Technical Note

Arthroscopic Peripheral Compartment Iliopsoas Release for Iliopsoas Impingement After Primary Total Hip Arthroplasty

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Abstract: Anterior iliopsoas (IP) impingement after total hip arthroplasty is an underrecognized and continued cause for postoperative pain. There are multiple etiologies for this impingement from cup positioning and sizing to changes in the leg length, and offset must be evaluated to confirm no need for implant revision. Additionally, tension of the IP tendon can be increased in patients with diminished spinal mobility, either from prior fusion or with increasing age. Managing this surgically after failing conservative treatment options is best done arthroscopically to prevent additional large, open procedures that place the arthroplasty at unnecessary risk of infection and potential instability. In this article, we describe an arthroscopic technique using fluoroscopy to guide the release of the iliopsoas tendon from the peripheral compartment.

Introduction

The etiology for pain postoperatively after total hip arthroplasty (THA) is vast.[1,2] Prior to the diagnosis of iliopsoas impingement, the following should be ruled out: component loosening, infection, periprosthetic fractures, occult and stress fractures involving the pelvis or acetabulum, and osteolysis.[3,4,5] Additionally, lumbar spine, intra-abdominal, retro-peritoneal and vascular pathologies should be evaluated.[6,7] Screening for these entities is outside the scope of this technique article.

In cases of failed conservative measures after diagnosis of iliopsoas impingement, arthroscopic release of the tendon has been shown to significantly improve patient-reported outcomes in the short and mid-term.[8,9,10] Improvements in pain relief and hip flexion strength have also been demonstrated.[11] This technical note presents arthroscopic technique for iliopsoas release after primary THA.

This study was performed at the American Hip Institute Research Foundation in accordance with the ethical standards in the 1964 Declaration of Helsinki and in accordance with relevant regulations of the U.S. Health Insurance Portability and Accountability Act (HIPAA). Details that might disclose the identity of the

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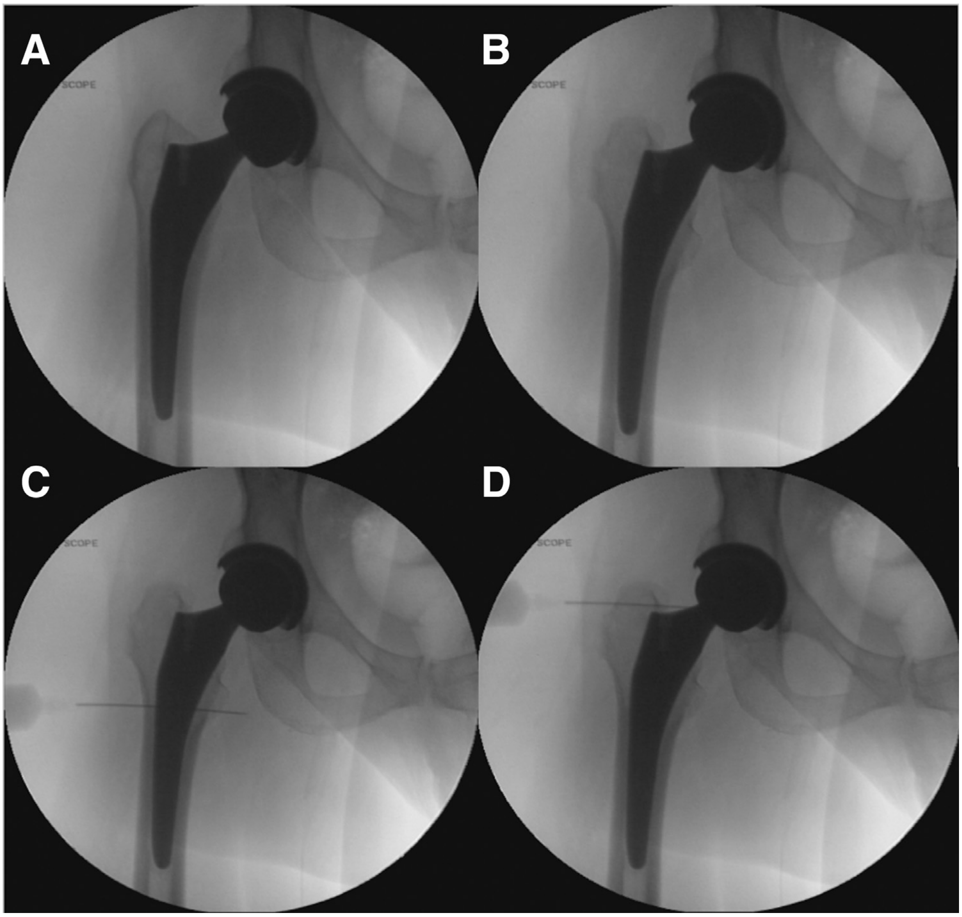

