Technical Note

# Parachute Technique for Dermal Allograft Augmentation in Open Gluteal Abductor Repair

Ady H. Kahana-Rojkind, M.D., Tyler R. McCarroll, M.D., Benjamin D. Kuhns, M.D., M.S., Ali Parsa, M.D., Roger Quesada-Jimenez, M.D., and Benjamin G. Domb, M.D.

**Abstract:** Retracted full-thickness tears of the gluteus medius tendon are a well-recognized cause of disabling weakness and pain that significantly impact patients' quality of life. We present an efficient knotless parachute technique for dermal allograft augmentation in open gluteal abductor tendon repairs. Our technique reinforces the suture-tendon interface by incorporating a robust biological scaffold into a knotless double-row fixation. This approach capitalizes on the increased pressure and contact area achieved between the greater trochanter and the dermal allograft/gluteus medius tendon construct without the prominence of knotted sutures.

Greater trochanteric pain syndrome (GTPS) is a common orthopaedic diagnosis that impacts up to 25% of the general population and can result in disability and quality of life levels comparable to those linked with advanced stages of hip osteoarthritis.[1,2] Gluteal tendinopathy is a leading cause of GTPS, affecting 18% to 50% of patients with this diagnosis.[3-5] As the aging population grows and detection improves, the incidence of gluteal tendinopathy is likely to rise.[5] Most cases of GTPS can be resolved through nonsurgical treatments such as physical therapy, lifestyle adjustments, anti-inflammatory medication, and/or biological injections with success rates exceeding 90%.[5-7] When nonoperative treatment fails, gluteus medius and minimus tendon tears are addressed through either open or endoscopic surgical methods depending on the severity of the tear (Fig 1).[1,8-10]

When addressing large and retracted tears, an open approach may be preferred as it offers better tissue exposure, facilitates the release and reduction of the retracted tendon, reduces surgical time, and has demonstrated good outcomes.[11-13] One must also consider the degree of degeneration and retraction, which may increase the risk of surgical failure or pullout.[14,15] To avoid this, a dermal allograft can be used. The graft may provide a higher ultimate load resistance and decrease the gap formation between the tendon and bone, allowing cellular ingrowth, neovascularization, and possibly improved healing.[16]

Traditionally, tendon-to-bone fixation, with or without the use of a dermal allograft, has relied on knotted techniques.[17] By using a knotless technique, the procedure may be less time-consuming and leaves behind less foreign material that can impinge on surrounding soft tissue, be a source of abrasion against the iliotibial band, or can act as a nidus for bacterial reproduction.[18]

The purpose of this article is to describe a technique for dermal allograft augmentation that (1) incorporates the graft to the fixation of the gluteus medius tendon and (2) uses the biomechanical strength of the graft to reinforce the repair.

This study was performed in accordance with the ethical standards in the 1964 Declaration of Helsinki and was carried out in accordance with relevant regulations of the US Health Insurance Portability and Accountability Act. Details that might disclose the identity of the subjects under study have been omitted. This study was approved by the Institutional Review Board (IRB ID: 5276) and was supported by Arthrex funding (IIRR-01752).

*From the American Hip Institute Research Foundation, Chicago, Illinois, U.S.A. (A.H.K-R., T.R.M., B.D.K., A.P., R.Q-J., B.G.D.) and American Hip Institute, Chicago, Illinois, U.S.A. (B.G.D.).*

*Received October 4, 2023; accepted January 15, 2024.*

*Address correspondence to Benjamin G. Domb, M.D., 999 E Touhy Ave, Suite 450, Des Plaines, IL 60018, U.S.A. E-mail: DrDomb@americanhipinstitute.org*



