

Forget the Greater Trochanter! Hip Joint Access With the 12 O'clock Portal in Hip Arthroscopy



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Abstract: Most surgeons rely on the greater trochanter as the reference point to establish the anterolateral portal. Nevertheless, we believe that the anterosuperior iliac spine is a more reliable landmark. Unlike the greater trochanter, it is unaffected by leg rotation and is more easily identified by palpation. Abiding by the central tenet of medicine to “do no harm,” the technique described herein presents in detail the concept of the 12 o'clock portal placement, a hip joint access method based on identifying specific anatomic points under fluoroscopy and by palpation. To accomplish this goal, this Technical Note presents a step-by-step approach, including tips and pearls for patient positioning and fluoroscopic guidance. We believe this method ensures a reproducible and safe way to start hip arthroscopy in the supine position.

Byard^{1,2} first described the supine position, portal placement, and anatomic landmarks for hip arthroscopy. The anterolateral (AL) portal is usually the very first access portal created when performing hip arthroscopy. Anatomically, it has been standardized relative to the location of the greater trochanter (GT).¹⁻⁴

Hip arthroscopy is perhaps one of the final frontiers in sports medicine.⁵ There has been a great deal of evolution in technique since the first arthroscopic

visualization of the hip in 1931.⁶⁻⁸ This new understanding, in conjunction with the surge of technological and technical advancements, has paved the way for complex procedures, such as labral and capsular reconstructions.⁹⁻¹¹

The importance of technical foundations cannot be overstated.¹²⁻¹⁵ Positioning of the patient and portal placement are critical; these are the first and perhaps greatest hurdles that orthopaedic surgeons face when entering this field.^{8,16,17}

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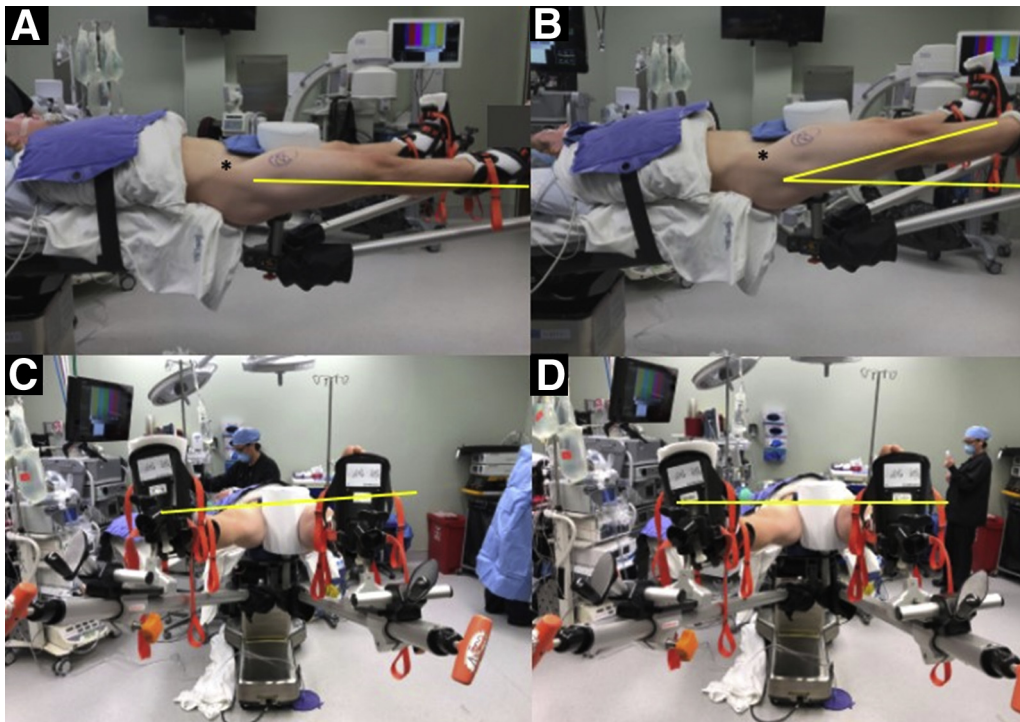


Fig 1. All pictures correspond to a female patient in the supine position in preparation for a right hip arthroscopy. (A) Patient's head is to the left and feet to the right. The yellow line shows that the patient is parallel to the floor. Simultaneous bilateral traction applied manually ensures adequate contact between the perineum and the post. (B) The Trendelenburg position is achieved by creating an incline (8° - 10°) as indicated by the yellow angle. The inclined position decreases the pressure between the perineum and the post. (C) Right hip is to the left. In the Trendelenburg position, the patient's pelvis is lateralized and the anterior inferior iliac spines are not parallel. (D) Right hip is to the left. The operative table is tilted away from the surgical side until the anterior inferior iliac spines are parallel.