Fig 1. Right hip fluoroscopic intraoperative images displaying portal placement. (A and B) Initial AP image of the operative hip is obtained with neutral rotation (A) and external rotation (B) to bring the lesser trochanter fully into profile, as it is a posterior and medial structure. (C) With the leg maintained in the externally rotated view, a spinal needle is used to plan the distal portal, 4-5 cm distal to the typical mid-anterior portal. (D) A second portal is made using a spinal needle in a similar location as the traditional midanterior portal and will initially function as the working portal.

subjects under study have been omitted. This study was approved by the Institutional Review Board (IRB ID: 5276).

Surgical Technique

The patient is placed in standard supine positioning for arthroscopic hip procedures. Our preferred method is a postless setup using Smith & Nephew friction pad and distractor attachment. Although traction will not be required to distract the hip joint/prosthesis, it is our preference to have the ability of our preferred hip arthroscopy standard setup to change the rotation of the operative extremity. Fluoroscopy is used with various combinations of internal and external rotation on anteroposterior (AP) images to confer correct extracapsular placement. There are two main locations that are developed: distally around the lesser trochanter and proximally, anterior to the acetabular component in the region of what was the iliopsoas recess, where the impingement occurs.

An initial AP image of the operative hip is obtained with neutral rotation (Fig 1A). The image is matched to the supine AP image taken during preoperative workup. On the basis of the amount of rotation seen in

Table 1. Iliopsoas Release Arguments

Pros	Cons
Prior capsular repair remains largely intact without need for distraction and work through the central compartment.	Increased operative time showing insertion at lesser in addition to impingement over acetabulum compared to either alone
Minimally invasive without further large open procedure required for treatment	Requires fluoroscopy
Small capsular opening, thus, minimizes risks of infection or postoperative instability	Inherent risk for possible infection
Decreased overinstrumentation of the joint	

Table 2. Technical Pearls

- External rotation of extremity brings lesser trochanter and insertion of iliopsoas into endoscopic view.
- Finding insertion distally and using this to track proximally over the cup impingement minimizes difficulty with localization of just tendon proximally.

