inflammation and pathology. The syringe is then carefully removed from



**Fig 2.** Spinal needle is angled (15° posterior and 15° cephalad) for the establishment of the anterolateral portal of the right hip (arrow). © 2016 Allston J. Stubbs. All Rights Reserved.

the needle while maintaining the needle's position. A resulting tell-tale fluid stream confirms intra-articular needle placement. A Nitinol guidewire (Smith & Nephew) is placed through the spinal needle into the joint and the spinal needle is removed. Like a finger-trap toy, the wire is gently tested by a small push and pull. The wire should move easily and have a firm end-point against the base of the acetabulum. If the wire does not move easily or there is no firm end-point with the acetabulum, one should repeat the spinal needle placement in the sequence above. Once confident with the wire location, the smallest obturator-cannula (Smith & Nephew) combination is placed over the wire and guided coaxially along the wire into the joint. With a metal obturator-cannula system, one may notice a change in frequency as one crosses through the hip capsule. We recommend 3 to 5 twists of the obturator-cannula for every 2 to 3 mm of advancement along the Nitinol wire. The obturator is removed and the 70° arthroscope (Smith & Nephew) is introduced into the joint through the anterolateral cannula. In certain instances, the presence of bubbles from the agitated saline will assist with identifying pathology along the chondrolabral interface.<sup>3</sup> The "anterior triangle of the central compartment" should be identified by placing the anterosuperior labrum, anterior capsule, and femoral head surface within the circular visual field. After briefly assessing the joint space, the MAP is made under direct arthroscopic visualization of the anterior triangle space.

A 3-mm deep skin incision is made at the location previously marked for the MAP. A curved hemostat is then used to spread medially and laterally subcutaneously to protect the path of the lateral femoral cutaneous nerve. Then a 17-gauge spinal needle is placed through the incision and into the anterior triangle space along a quasiparallel and converging tract relative to the anterolateral cannula path (Fig 3). The arthroscope



**Fig 3.** External view of the right hip redemonstrating the anatomic location of the modified anterior portal (MAP) and angulation of the arthroscope in the anterolateral (AL) portal for visualization. © 2016 Allston J. Stubbs. All Rights Reserved.

**Table 3.** Anatomic Risks of Portals

Portal	Anatomy at Risk
Anterolateral portal <sup>2,6</sup>	Pierces gluteus medius (or if possible between the tensor fascia lata and gluteus medius)  Distance from: Superior gluteal nerve—approximately 44 mm to 64.1 mm Sciatic nerve—approximately 40.2 mm
Modified anterior portal <sup>6</sup>	Distance from: Lateral femoral cutaneous nerve—approximately 25.2 mm when measured from the equilateral triangle Damage prevented with blunt dissection Lateral femoral cutaneous artery—approximately 19.2 mm

is angled to visualize the tip of the needle as it pierces into the joint. The stylet is then removed from the needle and the Nitinol wire is placed into the joint before removal of the spinal needle. The cannula is then placed into the joint establishing the MAP.

## Discussion

Hip arthroscopy is a valuable diagnostic and therapeutic procedure for the treatment of hip disorders and preservation of the hip. Traditionally, access to the hip joint has been considered difficult, and most hip arthroscopists consequently rely on an imaging modality to assist with portal establishment and confirm access to the joint. Fluoroscopy is most commonly employed; however, ultrasound guidance has gained recent popularity, and has the benefit of eliminating or minimizing additional radiation to the patient and operating room staff.<sup>4,5</sup> The use of ultrasonography often necessitates additional training of the surgeon, and images are dependent on both operator technique and patient habitus. The technique that is detailed in this article and Video 1 relies on anatomic knowledge and palpation, thereby, not only eliminating the need for additional fluoroscopic training and exposure, but also the potential risk of contaminating the surgical field (Table 3).

Most pathology of the hip can be addressed using the anterolateral and MAPs. The knowledge of additional potential portals that can be used for hip arthroscopy is a benefit to the surgeon. As shown in the Surgical Technique section and Video 1, the location of the anterior portal is imperative for determining placement of the MAP. At our institution, we prefer to use the anterolateral rather than the anterior portal, because the anterior portal poses a greater risk of iatrogenic injury to the iliofemoral ligament and iliopsoas compartment. The anterolateral portal carries less risk than other portal locations and should be established

first to allow for arthroscopic visualization of additional portals.

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