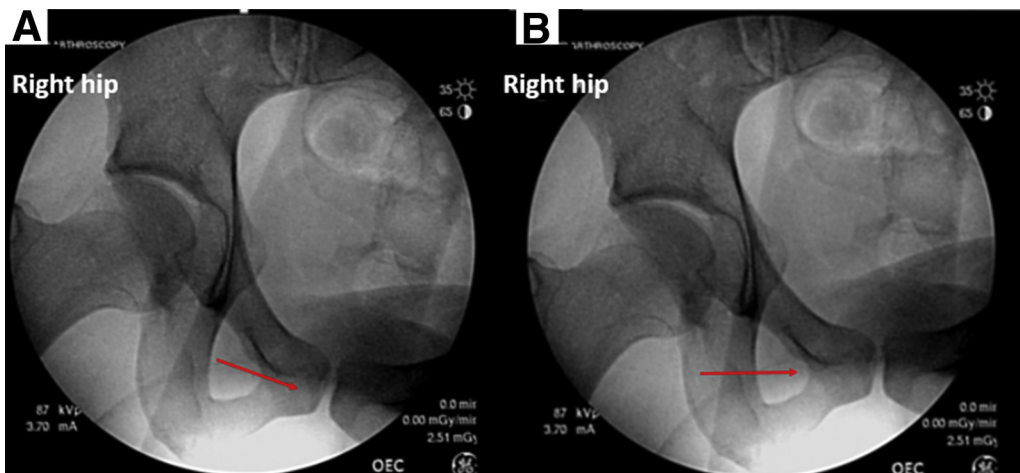


Fig 2. Both images correspond to a right hip. The C-arm has undergone cephalic tilt to compensate for the Trendelenburg inclination; a leveled pubic symphysis is vital for obtaining a true anteroposterior projection. (A) Fluoroscopic shot without C-arm cephalic tilt. The pubic symphysis is not level (red arrow). (B) Fluoroscopic shot with cephalic tilt. Note that the pubic symphysis is level (red arrow). This is a true anteroposterior projection.

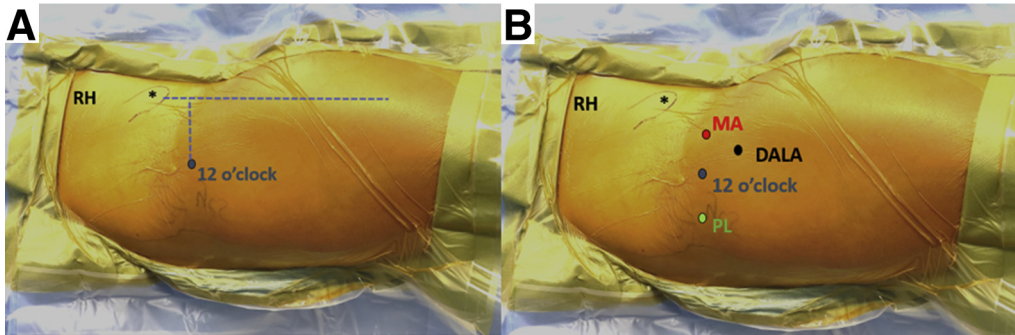


Fig 3. Hip arthroscopy portals. (A) Right hip (RH), with patient in the supine position with head to the left. Figures show the location of the 12 o'clock portal. (B) Spatial relationship between the 12 o'clock portal and other common hip arthroscopy portals. DALA, distal anterolateral accessory; MA, mid-anterior; PL, posterolateral. *Anterior inferior iliac spine.

Surgical Technique

Patient Positioning

Position the patient in the modified supine position. Care must be taken to provide extra padding to the feet. For females, apply lubricant ointment to the genital region. An

extra-padded post is also used.¹⁸ Once the patient is secured on the table, the following steps are performed:

1. Before draping, manual bilateral leg traction is simultaneously applied to achieve full contact between the perineum and the post.

