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Contemporary Surgical Approaches for Refractory Gluteus Medius Pathology

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ABSTRACT

Trochanteric pain is a highly prevalent clinical entity of lateral hip pain, encompassing bursitis, tendinopathy, and/or rupture of the hip abductor apparatus. It is predominantly observed in middle-aged women. Classically, patients are treated with nonsurgical treatment, consisting of the use of anti-inflammatory drugs, physiotherapy, and infiltrations, owing to the low diagnostic and anatomical precision necessary to indicate the need for surgical management.

Within trochanteric pain syndrome, tendinopathy and tendon tears of the abductor musculature are frequent, with degenerative lesions of the gluteus medius and gluteus minimus tendon resulting from a lateral hyperpressure given by the iliotibial band complex, tensor fasciae latae, and gluteus maximus. These lesions may be refractory to conservative management and require surgical management.

Endoscopic hip surgery offers a minimally invasive approach with quicker recovery, reduced scarring, and improved aesthetic outcomes; therefore, we have developed our own endoscopic technique for the management of gluteus medius injuries, which encompasses a spectrum of procedures, ranging from lateral decompression and trochanteric perforations in cases of refractory tendinopathy and lesions comprising less than 30% of the gluteus medius tendon thickness to the application of bioinductive collagen patches for lesions exceeding 30%, and culminating in reinsertion with anchors in instances of full-thickness rupture.

Our surgical approach provides an alternative for the treatment of gluteus medius lesions refractory to conservative management, obtaining good clinical results with reproducible techniques and a low rate of complications.

Introduction

The abductor apparatus comprises a set of muscles involving the gluteus medius, gluteus minimus, and tensor fasciae latae. While the tensor fasciae latae inserts distal to the hip, the confluence of the gluteus medius and gluteus minimus inserts proximal to the greater trochanter[1]. This group of muscles stabilizes the pelvis during gait and standing and has a secondary but important stabilizing effect on the hip joint[2].

Traditionally, trochanteric pain has been considered to have minor significance and is primarily attributed to trochanteric bursitis; however, recent research has demonstrated that tendinous inflammation plays a significant role in the pathogenesis, identifying gluteal tendinopathy as the primary cause of this pain[2-13] and is likely secondary to a proximal hyperpressure syndrome, analogous to the mechanism observed in the knee joint with the iliotibial band.

Epidemiology

The incidence of gluteal tendinopathy requiring surgical treatment has recently been increasing, corresponding to lesions refractory to conservative treatment and partial and/or complete ruptures. This is related to advances in diagnosis through imaging studies and directed physical examination[14,15] as well as to the appearance of less invasive therapeutic options, endoscopic procedures, and alternatives with better results. This tendinopathy is more frequent in middle-aged women[16,17]. It is believed that in patients older than 70 years, the prevalence is more than 80% without presenting symptoms[18], which makes the physical examination fundamental both to make the differential diagnosis of pathologies more prevalent at that age, such as hip arthrosis, as well as to make a correct and timely diagnosis and to provide adequate treatment[19]. The etiology of this prevalence in this specific demographic population remains unclear. The proposed factors include the biomechanics of the female hip, which experiences up to a 50% greater load compared to males, coupled with a reduction in estrogen levels. This hormonal change results in tendon thinning and consequently increases the likelihood of gluteus medius rupture[20-22].

Tendinopathy of the gluteus medius is the primary etiology of trochanteric pain, particularly in female patients over 50 years of age. This condition has traditionally been associated with trochanteric bursitis, often leading clinicians to overlook the underlying rupture lesion of the tendon or tendon complex comprising the gluteus medius and gluteus minimus. The diagnosis is usually clinical, which is accurate in the vast majority of cases and does not require further examination unless associated hip pathology, either intra-articular or periarticular, is suspected. This diagnostic approach is appropriate for patients without a history of morbidity, who seek consultation for the first time. However, the situation differs in patients with a history of rheumatoid arthritis or other diseases affecting collagen, requiring an alternative diagnostic approach. Similarly, this applies to individuals who have sought multiple consultations or those who have undergone physiotherapy and/or infiltration in the affected area, a treatment modality particularly prevalent among clinicians.

Imaging

Typically, the initial diagnostic imaging modalities requested for this pathology include hip ultrasound in conjunction with a radiograph, which should encompass the entire pelvis rather than solely the affected hip. The efficacy of ultrasound is limited to confirming diagnostic suspicion, as it does not provide clinicians or surgeons with more pertinent information, such as inflammatory involvement of the tendon, partial and/or complete lesions of the gluteus medius tendon, and particularly of the gluteus minimus. The latter, being more medially situated, was not readily visualized on ultrasound examination. Notably, the structural lesion of the gluteus medius minor complex initiates medially; specifically, the gluteus minimus tendon is the first to be affected. Consequently, the diagnostic imaging protocol for this high-risk group should encompass both a pelvic radiograph and a magnetic resonance imaging (MRI) examination of the hip.