*2212-6287/231463*
*https://doi.org/10.1016/j.eats.2024.102958*

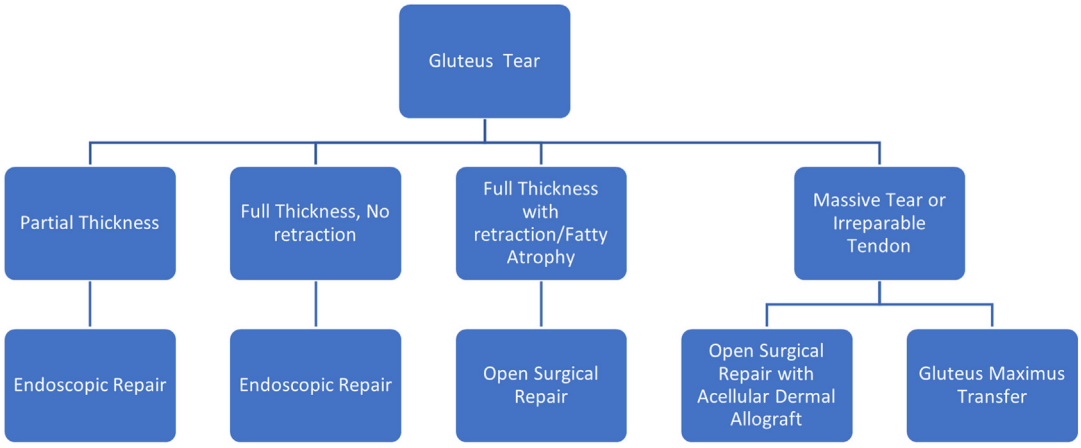


**Fig 1.** Gluteus medius tear treatment algorithm.

## Surgical Technique (With Video Illustration)

Technique Video 1 describes the knotless parachute technique in detail.

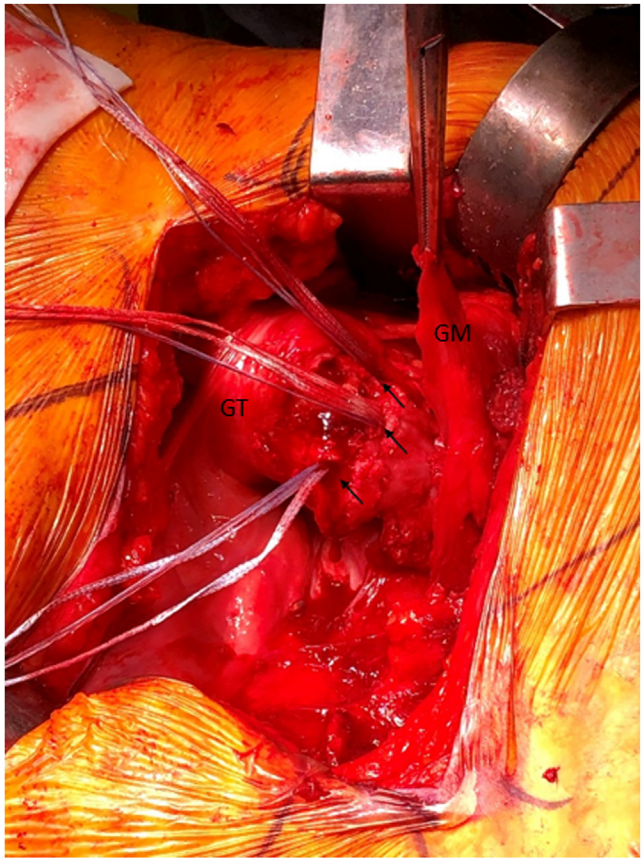


**Fig 2.** The patient is placed in a right lateral decubitus position and the left hip is accessed through the posterolateral approach. The retracted gluteus medius (GM) is isolated and a clamp is placed over the tendon. The proximal row of the construct is made by placing 3 SwiveLock anchors loaded with SutureTapes (black arrows) on the lateral facet of the greater trochanter (GT).

### Patient Positioning

After obtaining and signing the surgical informed consent, the appropriate extremity is identified and marked in the preoperative holding zone; subsequently, the patient is transported to the operating room. After administering general anesthesia, the patient is moved onto the operating table and positioned in a standard lateral decubitus position. Sufficient padding is provided for all bony prominences. The surgical limb is prepared with ChloraPrep (Becton Dickinson) and draped to enable unrestricted movement. The surgical field is covered with Ioban (3M Corporation).

