Technical Note

A Technique for Endoscopic in Situ Repair of Undersurface Hip Abductor Tears

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Abstract: Endoscopic repair of hip abductor tendons has been shown to have equivalent outcomes and lower complication rates compared with open repair. First reported in 2007, endoscopic repair has become more frequent, with multiple techniques previously described. Frequently, hip abductor tears involve a partial-thickness undersurface component that has been previously addressed endoscopically by making a longitudinal split in the tendon to access the diseased tissue. However, we present a technique for addressing these undersurface tears in situ, accessing the undersurface of the tear by coming under the distal anterior edge of the gluteus medius tendon.

Hip abductor tears are a well-recognized source of lateral hip pain and dysfunction, or greater trochanteric pain syndrome (GTPS). After failure of conservative treatment and in the absence of significant concomitant arthritis, these tears respond well to surgical repair. Voos et al.[1] first reported endoscopic gluteal repairs in 2007 with good pain relief and functional results. As arthroscopic techniques have improved, there have been multiple reports of successful arthroscopic treatment of abductor tears.[2-4] Moreover, endoscopic treatment appears to have a lower complication rate compared with open treatment, with similar outcomes.[5,6] Typically, hip abductor are undersurface tears that involve some portion of the gluteus medius and underlying minimus tendons. Unlike in the shoulder, where undersurface tears can be viewed from within the joint, hip abductor tears can be difficult to visualize and adequately treat.

Previous techniques have described a transtendinous approach to the tear, splitting the gluteus medius (GM) tendon in line with its fibers.[1-4] Through this split, the tears can be debrided, and the bone can be prepared for repair using a variety of suture anchor type constructs. This technique has led to good clinical results; however, long-term data are lacking. We use this technique to approach smaller tears that are located toward the most proximal portions of the GM footprint, when the more distal portion is intact. One issue with this technique is the limited access that it provides to the torn tendon anterior and posterior to the iatrogenic split. Furthermore, the dissection required through this split to fully debride unhealthy tissue and prepare the trochanteric footprint can lead to damage of normal tissue or inadequate footprint preparation.

In this technical note, we present a technique for addressing these undersurface tears in situ by coming under the distal anterior edge of the gluteus medius tendon. This can be thought of as using the rotator interval in the shoulder to perform an in situ partial articular-sided tendon avulsion (PASTA) repair. This technique allows excellent exposure to the torn tendons and full footprint visualization without violating potentially healthy tendon.

Table 1. Equipment Required

Camera	30° Arthroscopic Camera
Cannula	Only the arthroscope cannula is required
Radiofrequency ablator	Opus (Arthrex)
Shaver	4.5-mm Platinum Incisor (Smith & Nephew, Andover, MA)
Suture retriever	60° (pink) Ideal suture passer (DePuy Mitek)
Anchors	5.5-mm double-loaded PEEK Corkscrew ×2 and 5.5-mm SwiveLock (Arthrex)

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Fig 1. A left hip is prepared and draped in preparation for endoscopic abductor repair. Patient is in supine position. A line is drawn from the anterior superior iliac spine to the center of the patella, and the greater trochanter is marked on the leg. The distal lateral portal (1) is established distal to the vastus ridge, and placement is confirmed with a spinal needle and fluoroscopy. The proximal lateral portal (2) is placed using spinal needle localization ~5 to 6 cm proximal that will be used as the primary working portal. The distal anterior portal (3) is placed ~4 to 5 cm anterior to the distal lateral portal to allow access to the anterior aspect of the abductor tendon insertion. The final proximal posterior portal (4) is placed a few centimeters posterior and in line with the proximal lateral portal using spinal needle localization.