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Upon confirmation of the diagnosis and exclusion of structural lesions, either through early consultation or a brief observation period, treatment should be initiated. The primary intervention is conservative, with anti-inflammatory medications, physical therapy, strengthening and stretching exercises targeting the abductor apparatus, and local infiltration in patients presenting with severe symptoms. It is important to avoid steroid infiltrations, as it has been shown that repeated use of steroids can induce tenomalacia and joint destruction. Instead, infiltration with platelet concentrates is preferred[24].

Symptoms may be nonspecific; however, the primary manifestation is progressive pain and heightened sensitivity in the lateral aspect of the greater trochanter, which may be accompanied by diminished strength and a positive Trendelenburg sign in cases of prolonged evolution. When gluteus medius tendinopathy is clinically suspected, it is imperative to conduct hip MRI, which is considered the gold standard[23-27].

Magnetic Resonance Imaging should be evaluated by both the surgeon and a trained radiologist, since the structural lesion in the medial-minor tendon complex classically starts from medial to lateral, which is why surgical treatment alternatives should be previously defined and not based only on intraoperative findings. In some instances, MRI failed to reveal structural alterations in the gluteus medius tendon in patients with persistent tendinitis **Figure 1a-1b**. The absence of visible changes complicates the decision-making process for surgical intervention.

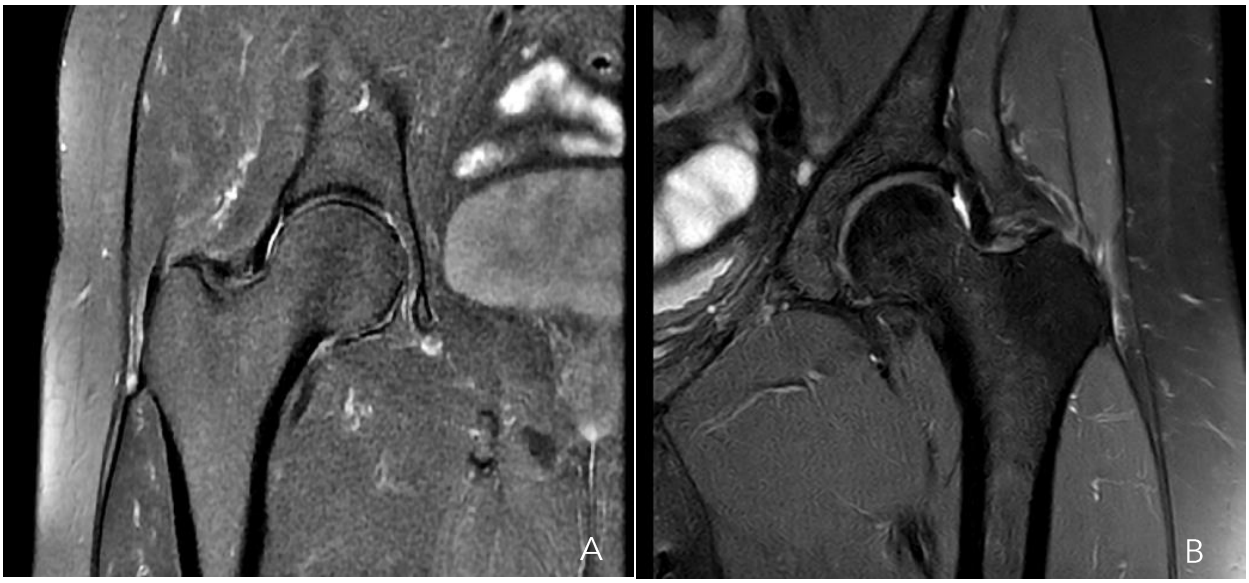

Figure 1a-1b. MRI of right (a) and left (b) hips with gluteus medius tendinitis

Management

The first-line of treatment involves conservative methods, including anti-inflammatory medications, physiotherapy, exercises to strengthen muscles, stretching the abductor complex, site-specific injections, and platelet-rich preparations[24]. Nevertheless, when these initial interventions prove ineffective, surgical options may become necessary, and traditional open surgical approaches for treating classic gluteus medius conditions, including open repair[28], have demonstrated limited success. These methods typically result in only an approximately 50% improvement, with complication rates ranging from 8-14%. Moreover, patient satisfaction remains low, with only 35% reporting good or excellent outcomes[29-32]. In contrast, endoscopic procedures have become increasingly favored for gluteal repairs. This shift is due to reported success rates of 85%, significantly lower complication rates of 2-3%, and substantially higher patient satisfaction levels, reaching 80%[4,13,19,33]. Restoring the functionality and ergonomics of the abductor mechanism is crucial, as it not only helps regain function and alleviates pain but also enhances hip stability[34]. Consequently, when the

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gluteus medius sustains an injury, the resulting increase in force reaction can lead to articular effects in both native and prosthetic hips[35-38].

Although both endoscopic and open surgical techniques have shown promising outcomes, they encounter challenges and potential complications. For endoscopic procedures, one of the primary issues mentioned in research is the complexity of anchor placement, although this has become less problematic as surgeons gain experience and equipment design improves. Open surgery, on the other hand, is associated with risks such as minor infections of the skin, blood clots in veins, bruising, and concerns related to cosmetic appearance [39-41].