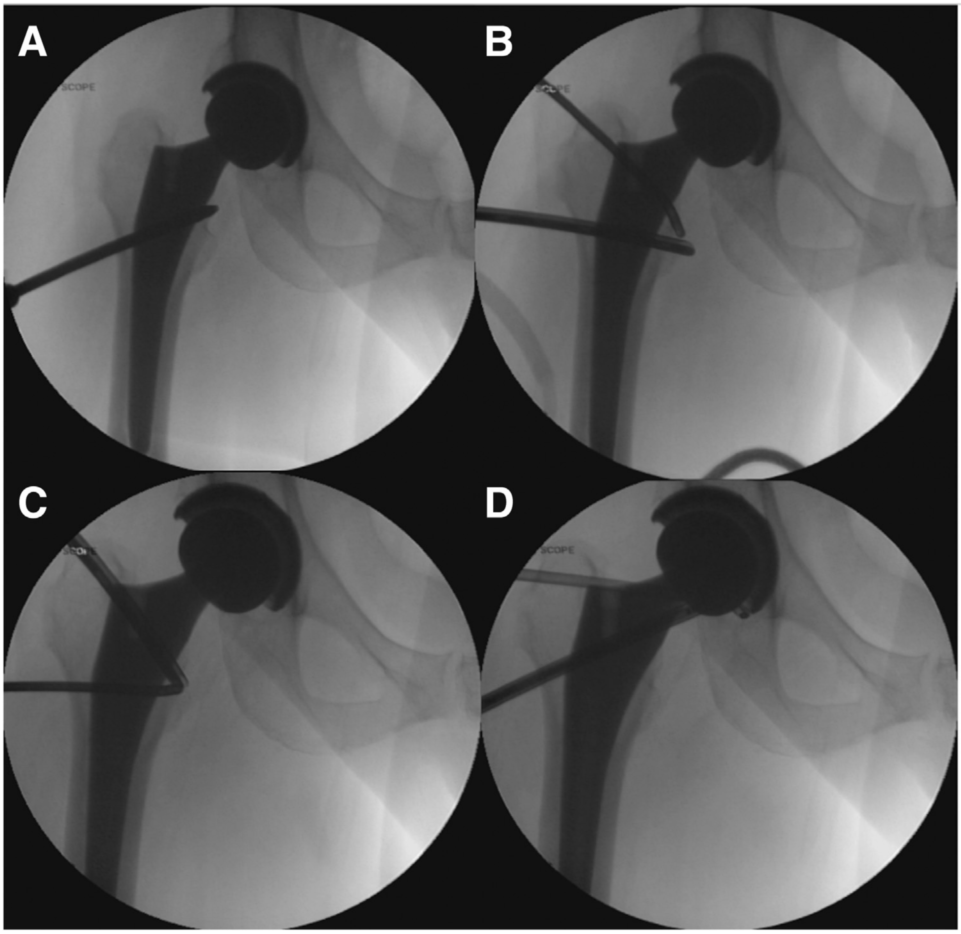

Fig 2. Right hip fluoroscopic intraoperative images to confirm positioning. (A) The trochar and sheath are first inserted through the distal portal. A 5.0-mm cannula (Hip Arthroscopy Masters Instrument Set; Arthrex, Naples, FL) is used when working endoscopically to expand the working area secondary to the increased flow it provides compared to smaller options. Aim is directed proximally and posteriorly until the anterior portion of the femoral shaft is palpated at which point the 70° arthroscope is inserted. (B) Using the proximal portal, the surgeon insets a switching stick in a standard triangulation manner. (C) An arthroscopic half-pipe (open cannula; Arthrex; Naples, FL) is used to switch to either cautery wand (Covac 50; Smith & Nephew, Andover, MA) or curved shaver (Dynoics II 4.5-mm curved shaver; Smith & Nephew). Half-pipe is once again used to switch the camera and working instruments between both portals depending on the plane being developed. (D). Imaging used to confirm location of view anterior rim of the acetabular cup.

the lesser trochanter, a varying degree external rotation is placed to bring it into profile better (Fig 1B). With the lesser trochanter being a posterior and medial structure, usually, this rotation brings it anterior and much easier to develop (Table 2).

With the leg maintained in the externally rotated view seen above, a spinal needle is used to plan the distal portal (Fig 1C). This is typically 4-5 cm distal to the what would typically be made as our mid-anterior portal previously described. The goal for this anterior accessory portal is be at the level of the distal third of the lesser trochanter. Prior to making the portals, the anterior superior iliac spine is marked with mid-axial line drawn toward the patella anteriorly on the thigh. This helps confirm that all portals made are lateral to this line, making sure to maintain safe distance relative to the neurovascular structures medially. It is easy easier to lose bearings on extracapsular location; thus, we believe it is critical to take extra precautions such as this to prevent medial deviation.

The second portal made will initially function as the working portal seen with the projected trajectory in Fig 1D. Typically, this is in a similar location as the traditional mid-anterior portal that we have previously described. With prior direct anterior approaches for total hip arthroplasty, it also usually lies in the distal extent of this incision. The key here is to be roughly 5 cm proximal to the prior distal portal to prevent chop-sticking of the camera with the instruments, as well as being proximal enough to expose impingement of the tendon over the acetabular cup rim.

Trochar and sheath are first inserted through the distal portal (Fig 2A). Our preference is the use of a 5.0-mm cannula when working endoscopically, as increased flow helps to expand the working area. The AP image is obtained to confirm the position. Initially, aim is directed proximally and posteriorly until the anterior portion of the femoral shift is palpated. Fluoroscopic imaging is used to confirm this. A 70° arthroscopic camera is inserted with eyes directed proximally and anteriorly. Prior to insertion of the camera, a sweeping motion can be performed just underneath the iliopsoas tendon to develop a working space.