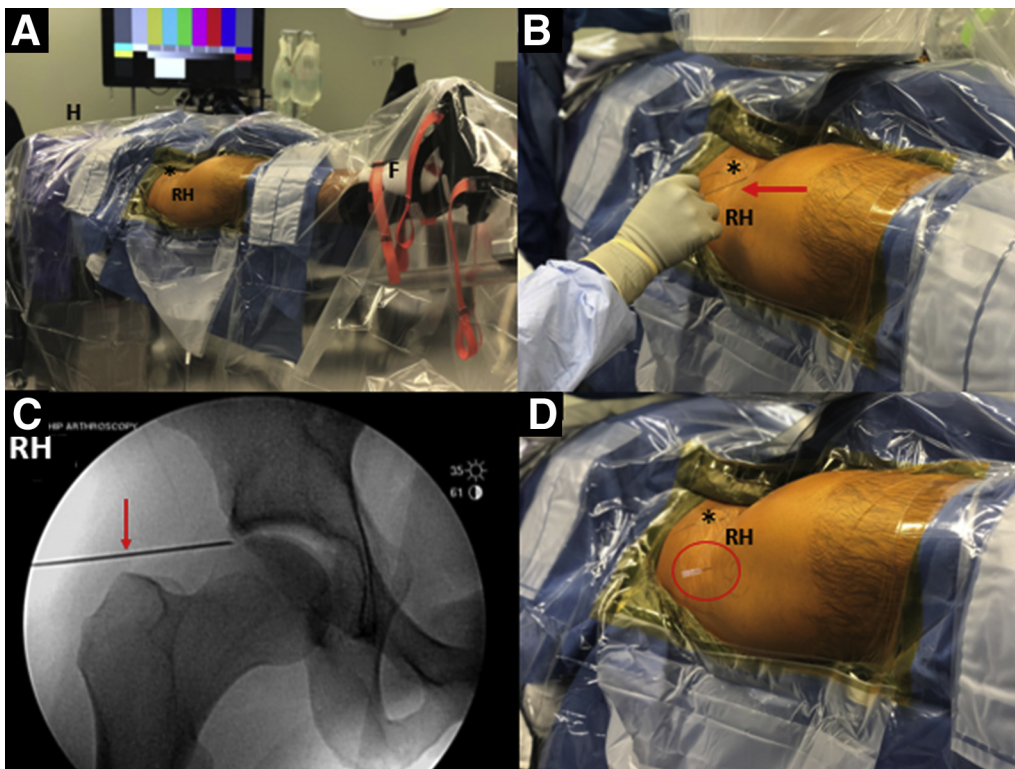


Fig 4. A-D present a supine right hip (RH). The head (H) and right foot (F) are labeled. (A) The patient is positioned in the traction table with 8° of Trendelenburg, with both anterior inferior iliac spines parallel to the floor. The operative hip (RH) is in neutral rotation and adduction, and the nonoperative leg is in neutral rotation and 30° of abduction. (B) Only gross traction is applied. The 18G × 3.5-inch pink spinal needle is placed over the skin to provide spatial information of the needle's trajectory and contrast for depth. (C) Fluoroscopy of the 18G × 3.5-inch pink spinal needle before it has penetrated the capsule. (D) Position of the needle is shown before venting of the right hip joint. *Right anterosuperior iliac spine. Red arrow and circle, 18G × 3.5-inch pink spinal needle.