For patients with intractable tendinitis, which is considered a surgical indication, an endoscopic procedure is conducted using 70° optics. The patient is positioned supine, with proximal posterior and distal posterior lateral endoscopic portals, along with an intermediate posterior accessory portal **Figure 2**. The procedure involves excising the extensive bursitis typically present in these patients **Figure 3**, followed by decompression of the peritrochanteric compartment. This achieved by performing a proximal tenotomy of the distal portion of the gluteus maximus tendon **Figure 4a-b**, as outlined in our 2023 publication[42].

Figure 2. Postoperative evaluation of the three endoscopic portals

Figure 3. Endoscopic bursae removal

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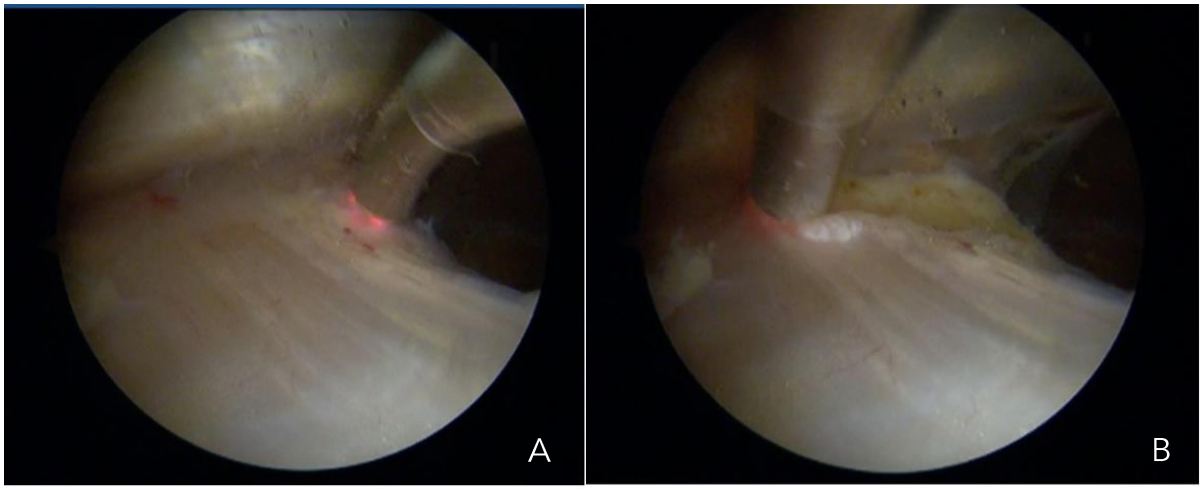

Figure 4a-b. Endoscopic partial gluteus maximus tenotomy

Given that this condition involves tendon insertion (enthesitis) in an area with poor blood supply, we utilize the intermediate portal to perform transtendinous perforations in the degenerated tendon regions **Figure 5**. These perforations are directed towards the greater trochanter to encourage the development of new blood vessels and enhance blood flow, ultimately promoting healing of the lesion, indicating that this method has yielded exceptional results in both clinical evaluations and imaging examinations for partial tears of up to 25% of the total thickness, as illustrated in **Figures 6a-b**.

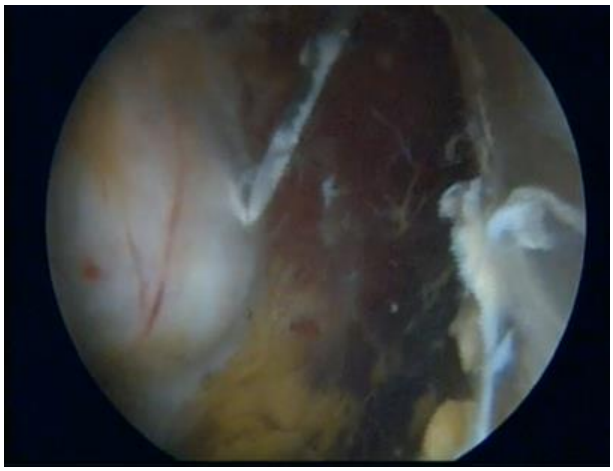

Figure 5. Endoscopic greater trochanter perforations

Figure 6a-b. Hip MRI scan showing a partial gluteus medius tear (a) and a gluteus minor tear (b)

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The selection of an appropriate treatment modality becomes more complex when lesions affect between 25% and 50% of the thickness **Figure 7.** As previously noted, these lesions are situated medial to the gluteus medius tendon, demonstrating tendon continuity in the most lateral region. Direct repair of this lesion would require the disinsertion of a healthy gluteus medius tendon, which is suboptimal. Cutting one healthy tendon to repair another would, at best, result in scar tissue formation, which would not possess the same functionality as native tissue. Consequently, in this subset of lesions, augmentation with a biological collagen patch is employed, in addition to the technique described for the two previous groups.