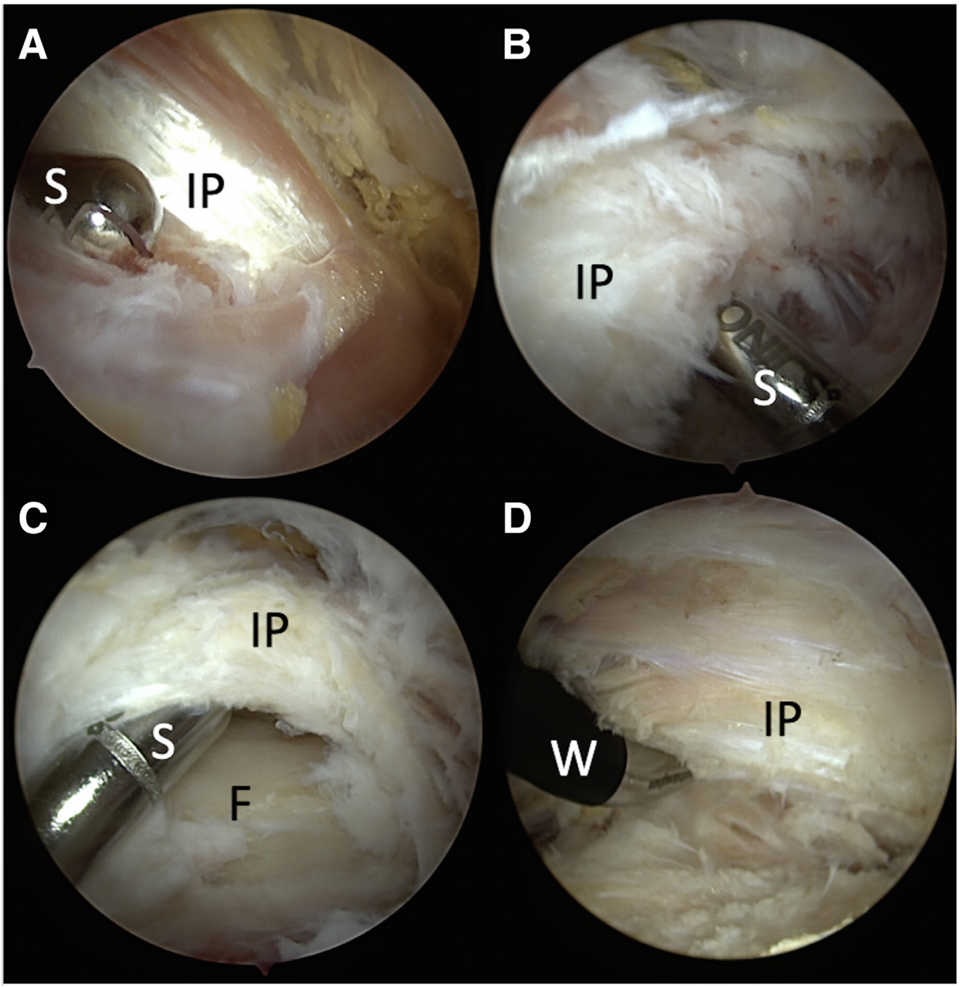

Fig 3. Arthroscopic intraoperative images during iliopsoas tendon (IP) tendon assessment. (A) Initial exposure of the IP distally at the insertion on the lesser trochanter, with a curved shaver (S) working through the proximal portal. (B) View from the proximal portal to allow the working instrument to better develop planes distally superficial and deep to the IP tendon. (C) Exposure of the point of impingement proximally over the acetabular rim. Femur is labeled "F". (D) Camera is placed distally once again further developing deep to iliopsoas tendon proximally using cautery (W)

Using the proximal portal previously described, a switching stick is first inserted in standard triangulation manner. Again, fluoroscopy is used to confirm placement over the lesser trochanter and slightly proximal (Fig 2B). In addition, fluoroscopic images are used to confirm the area of dissection is not too medial or lateral. After the switching stick is located, the arthroscopic half-pipe is used to switch to either cautery wand or curved shaver. Half-pipe is once again used to switch the camera and working instruments between both portals, depending on the plane being developed (Fig 2C). The goal of distal exposure is to expose 3 regions: anterior to the IP tendon and posterior to the IP tendon and the lesser trochanter.

Seen in Fig 3A is the initial exposure of the IP tendon distally. The camera is placed in the distal portal with curved shaver working through the proximal portal. As mentioned previously, it can be helpful to switch the camera from the distal to the proximal portal to allow working instruments to better develop planes distally superficial and deep to the IP tendon (Fig 3B). After the superficial and deep aspects of the IP insertion distally are exposed at the lesser trochanter, attention is then turned to exposing the point of impingement proximally over the acetabular rim (Fig 3C).