Surgical Technique

After induction of anesthesia, the patient is positioned supine on a fracture table (Hana Table, Mizuho OSI, Union City, CA). A list of equipment needed for the procedure can be found in Table 1. The perineal post is well padded, and the operative leg is abducted to ~20° to relax the tissues of the greater trochanter. Resting traction is applied to the operative leg, and the nonoperative leg has no traction applied (Fig 1). An initial visualization portal is established using fluoroscopic spinal needle localization ~4 cm distal to the vastus ridge in line with the femur. A guide wire is placed through the spinal needle, and a trochar and cannula are introduced over the wire (Fig 2). After piercing the iliotibial band, the trochar is used to perform blunt dissection in the trochanteric bursa. We ensure that the cannula is not within the tear by making sure it easily slides posterior to the greater trochanter before removing the trochar (Fig 2; Table 2). A 30° arthroscope is inserted with an inflow pump set at 60 mmHg. Under direct visualization, a proximal lateral portal is established using a spinal needle inside-out technique superior to the vastus ridge in line with the femur, to be used as the primary working portal. A shaver device is inserted through this portal and used to perform an extensive trochanteric bursectomy (Fig 3). It is key to remove as much bursa as possible, as any remaining will swell significantly during the tendon repair and impair visualization.

At this point, the abductor insertion is visualized and probed to determine the type of tear. If there is a complete insertional tear, then the tendon will be repaired like a full-thickness rotator cuff tear. When an undersurface tear is encountered, however, we use the technique described in this technical note (Video 1).

A third portal, distal anterior, is established using spinal needle localization ~4 cm anterior to the distal portal, staying lateral to a line connecting the anterior superior iliac spine (ASIS) and the center of the patella (Fig 1). Ideally, this portal allows access to the anterior aspect of the abductor insertion. Through this portal, an arthroscopic radiofrequency device is used to define the interval anterior to the gluteus medius tendon, which is gradually elevated until the undersurface portion of the tear is visualized (Fig 4). The tear is then debrided, and the footprint is prepared using an arthroscopic shaver or burr with the goal of debriding to healthy tissue and removing any of the reactive bony spurs that have formed (Fig 5). A free suture can be placed in the most anterior aspect of the tendon with the use of the Slingshot device (Stryker, Greenwood, CO) and retrieved out the proximal lateral portal to aid in retraction during this step.

Depending on the size of the tear, we typically use 2 double-loaded 5.5-mm PEEK Corkscrew anchors (Arthrex, Naples, FL). The anchor punch is inserted

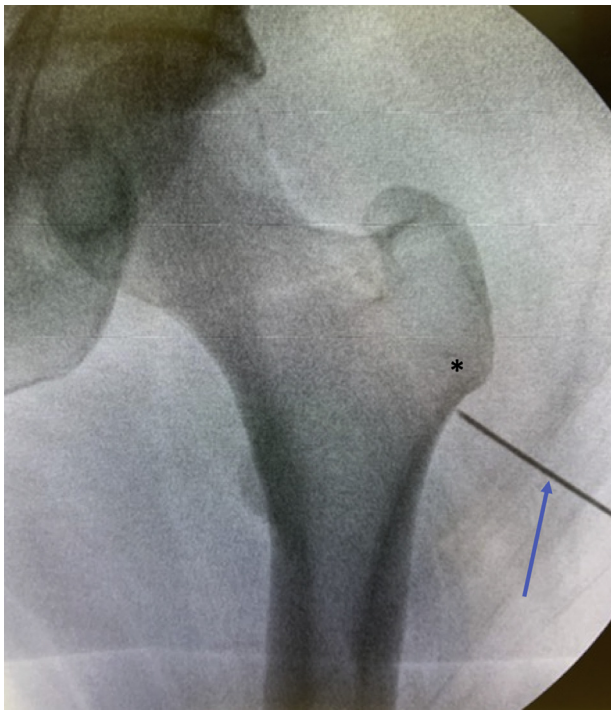

Fig 2. This fluoroscopic anteroposterior image of a left hip shows a spinal needle (arrow) being used to localize the initial viewing portal. The portal is initially placed ~4 cm distal to the vastus ridge (*) in line with the femur and angled cranially as shown in the image. The needle is adjusted as needed to allow adequate viewing and access to the peritrochanteric space.