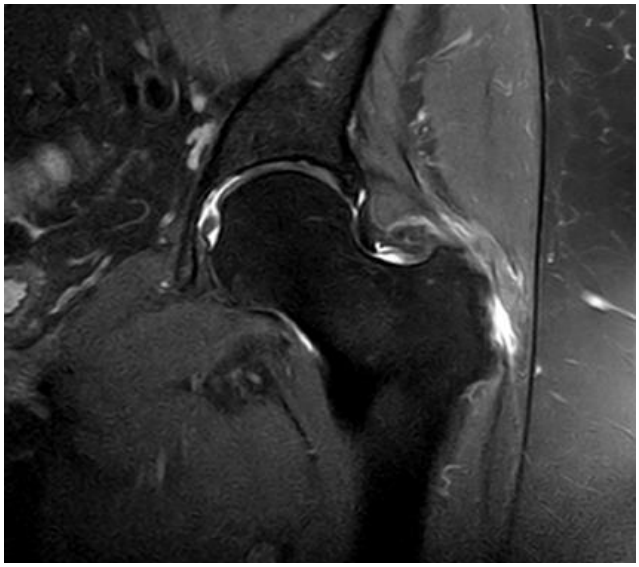
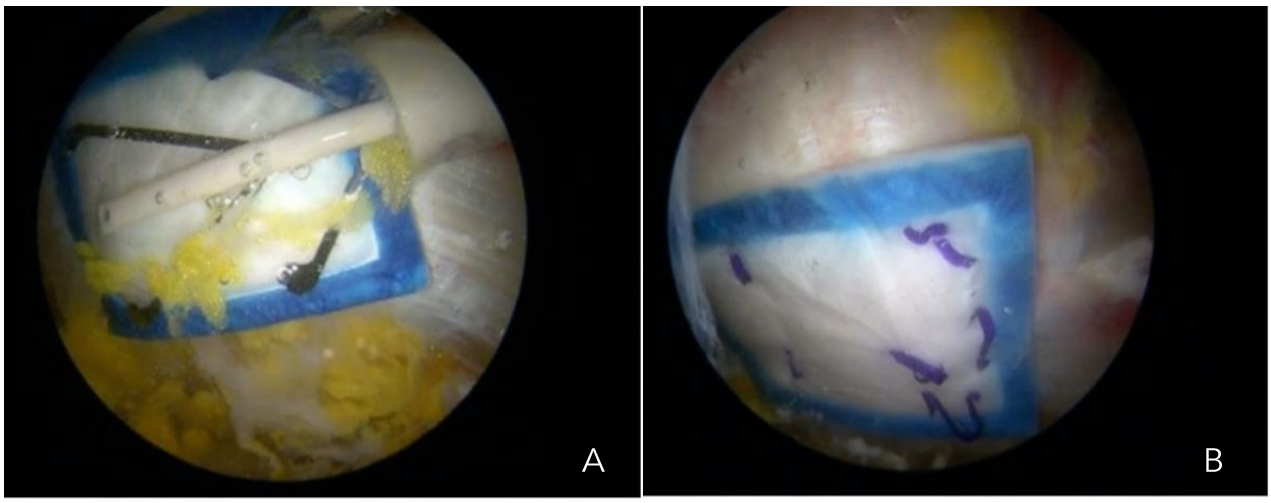


Figure 7. Hip MRI scan showing a 30% rupture of the gluteus medius and minor tendons

This patch stimulates tissue regeneration, promoting collagen deposition and enhancing the recovery of the gluteus minimus tendon **Figure 8a-b.** We have achieved favorable outcomes with this technique, which we published in 2024[43-44]. The REGENETEN® bioinductive patch (Smith & Nephew) is a highly porous type 1 collagen implant with oriented fibers that stimulate and guide the body's natural healing response. It supports new tendon growth by interrupting disease progression and promoting cell and blood vessel migration[45-47], ultimately resulting in increased tendon thickness.



Figures 8a-b. Endoscopic placement of a REGENETEN® bioinductive patch over the gluteus medius insertion

Our group conducted a prospective study by incorporating the REGENETEN® patch as a single augmentation technique from 2019 to 2024 with a minimum follow-up of 6 months[43]. The study population comprised patients who underwent hip surgery for tendinopathy refractory to conservative treatment, defined as failure to respond to NSAIDs, three courses of physiotherapy, and a symptom duration exceeding 6 months. In patients with a symptom duration of less than 6 months, surgical intervention was indicated in the presence of 30% to 50% rupture of the gluteus medius minimus tendon complex. All patients underwent preoperative MRI, which was subsequently compared with imaging performed 6 months postoperatively, demonstrating complete healing of the tendon.

Surgical technique

The procedure is conducted on an outpatient basis for all patients utilizing an anesthetic protocol comprising epidural block with sedation, and prophylactic antibiotics administered 30 minutes prior to the start of the surgical procedure. The patient is positioned in the supine decubitus position, with the ipsilateral leg in the surgical field, facilitating abduction, adduction, internal and external rotations, as well as hip flexion and extension movements.

Subsequently, the portals for surgical access are determined through individualized measurements for each patient. Initially, the width of the femur is outlined with a sterile marker at the level of the most lateral prominence of the greater trochanter, which is projected proximally and distally, in the posterior third of the femur (proximal posterolateral accessory portal (PPLA), and distal posterolateral accessory portal (DPLA). Finally, a posterior accessory portal is utilized at the level of the most lateral portion of the greater trochanter using half of the previously defined measurement[42].

