

# Endoscopic Repair of Proximal Adductor Avulsion

Dean K. Matsuda, M.D.



Optimal treatment of complete grade 3 tears of the adductor longus tendon from the pubic body has support for both nonsurgical management and surgical reattachment. We demonstrate the feasibility of endoscopic reattachment of an adductor avulsion with >3 cm of retraction. Using our previously described anterior pubic symphyseal portal and an anteromedial adductor portal, initial diagnostic endoscopy is followed by debridement of adhesions, preparation of the pubic body bony footprint, secure passage of suture tape through the avulsed tendon, reduction of the avulsed tendon, and knotless suture anchor reattachment. Endoscopic primary repair is a technically feasible, minimally invasive option in the treatment of retracted grade 3 adductor tears.

**A**lthough adductor strains are common sport-related injuries, fibrocartilaginous avulsions of the proximal adductor conjoint tendon involving the adductor longus are infrequent.<sup>1</sup> Good outcomes have been reported with conservative and surgical treatments.<sup>2-4</sup> In contrast to relatively common adductor tendinopathies which, when recalcitrant and treated surgically with tenotomy (partial or complete),<sup>5</sup> retracted avulsion injuries have been treated with open repair of the retracted tendon using suture anchor fixation.<sup>3,4</sup> This Technical Note presents a completely endoscopic reattachment of a severe grade 3 proximal adductor avulsion with >3 cm retraction (Fig 1) at 6 weeks after acute eccentric injury.

## Surgical Technique

After full disclosure was made that this might be the first known attempt of endoscopic repair, informed consent for both endoscopic and possible open adductor tendon repair was obtained. Under general anesthesia,

the patient was positioned in a supine lithotomy position with the surgeon between the abducted, flexed, and externally rotated lower extremities and arthroscopic monitor at head of bed. A Foley catheter was inserted to decompress and protect the adjacent bladder from iatrogenic injury should inadvertent plunging occur. Initial anteroposterior fluoroscopic spot imaging confirmed the pubic symphysis location which was transiently marked with a 22 g needle. A pouched “shower curtain” drape was centrally positioned over the pubic region with the cephalad end draped over the patient.

A 2 cm vertical anterior pubic symphysis (APS) portal<sup>6</sup> and an adductor portal approximately 2 cm distal to the palpated proximal extent of the retracted adductor tendon margin were made. Because the avulsed tendon was not under tension, its location was facilitated by symmetrical palpation of the intact contralateral adductor longus tendon in the lithotomy position.

Using a 30° standard arthroscope in the APS portal and a switching stick in the adductor portal, the bursal tissue anterior to the pubic symphysis is cleared with a windshield wiper motion and the 22-gauge needle demarcating the pubic symphysis is removed. A motorized shaver and radiofrequency probe (Hip Vac 50 Arthrowand; Smith & Nephew, Andover, MA) are used to resect soft tissues obscuring endoscopic visualization. Meticulous coagulation control of small bleeding vessels with the radiofrequency ablator permits low arthroscopic pump pressures no higher than 40 mm Hg or even “dry” endoscopy, minimizing local perineal swelling. Egress of instilled fluid via the 2 cm portals is encouraged.

Diagnostic endoscopy involves visualization of the pubic symphysis, the ipsilateral prepubic aponeurotic

From Premier Hip Arthroscopy, Marina del Rey, California, U.S.A.

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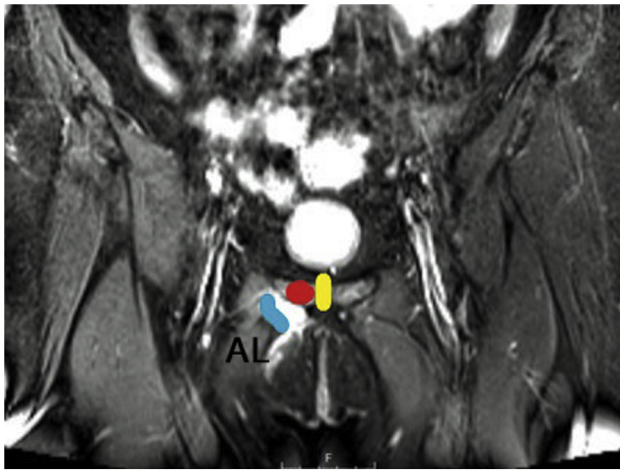
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Address correspondence to Dean K. Matsuda, M.D., Premier Hip Arthroscopy, Marina del Rey, CA 90292, U.S.A. E-mail: [Saltandlight777@hotmail.com](mailto:Saltandlight777@hotmail.com)