Table 2. Pearls and Pitfalls

Pearls	Pitfalls
Abduct the leg ~20° to relax the iliotibial band.	Full-thickness tears with retraction do not require visualization through the anterior interval and can be repaired according to surgeon preference.
Use fluoroscopy to ensure that the initial viewing portal allows adequate access to the area about the vastus ridge.	Large enthesophytes or calcifications around the tip of the trochanter make exposure through the anterior interval difficult and may require either a transtendinous approach or an open approach.
Ensure that the initial trochar and cannula easily slide behind the greater trochanter to avoid insertion into the abductor tendon or muscle.	Avoid disruption of the fascia on undersurface of the tensor fascia lata and gluteus maximus to avoid bleeding which may impair visualization.
Use a retrograde suture retriever through a percutaneous portal to minimize the need for additional cannulas; with this technique only the scope cannula is needed.	
A traction suture in the anterior aspect of the tendon can aid in exposure and preparation of the footprint.	

through the proximal lateral portal, and a tap is needed if hard bone is encountered (Fig 6). This step is repeated for each anchor, keeping the sutures out of the proximal lateral portal. Next, a fourth (proximal posterior) portal is established that will be used for suture passage through the tendon. This is done with spinal needle localization ~3 to 4 cm posterior to the proximal lateral portal (Fig 1). A 60° retrograde Ideal Suture passer (DePuy Mitek, Raynham, MA) is used to pass sutures using this proximal posterior portal. A grasper may be inserted through the distal anterior portal to help manipulate the tendon and deliver sutures to the retrograde passer as needed. The surgeon may use any suture passing device according to preference; however, additional cannulas or portals may then be needed for suture management. The sutures are typically placed in a horizontal mattress fashion from the proximal anchor and a rip stop pattern from the distal anchor. The sutures are tied using a sliding locking knot after shuttling through the proximal anterior portal. One limb of each suture is cut, and the other limbs are brought out to a lateral row 5.5-mm SwiveLock anchor (Arthrex). The lateral row anchor is placed through a percutaneous incision placed using a spinal needle to help guide ideal anchor placement in the lateral trochanter (Fig 7). The hip is then drained of excess fluid using suction, and 30 cc of 0.5% Marcaine with epinephrine and 5 mg of morphine are injected into the trochanteric bursa.

Postoperatively, we place the patient in an abduction brace for 4 weeks at all times and limit weightbearing to 20% of body weight to help with balance and prevent falls. Unless otherwise contraindicated, we place patients on enoxaparin 40 mg twice daily for 2 weeks followed by 325 mg aspirin daily for 4 weeks for DVT prophylaxis. At 6 weeks, weightbearing is increased until the patient is able to maintain a normal gait with a cane until 10 weeks postoperatively, and then progressed to weightbearing normally without assistive devices. At this point, therapy is usually started to help regain core and abductor strength.

Discussion

Since the late 1990s, there has been increased recognition of gluteus medius and minimus tears as a source of intractable lateral hip pain and dysfunction. Previously, these were thought to be incidental tears in patients with coexisting pathology; however in 1999, Kagan[7] published the first results of isolated open abductor repair for greater trochanteric pain syndrome (GTPS) with excellent results at long-term follow-up. Patients who undergo surgical treatment for abductor