### Surgical Approach

A posterolateral approach is employed over the greater trochanter. Dissection is meticulously conducted down to the iliotibial band, which is incised longitudinally over

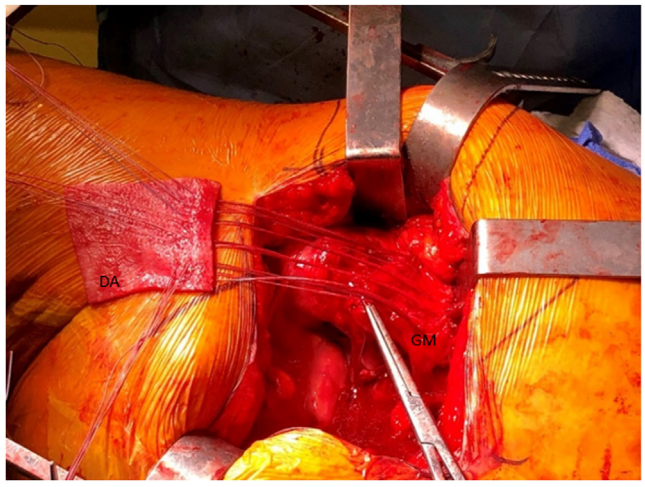


**Fig 3.** Left hip accessed through the posterolateral approach. A free needle is used to pass all anchor strands through the stump of the gluteus medius (GM) and subsequently through the proximal end of a suitably sized acellular dermal allograft (DA). The 2 strands of SutureTape are passed proximal to the knotless mechanism, which is placed in a mattress configuration.

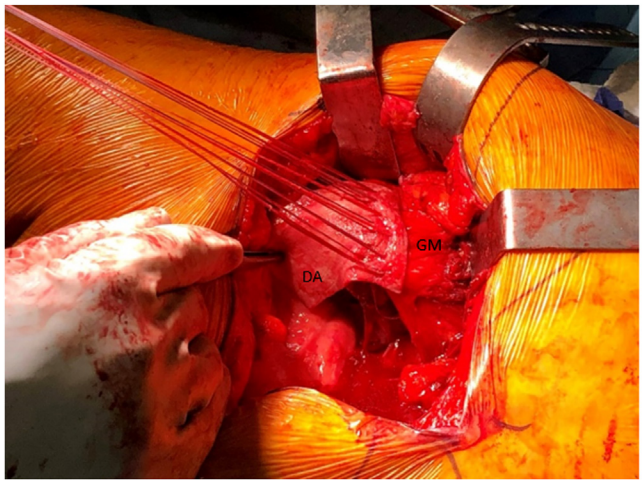


**Fig 4.** Left hip accessed through the posterolateral approach. The dermal allograft (DA) is pushed down into the greater trochanter (GT) to cover the stump of the gluteus medius and its insertional footprint.

the greater trochanter to expose the bursa. Subsequently, a bursectomy is performed to facilitate visualization of the tendons and assess their condition. The distal stump gluteus medius is isolated using blunt dissection and debrided with scalpel and rongeur to remove all nonviable tissue. Additional debridement of scar tissue may be required to fully mobilize the tendon stump. The tendon footprint on the greater trochanter is prepared by decortication with a mechanical burr (Arthrex) or a large curette to obtain bleeding bone suitable for healing and tendon integration.

### Tendon Repair With Allograft Augmentation

After confirming the location of the gluteus medius footprint and ensuring adequate debridement of the