Seen fluoroscopically in Fig 2D, the camera is once again viewing through the distal portal with working instrumentation via the proximal portal. Fluoroscopic images are initially obtained to confirm location of view anterior rim of the acetabular cup. A combination of cautery, as well as the shaver are used to expose the IP. It is important to anticipate the anatomy to now have roughly 50% tendon and 50% muscle belly compared to tendon alone at the distal insertion exposed initially. Once the location of the IP is confirmed via direct visualization, as well as location on fluoroscopy, the plane between the tendon and the capsule is developed (Fig 3D, Fig 4, A and B).

Both cautery and shaver are used to perform synovial biopsy to confirm no threat of infection. Typically, an alligator grasper is used to remove multiple pieces of capsule, which is sent for frozen section and cultures. Arthroscopic images are taken to show the underlying acetabular component, head ball, polyethylene liner,

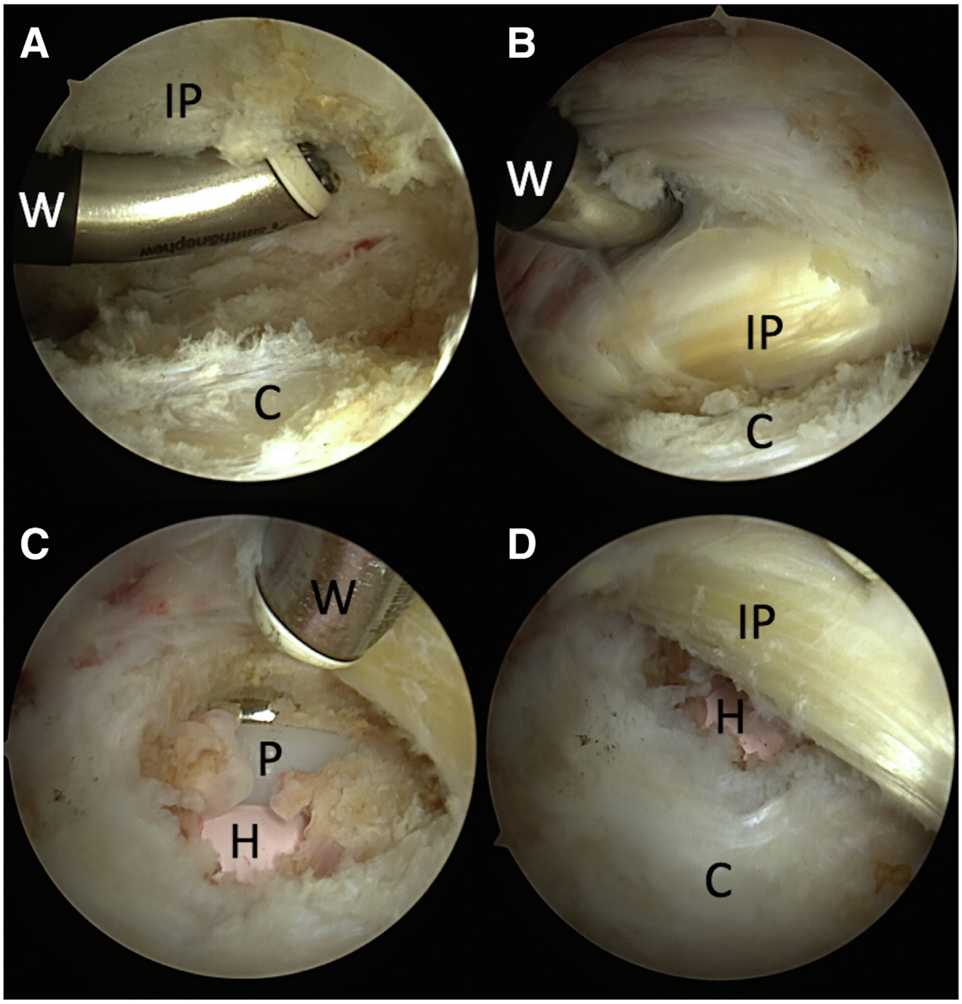

Fig 4. (A) Cautery device (W) seen working proximally through the proximal portal developing the plane deep to the iliopsoas tendon (IP) and superficial to the capsule (C). (B) With camera still viewing from distal portal, cautery (W) is further developed superficial to the plane of the iliopsoas sheath (IP) (C) Cautery is used proximally to develop an interface of the tendon prosthesis with the small capsular rent to verify the exposure and rule out cup malposition as the etiology of the patient's symptoms. Ceramic head ball (H), Polyethylene liner (P). (D) Additional view showing no cup malposition requiring revision to prevent iliopsoas symptoms.

and IP tendon pathology (Fig 4, C and D). The area of capsule removed is no large than 5 mm, thus preventing any postoperative instability.