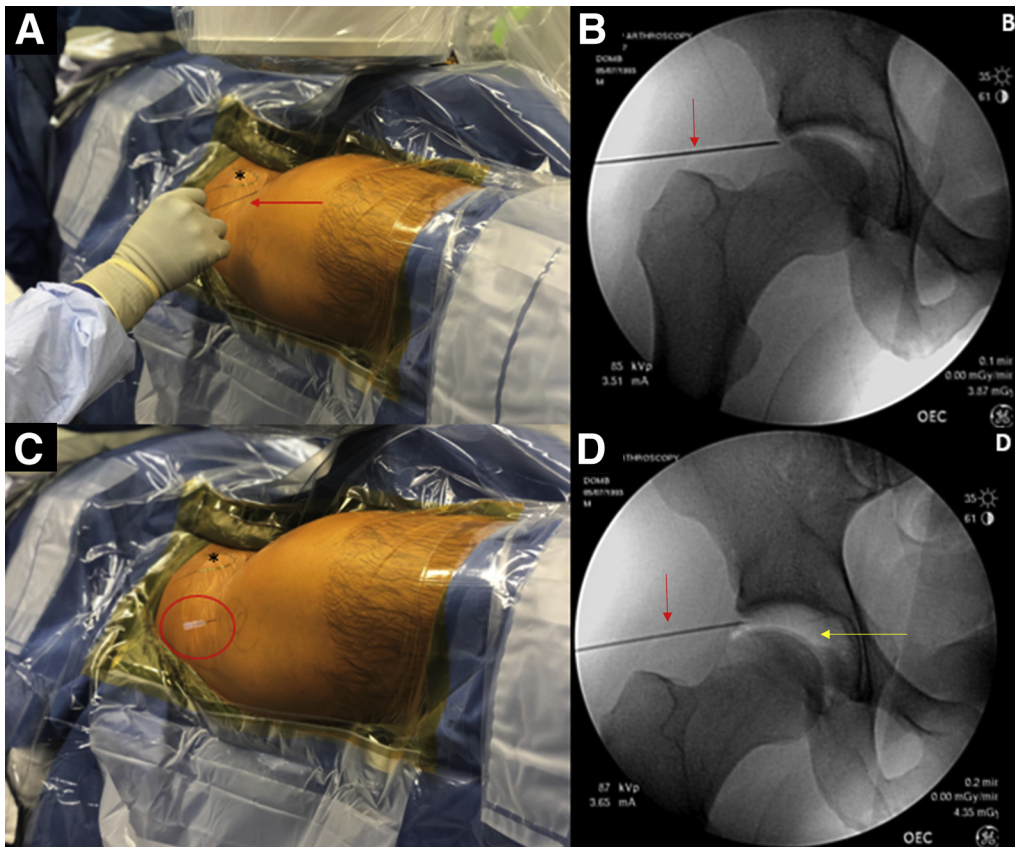


Fig 5. A-D present a supine right hip (RH). (A) With only gross traction, the 18G \times 3.5-inch pink spinal needle is placed over the skin to provide a spatial idea of the needle's trajectory and height (red arrow). (B) The spinal needle (red arrow) is introduced without entering the capsule. (C) Position of the needle is shown before venting of the right hip joint. (D) The spinal needle is advanced into the capsule. The stylet is removed, and the hip seal is broken. Distention of the joint is confirmed by the presence of air in the arthrogram (yellow arrow). Note the inferior displacement of the femoral head without additional traction. *Right anterosuperior iliac spine.

2. The operative leg is positioned to neutral rotation and adduction.
3. The nonoperative leg is placed in 30° of abduction.
4. The operative table is transitioned from 0° to 8°-10° of Trendelenburg inclination (Figure 1 A and B).
5. Pelvic tilt must be addressed by lateralizing the operative table to have both anterosuperior iliac spines (ASIS) parallel to the floor (Figure 1 C and D).
6. After the patient is draped, a second round of gross bilateral nonsimultaneous leg traction is applied by an assistant: first the nonoperative leg, followed by the operative leg.
7. Lateral tilt of the pelvis is rechecked by palpating bilateral ASIS as described in step 5.

Fluoroscopy Technique

Access of the hip joint is possible without the use of fluoroscopy. However, we believe that it is necessary to

achieve safe, reproducible, and expedient portal placement. The steps are as follows:

1. The C-arm is positioned on the nonoperative side of the patient and draped in sterile fashion.
2. To compensate for the inclination introduced by the Trendelenburg position, the C-arm must be tilted to account for the angular displacement of the operative table. This allows the C-arm to obtain a true anteroposterior (AP) image.
3. An AP pelvis centered at the pubic symphysis should reveal a vertical pubic symphysis. This is the hallmark of a high-quality AP image (Figure 2).

Landmarks for the 12 O'clock Portal

Traditionally, the GT is the chief landmark for AL portal placement. A few factors, however, can affect its reliability. First, because it is a mobile structure, the position of the GT is liable to change according to the rotation of the leg, flexion-extension of the hip, and