The initial portal established is the DPLA, which is utilized to access the virtual space between the vastus lateralis and the iliotibial band. This space is distended using normal saline solution (NSS) with epinephrine at a concentration of 1 mg per 3 liters of NSS, maintained at a temperature of 30°C[48]. The PPLA is subsequently established utilizing a guide wire under direct visualization with a 70° optic through the DPLA portal. A bursectomy and resection of fibrous bands are performed to identify the gluteus maximus as a landmark. A partial tenotomy of the proximal portion of the distal insertion of the gluteus maximus, approximately 3 cm in length, is executed, which enhances the working space and reduces pressure in the lateral compartment[49]. The proximal end of the greater trochanter and the gluteus medius tendon are identified, and tendon lesions are examined. Subsequently, the greater trochanter is drilled in the areas of gluteus medius tendon degeneration utilizing a 2.3 mm drill through the PPLA.

In patients previously identified with lesions exceeding 30%, the bio-inductive collagen patch is applied after the perforations through the DPLA, which is secured with resorbable anchors through the PPLA, with the arthroscopic lens positioned in the PPLA. Internal and external rotation maneuvers are executed to facilitate perforations, placement, and fixation of the collagen inductive patch. The stability of the fixation is evaluated by conducting flexion and extension, abduction and adduction movements, and rotational movements.

Complete rupture of the gluteus medius tendon presents a significant challenge for surgeons, as the tendon has been displaced from its anatomical position in the greater trochanter, which is typically sclerotic and is associated with a tendon of poor quality. Poor outcomes have been reported with conventional open surgical treatments in such cases. Consequently, we have developed an endoscopic surgical technique, as described for partial tendon lesions, with the notable distinction that in these cases it is crucial to examine the continuity of the tendon with the bone tissue and assess its adherence or detachment. If the tendon is detached, it must be incised longitudinally to identify the sclerotic zone of the bone at the greater trochanter, which is then

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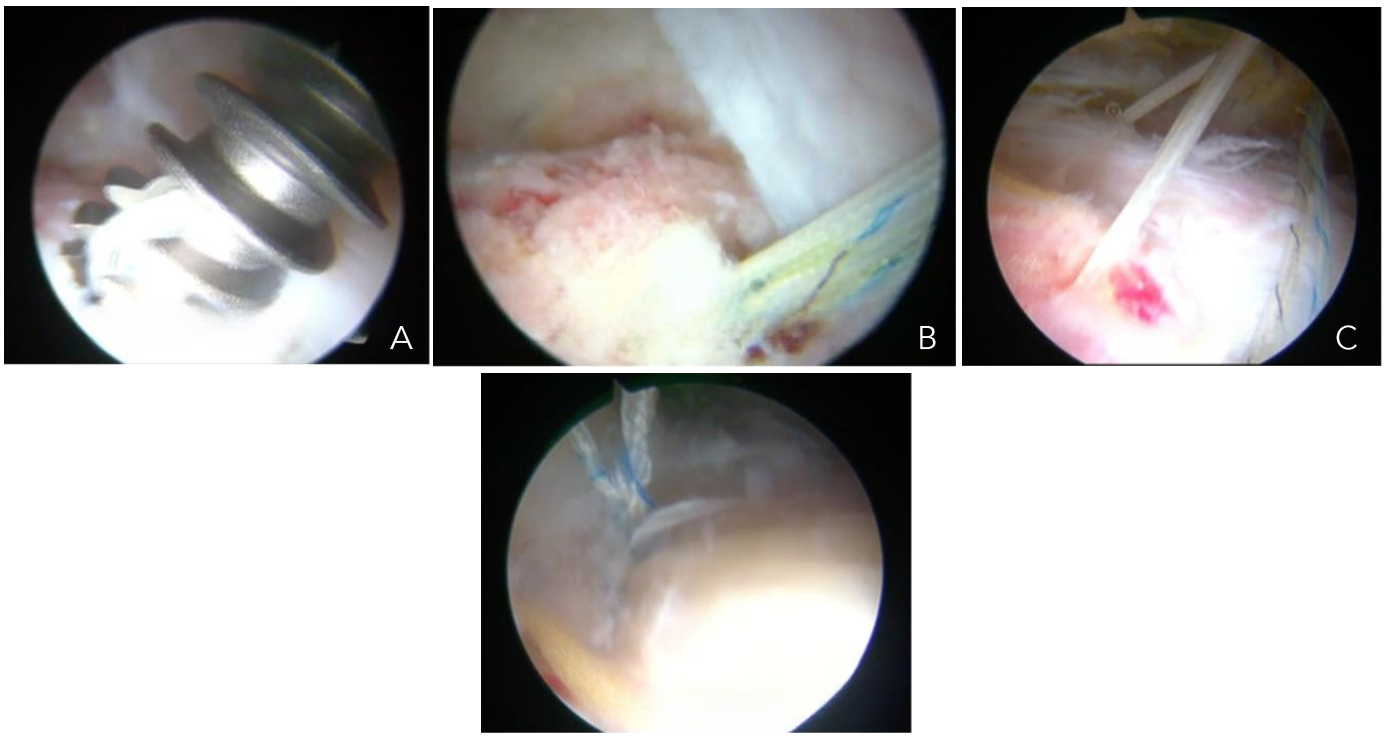
removed, typically with a 5.5 mm burr drill, to create a bleeding bed where the tendon can heal. The tendon is subsequently fixed with one or two 5.5 mm titanium anchors loaded with double sutures to close the incision and secure the tendon to the bleeding bed of the greater trochanter **Figure 9a-c and 10a-d.**

Figures 9a-c. Endoscopic view of a longitudinal incision of the gluteus medius tendon (A), exposure of sclerotic bone beneath the tendon (B), bone bed preparation under tendon (C).



