Intra-articular Fluid Distension for Initial Portal Placement During Hip Arthroscopy: The “Femoral Head Drop” Technique
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Abstract: Iatrogenic injury is a known complication of initial portal placement during hip arthroscopy. The rate of labral puncture or damage to the articular surfaces with arthroscopic instruments is variable and may be associated with operator inexperience or complex anatomy. In addition, the amount of traction applied to achieve joint distraction may unnecessarily place patients at risk of neurapraxia. The purpose of this article is to describe the “femoral head drop” technique as a method to increase safe access to the central compartment and minimize the amount of traction needed to do so, especially in patients with challenging bony anatomy. This technique uses the application of intra-articular saline solution to cause inferior migration of the femoral head. Intra-articular fluid distension, or the femoral head drop technique, is simple, safe, and reproducible, making it appropriate for hip arthroscopists at any level of experience.

Intra-articular fluid distension is an established method to increase joint distraction and minimize traction requirements, thereby reducing the risk of iatrogenic chondrolabral injury and nerve damage, respectively.7,8 The purpose of this technical note is to describe the use of intra-articular fluid distension as a safe method for obtaining increased access to the central compartment of the hip joint.

Technique
Take the patient to the operating room, and place him or her supine on a Smith & Nephew Hip Positioning table (Smith & Nephew, London, England) (Video 1, Fig 1, Table 1). Administer general anesthesia through a general endotracheal tube intubation followed by a motor blockade. Move the patient with care against a silicone gel–padded perineal post. Pad both feet and ankles, and secure them into distraction boots. Next, prepare and drape the patient using sterile technique. Confirm the absence of a muscular twitch. Move the operative leg into the neutral position (0° of flexion/5° to 10° of abduction) with the patella pointing directly upward. At this point, establishment of the anterolateral portal can begin.
Judiciously apply incremental traction until enough distraction has occurred to create an intra-articular radiolucency—a “vacuum sign” (Fig 2A). Next, place a 17-gauge arthroscopy needle (cannulated needle) on the skin of the patient to approximate the trajectory into the joint. Insert the needle 1 cm anterior and 1 cm superior to the tip of the greater trochanter. Hold the needle with a slight posterior tilt, and advance past the capsule into the joint using proprioceptive feedback and intermittent fluoroscopic guidance. Once the joint space has been entered, remove the needle insert (Fig 2B). This will promote venting of the joint to alleviate any negative pressure that will resist joint distraction. Leave the needle in place.

Prepare a syringe with 40 mL of normal saline solution; epinephrine is not added because of chondrotoxic effects. Attach the syringe to the cannulated needle, and inject a small amount of fluid. Use fluoroscopy to confirm intracapsular placement; the previously identified radiolucency, or vacuum sign, will disappear. Confirmation avoids excess accumulation of extracapsular fluid. Inject saline solution until firm resistance is encountered; typically, 30 mL is sufficient. Repeat fluoroscopy will show inferior migration of the femoral head away from the acetabulum (Fig 2C). When sufficient distension has been achieved or saline solution can no longer be injected because of resistance, quickly remove the needle with the syringe still attached. Extracapsular soft-tissue collapse along with the needle tract will trap the saline solution within the joint. Removal of the needle also prevents threading a previously punctured labrum with wider-bore instruments during later steps, which can cause significant damage to the labrum and adjacent chondral surfaces.

When adequate joint distraction (>9 mm) has been achieved, reinser the cannulated needle, bevel down, into the clear space. Remove the needle insert, and use a No. 10 blade to create a shallow (1-mm-deep) incision.
that breaches the dermis. Use a hemostat to dilate this entry site. Advance a 1.2-mm nitinol wire through the cannulated needle and into the clear space. Confirm appropriate positioning in the central compartment with fluoroscopy. Proprioceptive feedback should also indicate that the wire has been medialized within the acetabular fossa. Remove the cannulated needle, leaving the nitinol guidewire in place.