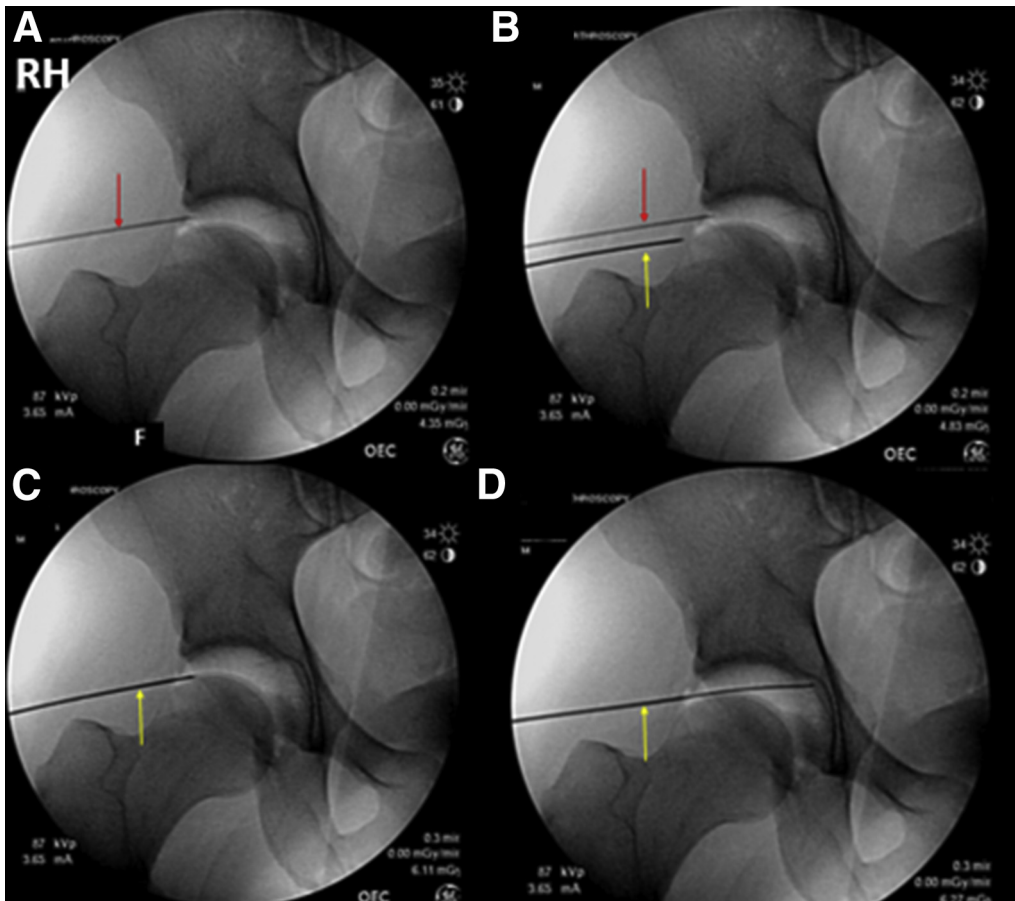


Fig 6. A-D correspond to the steps after venting the right hip joint. (A) The right hip joint seal has been broken, and traction is applied until enough space is achieved, ideally >10 mm. (B) The 18G × 3.5-inch pink spinal needle (red arrow) is left in place to show the difference in height between the venting position and the actual entry point for the 12 o'clock portal. The long spinal needle is advanced as close as possible to the femoral head until the capsule is reached. (C) Through palpation and fluoroscopy, the 12 o'clock position is identified, and the long spinal needle is advanced first with the bevel facing caudally. Immediately after penetrating the capsule, the bevel is turned 180° to face the femoral head to avoid scuffing the cartilage of the head. (D) The guidewire is advanced through the long needle until the tip of the wire reaches the acetabular fossa.

the joint's laxity. Second, identification of the GT in larger patients may be difficult. In our experience, AL placement based on the GT may increase the likelihood of placing the portal too anteriorly, which compromises intraoperative visualization. By contrast, the ASIS is an immobile and reliable anatomic landmark (Figure 3).

Venting the Hip Joint

Venting the hip joint is a critical step: it increases the joint space without further traction and provides a reference for the placement of the 12 o'clock portal. We suggest proceeding as follows:

1. The C-arm is rotated forward to the operative side, and an AP view of the hip is taken. The surgeon should place an 18G × 3.5-inch pink spinal needle (BD, Franklin Lakes, NJ) over the operative hip,

providing a template for the trajectory the needle will take to create the vent (Figure 4).

2. Using the ASIS as the landmark, advance the spinal needle with the bevel facing away from the femoral head until the capsule is reached. After confirming the position of the needle by fluoroscopy, gently perforate the capsule. Remove the stylet, and confirm that the seal has been punctured by fluoroscopy (air arthrogram) (Figure 5).
3. When venting is confirmed, apply traction until enough distraction is achieved for safe access (at least 10 mm). Keep the spinal needle in the same position during this step.

Identify 12 O'clock Portal

The point of entry for venting may be used as a reference to place the 12 o'clock portal. It is critical to