Figures 10a-d. Endoscopic view of a gluteus medius tear repair. Placement of a titanium anchor (A) Anchor in bone with sutures (B). Anchor sutures through tendon closing longitudinal incision/ tear (C). Final suture-anchor construct (D).

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Rehabilitation protocol

Because these procedures are performed endoscopically, they are classified as outpatient surgeries. The patient is administered pain medication, antithrombotic measures, and encouraged to engage in free movement within the bed during the immediate postoperative period. Upon recovery of leg mobility, ambulation is initiated, in all cases, with full weight-bearing, as tolerated, and supported by two canes. The home protocol includes the prescription of pain medication for 15 days and thromboprophylaxis with apixaban for 15 days. Cane usage is maintained for 3–6 weeks, depending on the progression of the patient's pain symptoms, except in cases of total tendon rupture, where patients are instructed to use canes for 12 weeks. To avoid overloading the gluteus maximus tendon area where tenotomy was performed, forced hip extension and active knee flexion exercises with fixed upper body are prohibited during the patient's rehabilitation for 6 weeks.

The patient is evaluated at one month and subsequently followed-up at 3 and 6 months. At the 6-month follow-up, an MRI is conducted to assess tendon healing.

Due to the reduced duration of surgery, minimal tissue disruption associated with endoscopic procedures, and the possibility of early ambulation, proximal deep vein thrombosis was not observed as a complication, despite the majority of patients being women over 50 years of age. The most common complication is postoperative pain, particularly in patients who experience immediate relief and consequently discontinue cane usage prematurely. Therefore, emphasis should be placed on the importance of continued cane use throughout the postoperative period.

Conclusions

Endoscopic surgical intervention for patients with tendinous pathology of the gluteus medius and minor apparatus refractory to conservative management demonstrates favorable functional and imaging outcomes with minimal complications. This technique is considered straightforward, reproducible, and safe. It is crucial to identify these patients early; in our cohort, they were individuals with a disease duration exceeding 6 months, those who had undergone more than three courses of physiotherapy, or those who had received steroid or platelet concentrate infiltrations with persistent pain. The significance of early surgical intervention lies in addressing the condition at its initial stages, thereby preventing the progression to major and/or complete tendon injuries, which are associated with less favorable outcomes.

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References:

1. Antonio S, Wolfgang G, Robert H, Fullerton B, Carla S. The anatomical and functional relation between gluteus maximus and fascia lata. Journal of Bodywork and Movement Therapies. 2013;17 (4):512-517. doi:10.1016/j.jbmt.2013.04.004

2. Tsutsumi M, Nimura A, Akita K. The Gluteus Medius Tendon and Its Insertion Sites: An Anatomical Study with Possible Implications for Gluteus Medius Tears. J Bone Joint Surg Am. 2019;101(2):177-184. doi:10.2106/JBJS.18.00602

3. Lequesne M, Mathieu P, Vuillemin-Bodaghi V, Bard H, Djian P. Gluteal tendinopathy in refractory greater trochanter pain syndrome: diagnostic value of two clinical tests. Arthritis Rheum. 2008;59(2): 241-246. doi:10.1002/art.23354

4. Thomassen PJB, Basso T, Foss OA. Endoscopic Treatment of Greater Trochanteric Pain Syndrome - A Case Series of 11 Patients. J Orthop Case Rep. 2019;9(1):6-10. doi:10.13107/jocr.2250-0685.1284

5. Williams BS, Cohen SP. Greater trochanteric pain syndrome: a review of anatomy, diagnosis and treatment. Anesth Analg. 2009;108(5):1662-1670. doi:10.1213/ane.0b013e31819d6562

6. Cormier G, Berthelot JM, Maugars Y; SRO (Société de Rhumatologie de l'Ouest). Gluteus tendon rupture is underrecognized by French orthopedic surgeons: results of a mail survey. Joint Bone Spine. 2006;73(4):411-413. doi:10.1016/j.jbspin.2006.01.021

7. Lachiewicz PF. Abductor tendon tears of the hip: evaluation and management. J Am Acad Orthop Surg. 2011;19(7):385-391. doi:10.5435/00124635-201107000-00001

8. LaPorte C, Vasaris M, Gossett L, Boykin R, Menge T. Gluteus medius tears of the hip: a comprehensive approach. Phys Sportsmed. 2019;47 (1):15-20. doi:10.1080/00913847.2018.1527172

9. Lindner D, Shohat N, Botser I, Agar G, Domb BG. Clinical presentation and imaging results of patients with symptomatic gluteus medius tears. J Hip Preserv Surg. 2015;2(3):310-315. Published 2015 May 19. doi:10.1093/jhps/hnv035