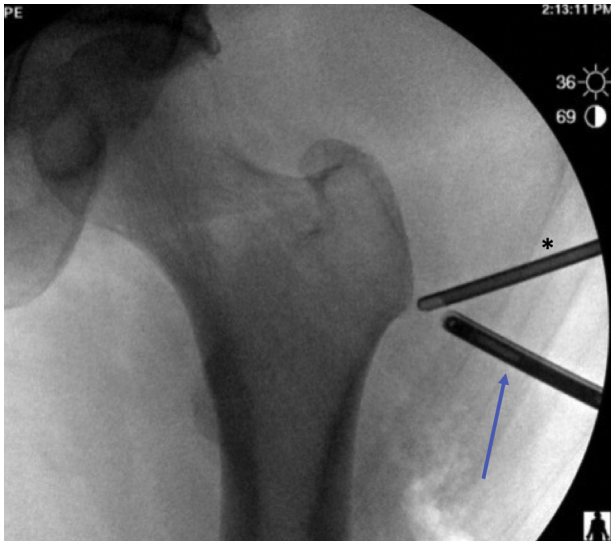

Fig 3. This fluoroscopic anteroposterior image of a left hip shows the arthroscope in the distal lateral portal (arrow) and a shaver inserted in the proximal lateral portal (*). This proximal lateral portal is placed in line with the femur just proximal to the level of the vastus ridge. It is initially placed with a spinal needle using fluoroscopic imaging, and its position can be adjusted to allow optimum working area around the insertion of the abductor tendons.

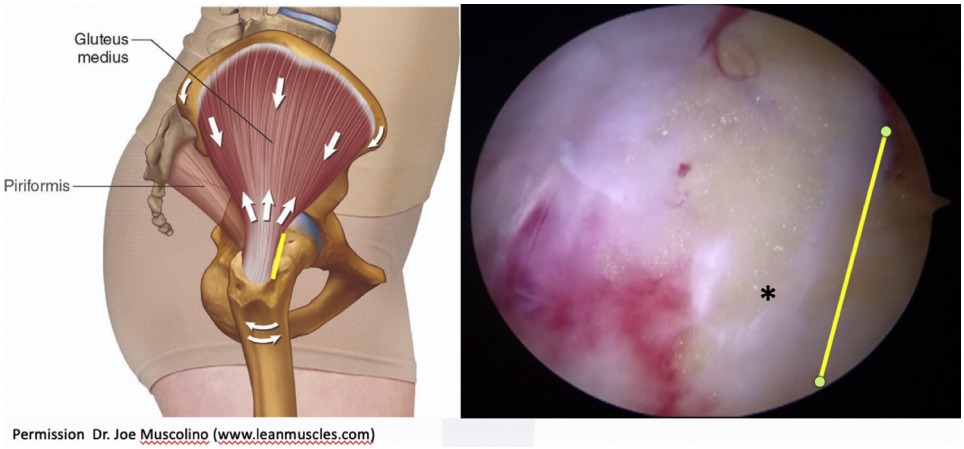

Fig 4. Diagram depicting a right hip both schematically and arthroscopically that illustrates the interval used to access the undersurface of the tear. The interval, shown by the yellow line, is opened with a radiofrequency device and allows the surgeon to come under the distal anterior edge of the gluteus medius tendon (*). Although this interval may be difficult to see, it is usually easily palpable as the finger comes off the edge of the tendon.

tears tend to be women (90%) and have tears that almost always involve the gluteus medius and about a third of the time the gluteus minimus.[5]

Voos et al.[1] published the first report of endoscopic abductor tendon repair in 2009, and with improved arthroscopic technique, multiple subsequent small case series[5] have documented effective treatment. More recently, in 2016, Byrd and Jones[8] published a case series with 2-year follow-up on 12 patients treated with endoscopic abductor repair. All patients had improvement in Harris hip score, and 11 patients (92%) had improvement in the International Hip Outcome Tool, with no postoperative complications. Although endoscopic repairs have received increased attention, open repairs are still common and successful. In 2018, Ebert et al.[9] published a series of 118 patients treated with open abductor repair using transosseous tunnels and lengthening of the iliotibial band. They demonstrated a significant improvement in all clinical and functional outcome measures at 12 months' follow-up, with 96% patient satisfaction.[9]

Both open and endoscopic repairs have since been shown to provide reliable relief of pain with excellent results. Two systematic reviews published in 2015 showed similar results between open and endoscopic treatment, with fewer complications in the endoscopic group, including tendon retear rates.[5,6] However, many of these studies include small numbers of patients with