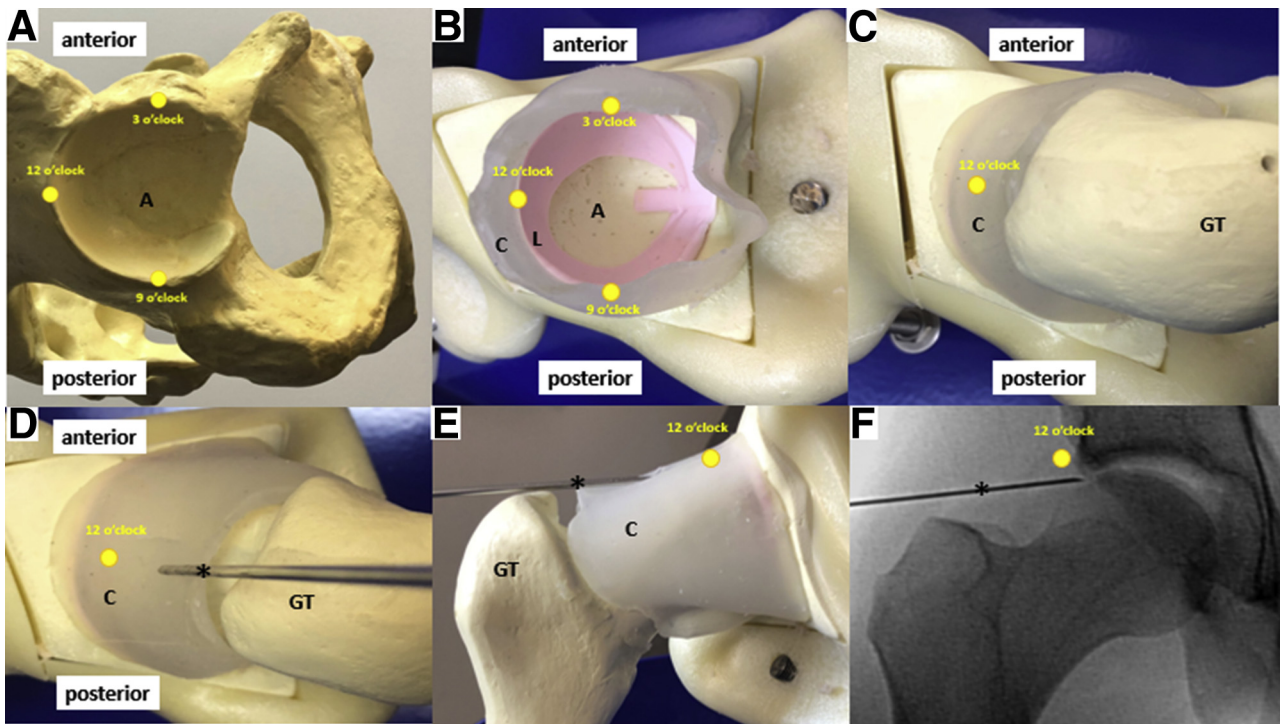


Fig 7. The concept of the 12 o'clock portal requires recognizing the 12 o'clock point at the level of the acetabulum. All the images correspond to a right hip in the supine position. A-D present lateral views, and E and F present anteroposterior (AP) views. (A) Osseous right hip model showing the 3, 12, and 9 o'clock positions of the acetabulum. (B) The labrum and the capsule have been added to the model, and the 3, 12, and 9 o'clock positions are identified. (C) The femur has been added to the model, and the 12 o'clock position is identified at the capsule level. (D) The spinal needle is shown perforating the capsule at the 12 o'clock position. (E) AP view. The 12 o'clock position is marked at the level of the capsule with the spinal needle perforating it. (F) Right hip AP fluoroscopy image in a patient's hip showing the ideal positioning of the spinal needle at the 12 o'clock position. *Long spinal needle. (A, acetabulum; C, capsule; L, labrum; GT, greater trochanter).

note that this position is usually not ideal for the placement of the final 12 o'clock portal. The difference between these 2 points may be >1 cm (Figure 6). Proceed as follows:

1. After injection of local anesthesia, make an incision to create the 12 o'clock portal. The incision is almost always distal to the venting point (Video). Working within the incision increases the needle's maneuverability, which is important for the next step.
2. Take the long spinal needle from the hip access kit (Arthrex, Naples, FL) and guide it through the incision until it reaches the capsule. The trajectory of the long spinal needle should come as close as possible to the femoral head without scraping the head: this reduces the risk for penetrating the labrum (Figure 6).

Identify the 12 O'clock Position

While in the hip, the surgeon must identify the 12 o'clock position of the joint by a combination of palpation and fluoroscopy. Inserting the arthroscope into this position will reveal the triangle formed by the

femoral head, labrum, and capsule (Video). Additionally, this point is equidistant from the 9 and 3 o'clock positions on the labrum, providing ease of access to these locations. The anatomic description of the 12 o'clock position is provided in Figure 7. To access the 12 o'clock position, the surgeon should follow these steps:

1. Advance the long spinal needle to the capsule with the bevel facing away from the femoral head. Do not penetrate the capsule at this point (Figure 6).
2. As discussed earlier, the tip of the needle should be in contact with the capsule at the 12 o'clock position at the most inferior point of the air arthrogram (Figure 6).
3. Gently push the spinal needle to the capsule without going through it. Resistance must be felt.
4. With fluoroscopy, confirm the needle's position. Do not go through the capsule. If the needle appears to be just outside of the hip joint, then the needle is at the 12 o'clock position. If the needle looks as if it is inside the hip joint, the needle has been placed