10. Ganderton C, Semciw A, Cook J, Pizzari T. Demystifying the Clinical Diagnosis of Greater Trochanteric Pain Syndrome in Women. J Womens Health (Larchmt). 2017;26(6):633-643. doi:10.1089/jwh.2016.5889

11. Long SS, Surrey DE, Nazarian LN. Sonography of greater trochanteric pain syndrome and the rarity of primary bursitis. AJR Am J Roentgenol. 2013; 201(5):1083-1086. doi:10.2214/AJR.12.10038

12. Ramírez J, Pomés I, Sobrino-Guijarro B, Pomés J, Sanmartí R, Cañete JD. Ultrasound evaluation of greater trochanter pain syndrome in patients with spondyloarthritis: are there any specific features?. Rheumatol Int. 2014;34(7):947-952. doi:10.1007/s00296-014-2947-9

13. Redmond JM, Chen AW, Domb BG. Greater Trochanteric Pain Syndrome. J Am Acad Orthop Surg. 2016;24(4):231-240. doi:10.5435/JAAOS-D-14-00406

14. Meghpara MB, Bheem R, Shah S, et al. Prevalence of Gluteus Medius Pathology on Magnetic Resonance Imaging in Patients Undergoing Hip Arthroscopy for Femoroacetabular Impingement: Asymptomatic Tears Are Rare, Whereas Tendinosis Is Common. Am J Sports Med. 2020;48(12):2933-2938. doi:10.1177/0363546520952766

15. Cvitanic O, Henzie G, Skezas N, Lyons J, Minter J. MRI diagnosis of tears of the hip abductor tendons (gluteus medius and gluteus minimus). *AJR Am J Roentgenol*. 2004;182(1):137-143. doi:10.2214/ajr.182.1.1820137

16. Christofilopoulos P, Kenanidis E, Bartolone P, Poultsides L, Tsiridis E, Kyriakopoulos G. Gluteus maximus tendon transfer for chronic abductor insufficiency: the Geneva technique. Hip Int. 2021; 31(6):751-758. doi:10.1177/1120700020924330

17. Robertson WJ, Gardner MJ, Barker JU, Boraiah S, Lorich DG, Kelly BT. Anatomy and dimensions of the gluteus medius tendon insertion. Arthroscopy. 2008;24(2):130-136. doi:10.1016/j.arthro.2007.11.015

18. Kenanidis E, Kyriakopoulos G, Kaila R, Christofilopoulos P. Lesions of the abductors in the hip. EFORT Open Rev. 2020;5(8):464-476. Published 2020 Sep 10. doi:10.1302/2058-5241.5.190094

© 2025 European Society of Medicine

19. Ebert JR, Bucher TA, Ball SV, Janes GC. A review of surgical repair methods and patient outcomes for gluteal tendon tears. *Hip Int.* 2015; 25(1):15-23. doi:10.5301/hipint.5000183

20. Moalli PA, Talarico LC, Sung VW, et al. Impact of menopause on collagen subtypes in the arcus tendineous fasciae pelvis.*Am J Obstet Gynecol.* 2004;190(3):620-627. doi:10.1016/j.ajog.2003.08.040

21. Greising SM, Baltgalvis KA, Lowe DA, Warren GL. Hormone therapy and skeletal muscle strength: a meta-analysis. J Gerontol A Biol Sci Med Sci. 2009; 64(10):1071-1081. doi:10.1093/gerona/glp082

22. Rosinsky PJ, Diulus SC, Walsh JP, et al. Development of a Predictive Algorithm for Symptomatic Hip Abductor Tears in Patients Undergoing Primary Hip Arthroscopy. Am J Sports Med. 2021;49(2):497-504. doi:10.1177/0363546520980461

23. Bird PA, Oakley SP, Shnier R, Kirkham BW. Prospective evaluation of magnetic resonance imaging and physical examination findings in patients with greater trochanteric pain syndrome. Arthritis Rheum. 2001;44(9):2138-2145. doi:10.1002/1529-0131(200109)44:9<2138::AID-ART367>3.0.CO;2-M

24. Guermazi A, Neogi T, Katz JN, et al. Intra-articular Corticosteroid Injections for the Treatment of Hip and Knee Osteoarthritis-related Pain: Considerations and Controversies with a Focus on Imaging-Radiology Scientific Expert Panel. Radiology. 2020;297(3):503-512. doi:10.1148/radiol.2020200771

25. Kong A, Van der Vliet A, Zadow S. MRI and US of gluteal tendinopathy in greater trochanteric pain syndrome. Eur Radiol. 2007;17(7):1772-1783. doi:10.1007/s00330-006-0485-x

26. Pan J, Bredella MA. Imaging of soft tissue abnormalities about the hip. *Radiol Clin North Am.* 2013;51(3):353-369. doi:10.1016/j.rcl.2012.10.003

27. Woodley SJ, Nicholson HD, Livingstone V, et al. Lateral hip pain: findings from magnetic resonance imaging and clinical examination. J Orthop Sports Phys Ther. 2008;38(6):313-328. doi:10.2519/jospt.2008.2685

28. Rice MW, Browning RB, Nho SJ. Surgical Treatment of Gluteus Medius Tears. *Arthroscopy.* 2022;38(7):2115-2117. doi:10.1016/j.arthro.2022.05.002