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**Fig 1.** Coronal STIR MRI demonstrating acute right adductor longus tendon avulsion. Digital measurement showed 3.7 mm of retraction of the free margin of the proximal adductor tendon (*blue*) from the left pubic body origin (*red*) with interposed focal high intensity fluid signal. The pubic symphysis is demarcated in yellow.

complex, distal rectus abdominis tendon, inguinal ligament insertion at the pubic tubercle, pubic body, gracilis, pectineus, adductor brevis, and the retracted proximal free end of the proximal anterolateral (AL) tendon (*Fig 2*). This patient had an intact prepubic aponeurotic complex and distal rectus insertion. The inferior part of the ipsilateral pubic body is the anatomic footprint of the avulsed AL and is debrided using a motorized shaver and radiofrequency ablator. Preparation of the bony footprint with a 5.5 mm round or flat top burr (Smith & Nephew) is performed with conservative decortication for desired bone marrow element exudation without compromising subsequent suture anchor fixation.

The proximal free margin of the avulsed and retracted AL tendon is then visualized. Interposed clot and scar tissue and adhesions are resected with a shaver and radiofrequency ablator. At this point, drilling and tapping for a Healicoil knotless suture anchor (Smith & Nephew) was done at the cephalad margin of the prepared footprint.

A suture passer device (First Pass; Smith & Nephew) was used to pass suture tape (Smith & Nephew) in a cinch stitch or luggage tag configuration (*Fig 3*). The initial horizontal mattress configuration is converted to a cinch stitch by looping the free suture tape ends under the horizontal suture tape crossing the anterior surface of the proximal tendon free margin. Secure purchase is confirmed via longitudinal traction via the APS portal, and mobility of the tendon is assessed. If deemed necessary, further mobilization of the retracted AL tendon may be achieved with release of the epimysium and perimysium, but it was not needed in this case.

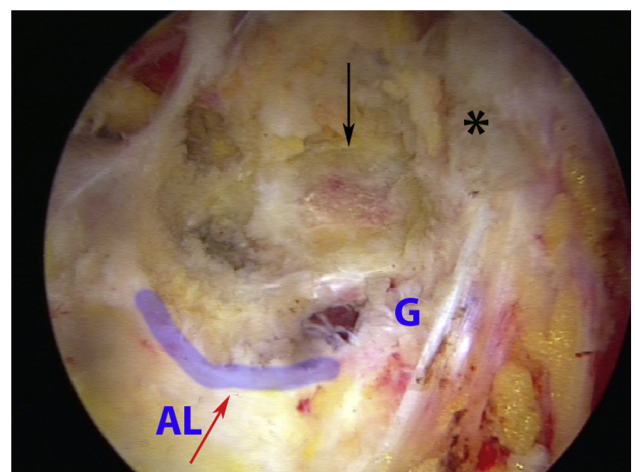
The arthroscope was then replaced into the APS portal, and the Healicoil anchor inserter was used to

fully reduce the avulsed AL tendon to the anatomic footprint by positioning the ipsilateral hip out of the hyperabducted lithotomy position (estimated 70° abduction) into 20° abduction with neutral extension. The AL tendon was securely fixated after full seating of the inserter and deployment of the knotless locking mechanism (*Fig 4*). Probe palpation and dynamic testing on gentle range of motion to approximately 40° abduction confirmed repair construct stability. Desired bone marrow element exudation from the Healicoil anchor site was confirmed.

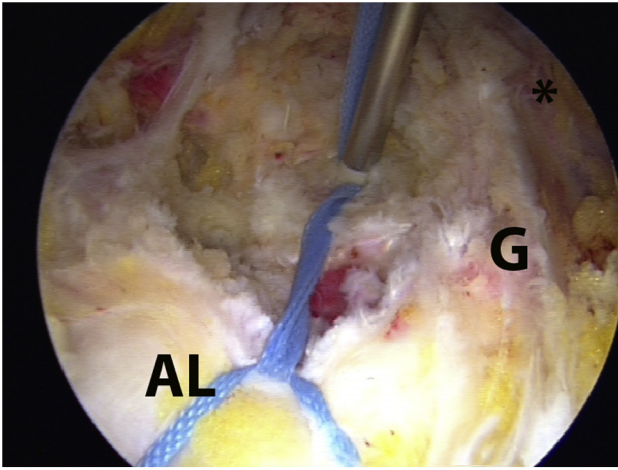
After routine closure of portal incisions and before reversal of general anesthesia, sterile dressings were applied, the Foley catheter was removed, and a hip brace was applied in 20° (neutral) abduction with an extension block set at 30°. With soft tissue play between the brace and the torso, this effectively prevented hyperextension. Key steps of endoscopic repair of this retracted avulsion of the adductor longus are demonstrated in the [supplemental material](#).