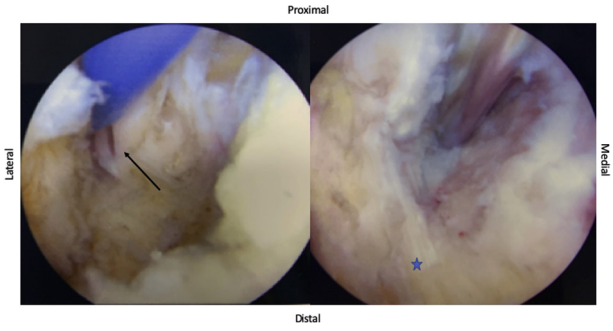

Fig 5. Two images of a right hip undergoing endoscopic abductor repair with orientation provided on the image. In the left image, the radiofrequency device is being used to open the interval distal to the edge of the gluteus medius tendon. The black arrow depicts the initial view of the tear, where there is a void with no tendon attached to the footprint. This is taken further proximal and posterior until normal tendon is encountered. In the right image, the blue star depicts the abductor insertion, and just distal to this is the vastus ridge. The shaver is used to further debride the tear and abductor tendon footprint in preparation for anchor placement.

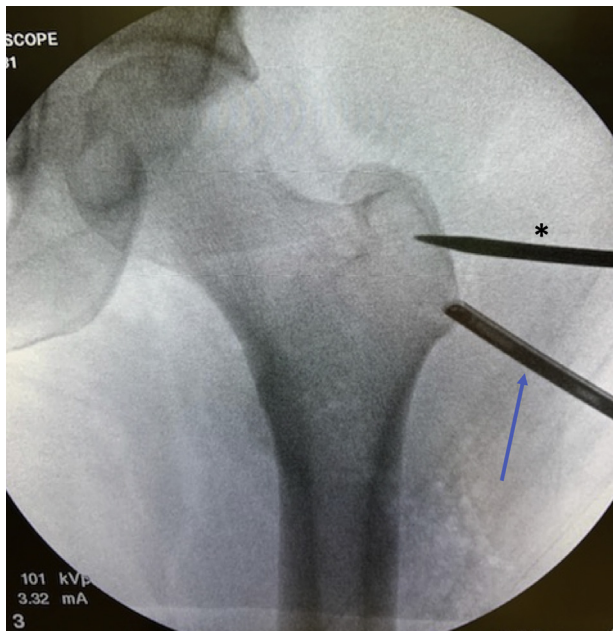

Fig 6. This fluoroscopic anteroposterior image of a left hip shows the arthroscope in the distal lateral portal (arrow) and the punch for a 5.5-mm PEEK Corkscrew anchor (Arthrex) inserted through the proximal lateral portal (*). The location of the punch is confirmed with fluoroscopy to ensure that it is proximal enough in the trochanter.