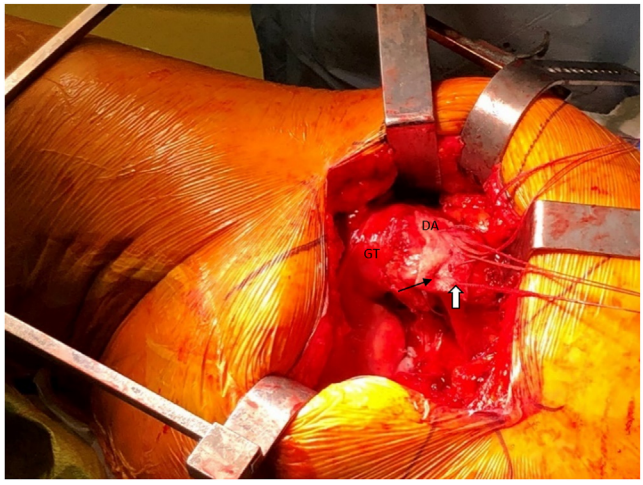


**Fig 5.** Left hip accessed through the posterolateral approach. The tensionable knotless mechanism (black arrow) of each of the anchors is engaged distal to the SureTapes (white arrow) to provide a ripstop mechanism at the proximal row of the construct.

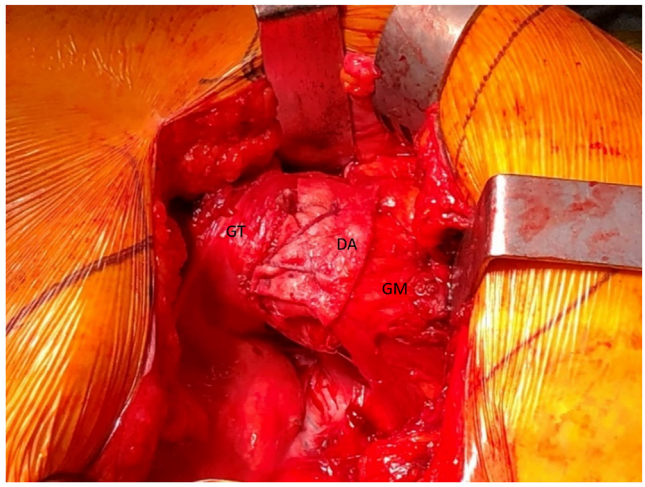


**Fig 6.** Left hip accessed through the posterolateral approach. Image demonstrating the completed gluteus medius (GM)/dermal allograft (DA) construct on the greater trochanter (GT).

bone, three 4.75-mm knotless SwiveLock anchors loaded with SutureTape (Arthrex) are placed on the lateral facet of the greater trochanter to form the proximal row of the construct (Fig 2). Initially, all the strands are passed through the gluteus medius tendon and then immediately threaded through a suitably sized acellular dermal matrix graft (Arthroflex; LifeNet Health) (Fig 3). The 2 strands of SutureTape are passed through the tendon and allograft just proximal to the knotless mechanism, which is placed in a mattress configuration in which the repair suture is placed on one side of the SutureTape strands and both ends of the shuttling suture placed on the other side. This is repeated for all 3 anchors. The graft is pushed down to the trochanter (Fig 4), and the tensionable knotless mechanism of each anchor is engaged, fastening the graft and tendon to each suture point (Fig 5). This mechanism allows for controlled tightening, ensuring reliable compression, and provides a ripstop mechanism for the proximal SutureTape. One strand from each pair of SutureTape is affixed to 2 distal knotless SwiveLock anchors. The tapes are tensioned in sequence to adequately compress the graft-tendon unit into the footprint (Fig 6). The tensionable knotless mechanism of the distal row anchors can be used to address dog-ears. The wound is then irrigated thoroughly with saline, and the fascia is closed in a running fashion with No. 1 STRATAFIX suture (Ethicon). The subcutaneous fat and skin are closed in a standard fashion, and the wound is covered with a dry sterile dressing.

## Postoperative Rehabilitation Protocol

Postoperatively, patients are advised to use crutches with partial weightbearing, up to 20 lbs., while also wearing a low-profile abduction brace (DonJoy VersaROM brace; Enovis) for a duration of 6 weeks. During

**Table 1.** Advantages and Disadvantages of the Knotless Parachute Technique for Open Gluteal Repairs

| Advantages | Disadvantages |
|---|---|
| Open approach allows good visualization. | More invasive technique with increased blood loss |
| Dermal allograft provides immediate strength to the repair. | Added cost of graft |
| Graft compensates for tendon retraction. | |
| Adjustable tension | |
| No knot loosening or suture prominence | |
| Ripstop mechanism | |

this time, patients are instructed to avoid hip abduction, adduction, internal rotation, and external rotation while wearing the brace. Once the brace is taken off, patients are directed to gradually reduce their reliance on crutches and start physical therapy to restore their mobility and strength.