### Postoperative Rehabilitation

The patient was allowed ambulation with flatfoot protected weightbearing on 2 crutches in the aforementioned hip brace. Full sitting and sleeping in any position except prone was permitted. At 3 weeks, the brace was used only at bedtime (to prevent inadvertent extreme abduction). Advancement to full weightbearing ambulation with 2 crutches was allowed between weeks 3 and 4 and advancement to household ambulation without upper extremity aids at 4 weeks. Physical therapy began with isometric strengthening after 4 weeks, with the addition of controlled passive



**Fig 2.** Supine endoscopic view from anterior pubic symphysis portal showing the pubic symphysis (\*), the proximal free margin (*blue line*) of the retracted adductor longus tendon (*red arrow, AL*), the adductor longus origin footprint (*black arrow*) on the inferior part of the right pubic body, and the intact gracilis tendon (*G*).



**Fig 3.** Supine endoscopic view before reducing the avulsed adductor longus (AL) tendon free margin to the anatomic footprint on the right pubic body. Note the blue suture tape in a cinch stitch (luggage tag) configuration engaging the retracted proximal tendon and the cephalad location of the suture anchor fixation site on the decorticated bony footprint. Gracilis tendon (G).

abduction and progressive adductor strengthening at 6 weeks. At 8 weeks, the patient was allowed commencement of sport-specific rehabilitation under the guidance of a physical therapist as long as pain-free full range of motion with comparable symmetry of adductor strength without pain was experienced. Tips and tricks for this procedure are shown in [Table 1](#), and advantages and disadvantages are shown in [Table 2](#).

### Discussion

We acknowledge a lack of firm consensus for surgical versus nonsurgical treatment of grade 3 adductor avulsion injuries. There is published support for both options,<sup>2-4</sup> and further investigation is required to firmly establish whether surgical repair (open or now endoscopic) can yield better outcomes, particularly in the setting of acute adductor longus avulsions with retraction. This technical report demonstrates the feasibility of performing safe reduction and repair of a retracted complete grade 3 adductor longus avulsion.

If surgical reattachment is elected and endoscopic repair is being considered, the patient should consent for endoscopic and open approaches. Relatively simple open conversion may be performed if needed, such as very retracted tendon or longer duration from acute injury.

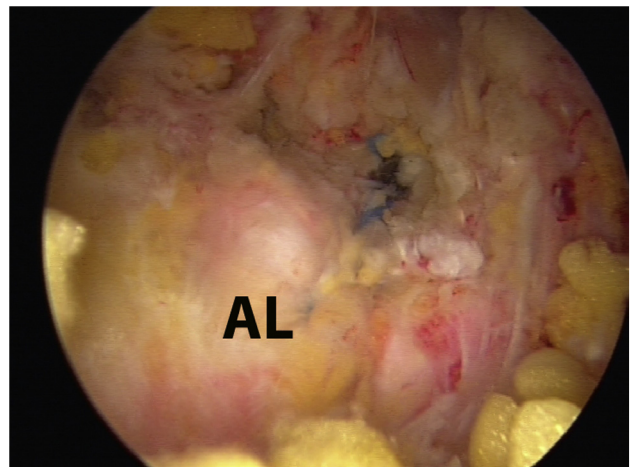
We opted to use 2 mm–wide suture tape (Ultratape; Smith & Nephew) for optimized tendon repair and needed an anchor that could accommodate this material. Open adductor repairs have been done using multiple smaller hard and suture-based anchors.<sup>3,4</sup> A relatively small footprint may not accommodate a large number of anchors, certainly not large-diameter

anchors. The Healicoil anchor was chosen because it offers the theoretical advantage of increased exudation of bone marrow elements for improved healing potential at the bone/tendon interface as seen in [Video 1](#).

Advantages of the endoscopic approach include the advantages of less-invasive surgery with the potential for accelerated rehabilitation and improved cosmesis. Moreover, the magnified endoscopic view facilitates detailed inspection of the normal and pathologic anatomy.

Disadvantages of the endoscopic approach include the theoretical potential for iatrogenic bladder injury should a motorized drill or burr inadvertently penetrate. Localized swelling of the perineum may also occur. Scrotal swelling has been reported in males undergoing endoscopic pubic symphysectomy and endoscopic surgeries for athletic pubalgia but is transient and resolves spontaneously.<sup>6-8</sup> Judicious use of dry endoscopy, low pump pressures (e.g., 40 mm Hg), hypotensive anesthesia, meticulous hemostasis using radiofrequency coagulation, and generous skin incisions (approximately 2 cm) to facilitate fluid egress may minimize soft tissue swelling.