The working location of the procedure is then once again transitioned back to the distal insertion of the IP onto the lesser trochanter. This is confirmed with

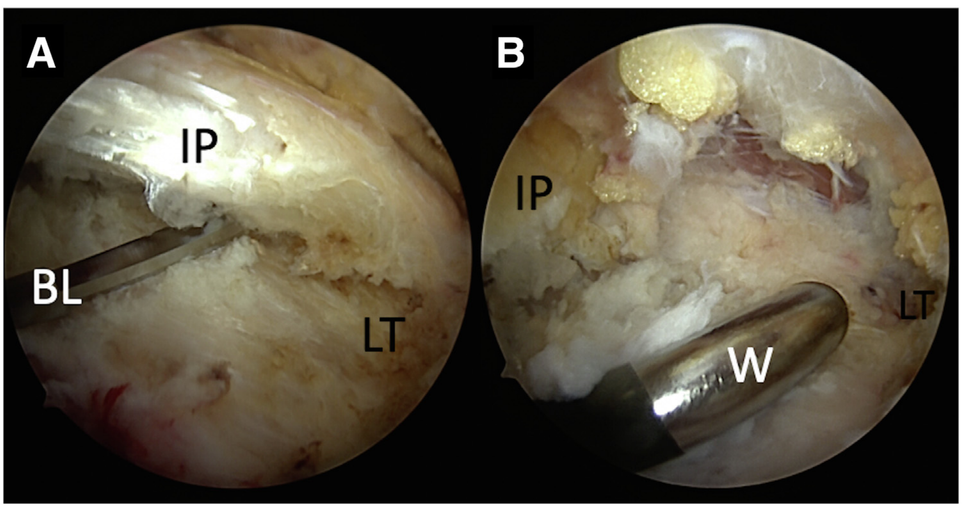

Fig 5. (A) With camera viewing through the distal portal, prior exposure of iliopsoas tendon (IP) at its insertion on lesser trochanter (LT) with beaver blade (BL) is introduced via the proximal portal. (B) Iliopsoas tendon (IP) is seen post-release, and electric cautery device (W) is used to coagulate ends to prevent adhesions.

fluoroscopy, but it is much easier to find the second time around due to the prior exposure and dissection. Using the proximal portal as the working vantage point, the half-pipe is used to introduce a 69-beaver blade to transect the IP tendon 5 mm from the insertion on the lesser trochanter (Fig 5A). The entirety of the tendon is released (Fig 5B). Video 1 depicts our step-by-step technique in detail.

Discussion

This technique offers a minimally invasive way of resolving postoperative iliopsoas impingement that fails nonoperative management. Without an arthroscopic approach, it would require an additional open procedure that would increase the risk of instability and infection, especially given the underlying implants (Table 1). Additionally, this allows for management without traction, as it is entirely in the peripheral compartment without access to the central compartment being required. Placing traction on a prior total hip arthroplasty could present multiple problems from iatrogenic prothesis damage to inability to obtain appropriate amount of distraction to safely release the IP tendon depending on prior changes to native leg lengths and offset. It is our preference to release distally close to the insertion of the IP tendon onto the lesser trochanter, as this has maximal decrease in the tension proximal. Distally, the IP is largely tendinous, while proximally at the level of the joint, it consists of roughly 50% tendon. Releasing the IP proximally would effectively lengthen the tendon. Further release proximally of the muscle belly would increase the risk of bleeding, as well as fluid extravasation into the intra or retroperitoneal spaces. One limitation to this technique is that it should only be considered in the hands of an experienced arthroscopy surgeon, as it can be very easy to get lost in the endoscopic space, especially medially near neurovascular structures that can have detrimental complications. Most reconstruction surgeons, don't routinely perform hip arthroscopy, thus making this technique less applicable to their practice. Additionally, another limitation is that it does not account for any implant position, most commonly the acetabular cup, which can lead to IP tendinitis. In those settings, larger revision and open surgery are required. Lastly, although minimally invasive, subjecting prior arthroplasty components to revision surgery has an inherent risk for possible infection. It is our preference to place patients on 10 days of prophylactic antibiotics to reduce this, although no literature has proven this to be necessary. With the increasing popularity of patient-specific components and robotic guided navigation in total hip arthroplasty, postoperative iliopsoas tendinitis may become less common, thus diminishing the utility of this technique.

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