## Discussion

Primary repair, whether open or endoscopic, is often challenging in the setting of a full-thickness, retracted, gluteus medius tear. The chronicity of such injuries gives rise to compromised tissue quality, accompanied by restricted tendon excursion, hampering the ability to return the tendon to the original footprint.[19] As a robust biologic scaffold, acellular dermal allograft provides a promising solution by offering immediate and indispensable structural reinforcement to the repair site, optimizing the environment for tendon healing. Moreover, the dermal allograft creates an environment conducive to optimal biological responses, thereby significantly enhancing the process of tendon-to-bone healing. Browning et al.[15] found that at a 1-year follow-up, patients who underwent abductor gluteal reconstruction with dermal allograft presented favorable outcome, with 62.5%, 50.0%, and 75.0% of patients achieving the patient acceptable symptomatic state for the Hip Outcome Score - Activities of Daily Living Subscale, Hip Outcome Score—Sport-Specific Subscale, and modified Harris hip score, respectively.

**Table 2.** Pearls and Pitfalls of the Knotless Parachute Technique for Open Gluteal Repairs

| Pearls | Pitfalls |
|---|---|
| Adequate preparation of the host bone for optimal healing | Insufficient mobilization of the retracted tendon |
| Appropriate anchor placement on the gluteus medius tendon footprint | Improper suture management |
| Incorporation of a torn gluteus minimus tendon into the anterior aspect of the construct | Inadequate tensioning of the graft-tendon construct |

Our technique presents an alternative repair method for massive, retracted abductor gluteal tendon tears that seeks to refine existing techniques with the adoption of all knotless technology. This design allows to establish a sturdier construct characterized by an even and dependable distribution of compressive forces. In addition, the technique does not rely on knotted anchors, which are variable in strength and add additional prominence that may cause damage to the surrounding tissue, including abrading the iliotibial band. Advantages and disadvantages of the technique as well as technical pearls and pitfalls are described in Tables 1 and 2. In conclusion, this method presents a straightforward approach that aims to increase surgical efficiency, diminish potential failure, and facilitate a proper tendon healing environment.

## Disclosures

The authors report the following potential conflicts of interest or sources of funding: A.H.K-R. reports a relationship with Arthrex Inc that includes travel reimbursement. B.D.K. serves on the editorial board for the *Journal of Arthroscopy*. A.P. reports a relationship with Smith & Nephew that includes educational support. B.G.D. reports that financial support was provided by American Orthopedic Foundation; a relationship with Arthrex that includes consulting or advisory, funding grants, nonfinancial support, and speaking and lecture fees; a relationship with Stryker Corporation that includes funding grants and speaking and lecture fees; a relationship with Medacta USA INC that includes nonfinancial support and speaking and lecture fees; a relationship with Orthomerica that includes nonfinancial support; a relationship with Medwest Associates Inc that includes speaking and lecture fees; a relationship with Ossur that includes nonfinancial support; a relationship with Stryker Endoscopy that includes funding grants and nonfinancial support; a relationship with American Hip Institute Research Foundation that includes board membership; a relationship with AANA Learning Center Committee that includes board membership; a relationship with the *Journal of Arthroscopy* that includes board membership; a relationship with American Hip Institute that includes equity or stocks. B.G.D. has patents for method and instrumentation for acetabular labrum reconstruction with royalties paid to Arthrex, knotless suture anchors and methods of tissue repair with royalties paid to Orthomerica, knotless suture anchors and methods of tissue repair with royalties paid to DJO Global, adjustable multicomponent hip orthosis with royalties paid to Arthrex, and a patent with royalties paid to Medacta Inc. B.G.D. is a board member of the AANA Learning Center Committee and the *Journal of Arthroscopy*. All other authors (T.R.M.,

R.Q-J.) report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

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