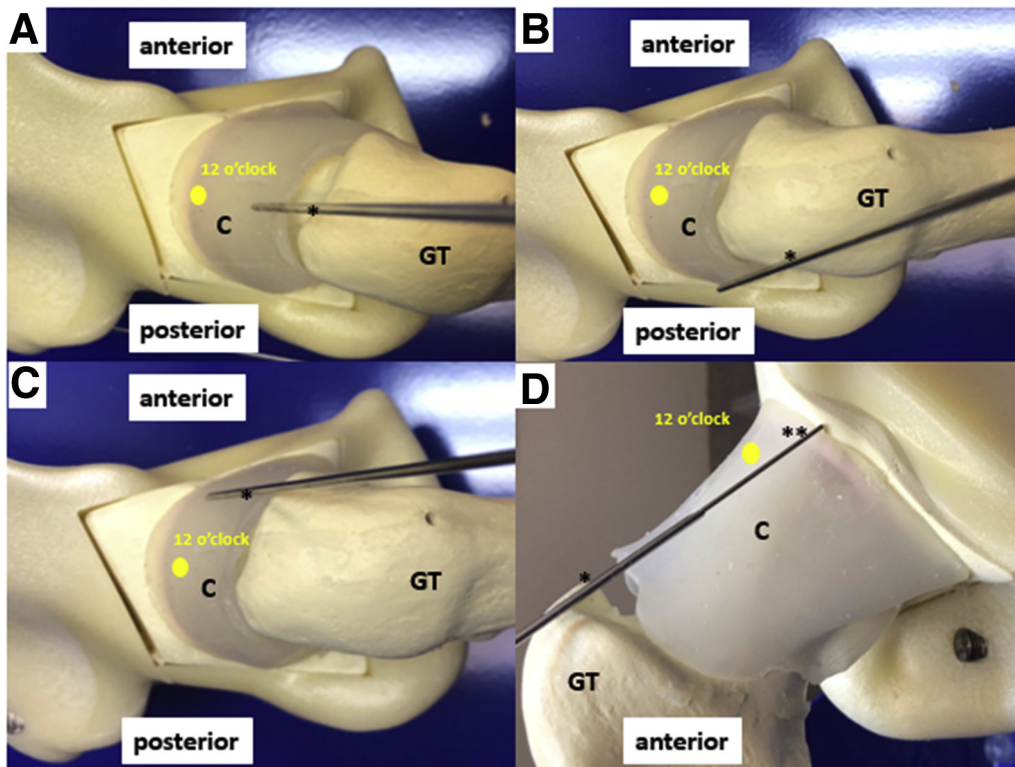


Fig 8. The images correspond to a right hip in the supine position. A-C present lateral views, and D presents an anteroposterior (AP) view. Fluoroscopy informs the surgeon of the height and trajectory of the spinal needle for placement of the 12 o'clock portal. Once the long spinal needle reaches the capsule, the surgeon pushes into the capsule gently without perforating it. If the needle is well placed, the AP image will show the needle just outside the hip joint. If the needle seems to be inside the hip joint, then the needle is either anterior or posterior to the desired point, as shown below. In the AP view, however, the image cannot inform whether the needle is posterior or anterior to the 12 o'clock location. (A) The long spinal needle reaches the 12 o'clock position. (B) The needle is placed too posteriorly. (C) The needle is placed too anteriorly. (D) AP perspective of C. C, capsule; GT, greater trochanter. *Long spinal needle; **guidewire.

either anterior or posterior to the 12 o'clock position and needs correction (Figure 8).

5. Once the 12 o'clock position is confirmed, advance the long spinal needle and penetrate the capsule. Immediately after entering the capsule, stop advancing the needle. Turn the needle 180° so that the bevel faces the femoral head and advance another 2 mm (Figure 6).
6. Remove the long spinal needle stylet and pass in the 1.1-mm guidewire (Arthrex, Naples, FL). The desired position should be such that the guidewire tip is at the level of the acetabular fossa (Figure 6).

Arthroscope Insertion

With the guidewire in position and the incision made,

1. Advance a 4.5-mm cannulated dilator (Arthrex, Naples, FL) until the capsule is reached.

2. Retract the guidewire by 5 mm to decrease the risk for it breaking in the hip.
3. Lever the hand away from the femoral head and continue advancing the cannulated dilator with a gentle, but firm, oscillatory motion (Figure 9).
4. Once the position of the dilator is confirmed with fluoroscopy, remove the inner portion and gently introduce the 70° arthroscope. Be sure to keep the inferior, cleft edge of the scope facing away from the femoral head to prevent damaging the femoral cartilage (Video).
5. After these steps, the image that the surgeon should obtain is shown in the Video.

Discussion

The learning curve in hip arthroscopy is steep.^{15,17} The first challenge is to safely access the joint, which requires acute anatomic knowledge, a strong sense of