Next, thread the 5.0-mm cannula and obturator over the nitinol wire. Cautiously advance the cannula and obturator, using a twisting motion, through the soft tissue and down to the capsule. Exercise great care during this step to not over-medialize and loop the wire around the femoral head. To avoid breaking the wire, gradually pull back on the wire as the cannula and obturator are advanced over it. Resistance will be met when breaching the capsule, just before entry into the central compartment. Any unusual resistance may indicate the presence of a dermal tag. In this scenario, remove the obturator and cannula, leave the wire in place, re-dilate the portal entry site around the wire with a hemostat, and rethread the cannula and obturator over the wire. Once the capsule has been breached by the 5.0-mm cannula and obturator, remove the nitinol wire. Retrograde flow of the previously injected fluid may be observed. Use fluoroscopy to preliminarily confirm intracapsular placement. Finally, insert a 70° video arthroscope through the anterolateral portal for definitive confirmation of proper portal placement. Then, with direct visualization established, diagnostic arthroscopy and additional portal placement can commence.

**Discussion**

Intra-articular fluid distension is a simple method to increase the safety of initial portal placement during hip arthroscopy. The space available for safe entry into the hip joint is largely dependent on 2 factors: (1) the identifiable clear space between the articular surfaces of the femoral head and lateral sourcil of the acetabulum and (2) the estimated proportion of that space that is not occupied by the acetabular labrum. Unfortunately, the labrum cannot be visualized with routine fluoroscopy and is variable in width. However, the identifiable clear space is a parameter that can be manipulated by altering the forces that dictate joint distraction, traction, and distension. Joint distraction by traction is the result of tension placed across the joint through an axial load. Here, the femoral head is “pulled away” from the acetabulum with the immediate result based on soft-tissue compliance. In contrast, joint distension occurs by venting and subsequent injection of saline solution; this acts to relieve negative intracapsular pressure resisting distraction and produces positive intra-articular pressure that “pushes” the femoral head away from the acetabulum, respectively.

The application of traction is effective but increases the risk of both transient and permanent nerve damage.

![Fig 2.](image_url) (A) Radiolucent vacuum sign (arrow) after minimal traction and before distension. (B) After venting. (C) After distension.
Inject saline solution until the greatest inferior migration of the femoral head, relative to the lateral sourcil of the acetabulum, has been achieved or firm resistance is met.

The vacuum sign will disappear after intra-articular saline solution injection. The disadvantages of ultrasound include extra equipment to assess the adequacy of acetabular rim recession and coxa vara, that limits the utility of conventional techniques used to access the hip joint. In these situations, intra-articular fluid distension may overcome anatomic constraints to joint distraction (Table 2). The disadvantages of the femoral head drop technique are those inherent to procedures that implement indirect visualization. The risks of portal placement under fluoroscopy include increased radiation exposure to the patient and operating room staff, soft-tissue damage including neurovascular injury, iatrogenic labral puncture, and damage to the chondral surfaces. Lastly, the effect of intra-articular fluid distension on joint distraction can be variable. When intra-articular fluid distension does not adequately increase joint distraction, we recommend using a smaller 4.5-mm cannula to enter the central compartment. Once access is established with a smaller cannula, the anterolateral portal can be safely dilated to standard arthroscopic size under direct visualization.

In conclusion, intra-articular fluid distension is one of many existent techniques that can be used to minimize iatrogenic injury to the chondral surfaces and labrum during initial portal establishment. The appeal of this technique is that it is simple, safe, and reproducible and reduces the amount of traction that is needed to achieve adequate joint distraction for initial anterolateral portal placement during hip arthroscopy.

### Table 2. Pearls and Pitfalls of Femoral Head Drop Technique

| Pearls                                                      | Pitfalls                                |
|-------------------------------------------------------------|-----------------------------------------|
| Confirm complete muscular relaxation.                       | Reduced efficacy in overweight and muscular patients |
| Apply the smallest amount of traction needed to obtain the vacuum sign. | Over-application of traction |
| Venting the joint before saline solution injection reduces the forces that resist distraction. | Mimicking of firm resistance by extracapsular saline solution injection |
| The vacuum sign will disappear after intra-articular saline solution injection. | Over-medialization of nitinol wire leading to breakage |
| Inject saline solution until the greatest inferior migration of the femoral head, relative to the lateral sourcil of the acetabulum, has been achieved or firm resistance is met. | Skiving of articular cartilage during introduction of obturator, cannula, or arthroscope |

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