Adductor injuries may be isolated or be a component of core muscle injury or athletic pubalgia involving the pyramidalis-anterior pubic ligament-adductor longus complex, the PACC, or the distal rectus abdominis insertion.<sup>4,8,9</sup> In this patient, endoscopy revealed this to be an isolated but severe adductor avulsion. The PACC and distal rectus abdominis were intact on preoperative magnetic resonance imaging and on intraoperative endoscopic examination. Although the adductor complex has been surgically addressed in comprehensive open surgeries for athletic pubalgia (or core muscle injury), a recent study reports similar successful outcomes in afflicted athletes using surgery “targeted” to



**Fig 4.** Supine endoscopic view of the right adductor tendon repair. Note the reduction of the proximal adductor longus (AL) tendon to the anatomic footprint on the ipsilateral inferior pubic body.



**Table 1.** Tips and Tricks for Endoscopic Repair of Proximal Adductor Avulsion

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Foley catheter to decompress bladder to minimize risk of possible bladder injury if inadvertent instrument slippage with penetration

Surgeon position between abducted, flexed, externally rotated lower extremities of supine lithotomy patient position with arthroscopic monitor comfortably near head of operative table.

Pubic symphysis as reference landmark can be identified either via anteroposterior fluoroscopic spot imaging or placement of 22-gauge needle into pubic symphysis. Latter is removed once needle (and, hence, pubic symphysis) is endoscopically visualized.

Adductor portal made about 2 cm distal to proximal free margin of retracted adductor conjoined tendon

2 cm portal incisions facilitate portal egress of endoscopic fluid to minimize local swelling

Dry endoscopy and use of low arthroscopic pump pressures ( $\leq 40$  mm Hg) to minimize local swelling

Begin with 30° standard length arthroscope in APS portal and perform initial debridement and footprint preparation and anchor site preparation (e.g., drilling, tapping) using Adductor portal as working portal.

Switch from initial APS viewing portal to Adductor viewing portal when performing “tendon work” including debridement, suture or suture tape passage, and initial assessment of tendon mobilization.

Consider cinch stitch configuration using suture tape for secure grasp of free tendon margin

Debride adhesions and scar tissue to mobilize retracted tendon. May consider epimysium and perimysium release if need.

Reposition ipsilateral lower extremity out of extreme abduction (approximately 70° abduction lithotomy frog leg position) to neutral abducted hip position (approximately 20° abduction) may facilitate retracted tendon reduction to anatomic footprint on pubic body

Ensure use of same portal (and, hence, angle of approach) used for anchor site preparation (e.g., drilling, tapping) for anchor insertion. Using wrong portal may cause inability to seat anchor and/or failure of anchor deployment mechanism.

Consider use of skeletonized anchor (e.g., Healicoin; Smith & Nephew, Andover, MA) that allows use of suture tape and enables desired local escape of bone marrow elements to fresh repair site. If using single larger diameter anchor in relatively small footprint surface area, place anchor at cephalad location to maximize tendon apposition.

Consider hip brace preventing extreme abduction and hyperextension prior to reversal of general anesthesia. Assess “play” of brace on torso to ensure desired extension block because one may need to dial in more extension block than indicated on brace hinge.

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the specific pathologic area such as the adductor origin.<sup>5</sup> But if, for example, a pubic plate avulsion is found on endoscopic examination, endoscopic repair has been described<sup>8</sup> and can be performed seamlessly with endoscopic adductor repair. Furthermore, recalcitrant femoroacetabular impingement and osteitis pubis, which may occur concomitantly, may be addressed with hip arthroscopy for the former and endoscopic pubic symphysectomy<sup>7</sup> for the latter condition.

Endoscopic repair of a retracted adducted adductor longus avulsion tear is feasible but technically challenging. In preparation of attempted endoscopic repair of these injuries, we recommend consideration of retracted complete grade 3 tears with at least 3 cm retraction as defined on preoperative magnetic

**Table 2.** Endoscopic Repair of Proximal Adductor Avulsions: Advantages and Disadvantages

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Advantages

- Less invasive
- Detailed magnified visualization of pathology
- Enables seamless assessment and treatment of other related pathology (e.g., osteitis pubis, rectus abdominis tear, prepubic aponeurotic complex repair)
- Improved cosmesis
- Potential for faster rehabilitation/recovery
- Easily converted to open approach if necessary

Disadvantages

- Technically challenging
- Scrotal/labial swelling (transient)

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resonance imaging in an active healthy patient no more than 6 to 8 weeks after acute injury. We recommend that the surgeon be familiar with prior open adductor avulsion repairs and have arthroscopic skills in hip or shoulder arthroscopy or both that would crossover well with this procedure (e.g., endoscopic repairs of the gluteus minimus/minimus tendon and/or proximal hamstring tendons, and/or rotator cuff repair). If feasible, cadaveric endoscopic procedures in a controlled laboratory setting would be optimal.

## Conclusion

Endoscopic primary repair of a retracted grade 3 proximal adductor avulsion injury is a technically feasible surgery

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