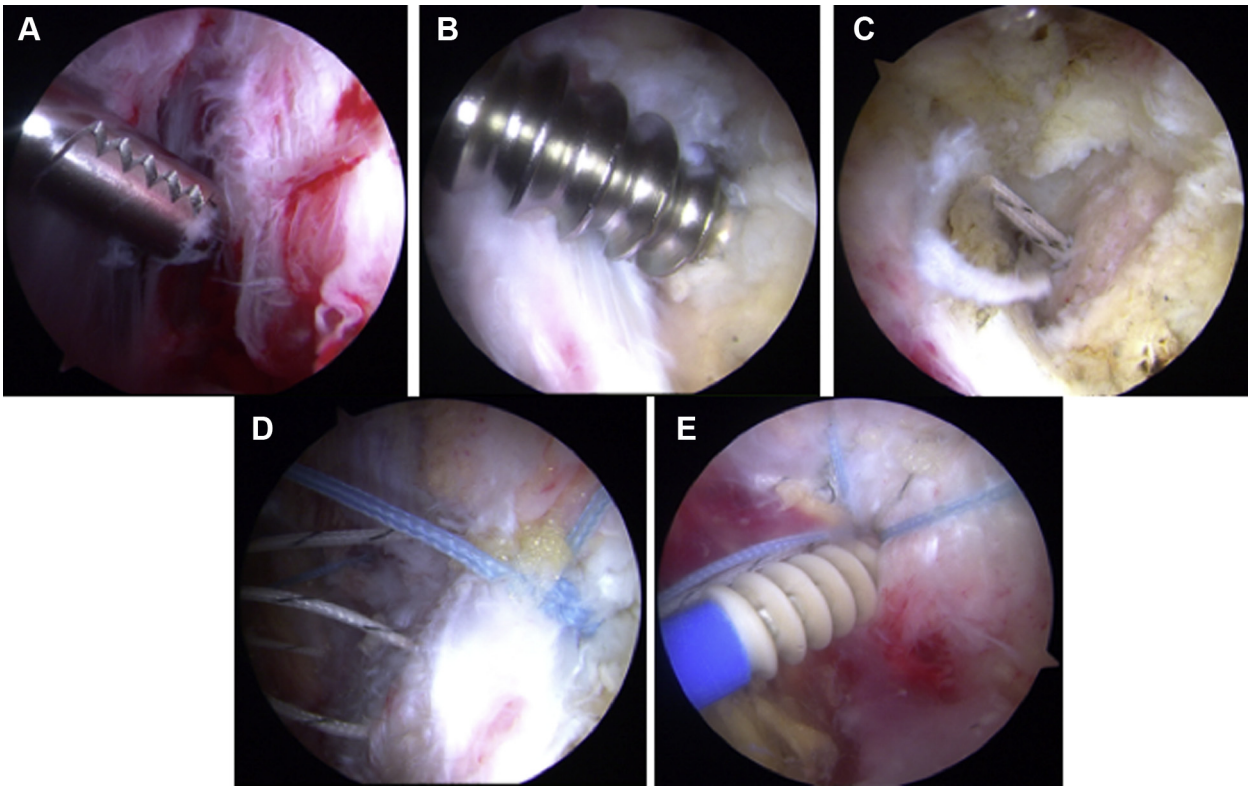

Fig 7. Endoscopic images of a right hip depict repair of an abductor tear. (A) With the camera in the distal lateral portal, a shaver is used to debride the bursa in the proximal lateral portal. (B) After adequate visualization and debridement of the abductor tear, a tap is used to prepare for insertion of a 5.5-mm double-loaded Corkscrew Anchor (Arthrex). (C) The first, more proximal anchor has been inserted, and both limbs have been passed in a horizontal mattress fashion through the proximal aspect of the tear. A second double-loaded anchor is typically placed more distally. (D) All four limbs of the sutures from both anchors have been passed, and the most distal suture has been tied. (E) After all suture limbs are tied, 1 limb from each is cut, and the other is brought out to a lateral row 5.5-mm SwiveLock anchor (Arthrex).

short-term follow-up, especially in the endoscopic group.

Although some tears can be full thickness secondary to trauma, many are degenerative in nature and exhibit undersurface tearing of the greater trochanter. This is analogous to PASTA tears in the rotator cuff and creates a unique challenge in the hip because of difficult visualization. Many previous techniques have described endoscopic repair of these tears through longitudinal splits in the tendon to visualize the undersurface tearing.[1,2,4,8] This technical note presents a unique surgical technique for endoscopic repair of undersurface abductor tendon tears using an interval anterior to the gluteus medius tendon. No healthy tendon tissue is violated, potentially increasing healing potential and long-term success rates, while also providing full footprint visualization. However, this technique is most useful for undersurface partial tears without significant retraction (<2 cm). Full-thickness tears or those with significant retraction are better suited for either open procedures or more traditional endoscopic techniques previously described. Furthermore, the presence of large bony spurs at the abductor insertion can make the technique challenging, and the authors prefer an open technique in these cases. However, further studies need to evaluate the long-term treatment of endoscopic abductor tears, using this technique as well as others.

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