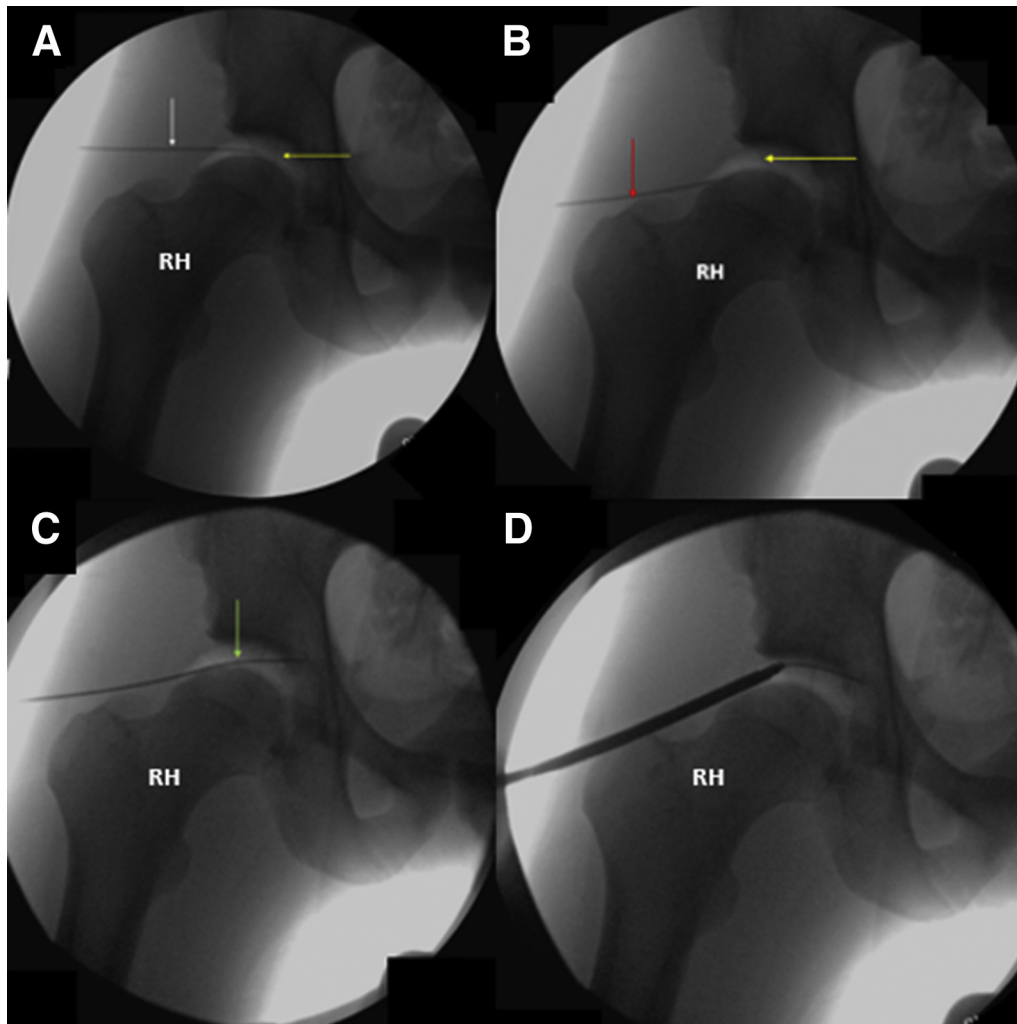


Fig 9. (A) The right hip (RH) joint seal has been broken with the 18G \times 3.5-inch pink spinal needle (white arrow), and traction is applied until enough space is achieved, ideally >10 mm (yellow arrow). (B) The long spinal needle (red arrow) is advanced to the 12 o'clock position, and the capsule is penetrated. (C) The guidewire is advanced through the long spinal needle (green arrow). (D) A 4.5-mm cannulated dilator is also advanced in a trajectory that avoids the femoral head.

spatial orientation, and repeated practice.¹⁸⁻²¹ The purpose of this technique is to provide reproducible and safe access to the hip joint for hip arthroscopy. This article describes an exact point of entry applicable for most cases. There are some contraindications (Table 1) where other techniques may be more appropriate.^{22,23}

Access of the hip joint is possible in the absence of imaging tools, basing placement entirely on anatomic landmarks. We believe this technique requires live

image control to be reproducible, precise, and most importantly, safe (Tables 2 and 3).²⁴ Exposure to radiation is a concern (Table 4), and an effort should be made to either limit the patient's exposure or consider low-dose radiation methods.^{25,26} Ultrasound (US) is an alternative to radiation. Several authors have described US as a tool in the diagnosis and treatment algorithm of hip disorders.²⁷⁻²⁹ Others have brought US a step further, using it for safe and reproducible portal placement.³⁰

Table 1. Surgical Indications and Contraindications

Indications	Contraindications
Any hip amenable to distraction of at least 10 mm	Hip with minimal to no distraction Severe acetabular overcoverage

Table 2. Advantages and Disadvantages

Advantages	Disadvantages
Reproducible and accurate portal position Expedient	Fluoroscopy required

Table 3. Pearls and Pitfalls

Pearls	Pitfalls
Reach the capsule with the 18G spinal needle without penetrating it. Identify the 12 o'clock position.	Placing the 12 o'clock portal incision too anterior or posterior Damaging the femoral cartilage or penetrating the labrum during entry
The 12 o'clock portal is distal to the venting entry point. The venting portal should be as close as possible to the femoral head. With larger patients, vent with the long spinal needle.	Insufficient traction Placing the 12 o'clock portal before venting Failing to correct for pelvic rotation with the C-arm, which will lead to misinterpretation of needle trajectory
The anterosuperior iliac spine should be used as the primary bony landmark.	Inappropriate patient positioning

Table 4. Risks

Risks
Inherent risks related to hip traction Scuffing femoral head cartilage Labral penetration Placing the portal too posteriorly, which could injury the gluteus medius tendon

Conclusions

The 12 o'clock portal is a reproducible and safe option to access the hip joint in an inside-out fashion. Nevertheless, we recognize that there are other techniques for portal placement and hip access that can be used.^{22,23,30,31}

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