29. Longstaffe R, Dickerson P, Thigpen CA, et al. Both open and endoscopic gluteal tendon repairs lead to functional improvement with similar failure rates: a systematic review. J ISAKOS. 2021; 6(1):28-34. doi:10.1136/jisakos-2020-000474

30. Ebert JR, Jain M, Janes GC. Good clinical outcomes, a high level of patient satisfaction and an acceptable re-operation rate are observed 7-10 years after augmented hip abductor tendon repair. Knee Surg Sports Traumatol Arthrosc. 2023;31 (6):2131-2139. doi:10.1007/s00167-023-07382-3

31. Chandrasekaran S, Lodhia P, Gui C, Vemula SP, Martin TJ, Domb BG. Outcomes of Open Versus Endoscopic Repair of Abductor Muscle Tears of the Hip: A Systematic Review. Arthroscopy. 2015;31 (10):2057-67.e2. doi:10.1016/j.arthro.2015.03.042

32. Rai S, Jin S, Meng C, et al. Arthroscopic release using F and C method versus conventional open release method in the treatment of gluteal muscle contracture: a comparative study [published correction appears in BMC Musculoskelet Disord. 2018 Jun 7;19(1):187. doi: 10.1186/s12891-018-2119-2.]. BMC Musculoskelet Disord. 2017;18(1): 113. Published 2017 Mar 16. doi:10.1186/s12891-017-1484-6

33. Kenanidis E, Lund B, Christofilopoulos P. A roadmap to develop clinical guidelines for open surgery of acute and chronic tears of hip abductor tendons. Knee Surg Sports Traumatol Arthrosc Off J ESSKA. 2021;29(5):1420-31.

34. Widler KS, Glatthorn JF, Bizzini M, et al. Assessment of hip abductor muscle strength. A validity and reliability study. J Bone Joint Surg Am. 2009;91(11):2666-2672. doi:10.2106/JBJS.H.01119

35. Myers CA, Laz PJ, Shelburne KB, et al. Simulated hip abductor strengthening reduces peak joint contact forces in patients with total hip arthroplasty. J Biomech. 2019;93:18-27. doi:10.1016/j.jbiomech.2019.06.003

36. Kahlenberg CA, Nwachukwu BU, Jahandar H, Meyers KN, Ranawat AS, Ranawat AS. Single-Versus Double-Row Repair of Hip Abductor Tears: A

Biomechanical Matched Cadaver Study. Arthroscopy. 2019;35(3):818-823. doi:10.1016/j.arthro.2018.10.146

37. Whiteside LA, Roy ME. Incidence and treatment of abductor deficiency during total hip arthroplasty using the posterior approach: repair with direct suture technique and gluteus maximus flap transfer. Bone Joint J. 2019;101-B(6_Supple_B): 116-122. doi:10.1302/0301-620X.101B6.BJJ-2018-1511.R1

38. Howell GE, Biggs RE, Bourne RB. Prevalence of abductor mechanism tears of the hips in patients with osteoarthritis. J Arthroplasty. 2001;16(1):121-123. doi:10.1054/arth.2001.19158

39. Chandrasekaran S, Gui C, Hutchinson MR, Lodhia P, Suarez-Ahedo C, Domb BG. Outcomes of Endoscopic Gluteus Medius Repair: Study of Thirty-four Patients with Minimum Two-Year Follow-up. J Bone Joint Surg Am. 2015;97(16):1340-1347. doi:10.2106/JBJS.N.01229

40. Dai Z, Chen Z, Liao Y, Tang Z, Cui J. Comparison of arthroscopic versus open surgery on external snapping hip caused by gluteal muscle contracture. Hip Int. 2018;28(2):173-177. doi:10.1177/1120700017754013

41. Gulledge CM, Makhni EC. Open Gluteus Medius and Minimus Repair With Double-Row Technique and Bioinductive Implant Augmentation. Arthrosc Tech. 2019;8(6):e585-e589. Published 2019 May 17. doi:10.1016/j.eats.2019.01.019

42. Parodi D, Villegas D, Escobar G, Bravo J, Tobar C. Deep Gluteal Pain Syndrome: Endoscopic Technique and Medium-Term Functional Outcomes. J Bone Joint Surg Am. 2023;105(10):762-770. doi:10.2106/JBJS.22.00394

43. Parodi D, Bravo JT, González I, Villegas D, Tobar C. Endoscopic gluteus medius partial tear repair with collagen patch augmentation. Clinical and imaging results. IPMRJ. 2024;9(1):26-35. doi:10.15406/ipmrj.2024.09.00369

44. Seidel D, Parodi D. Retrograde Acetabular Micro Perforations, for Treatment of Chondral Lesions Grade 1 and 2 in Patients with Femoroacetabular Impingement. In: Ozcan ProfG, ed. Achievements and Challenges of Medicine and Medical Science Vol. 10. BP International; 2025:95-103. doi:10.9734/bpi/acmms/v10/3622

45. Schlegel TF, Abrams JS, Bushnell BD, Brock JL, Ho CP. Radiologic and clinical evaluation of a bioabsorbable collagen implant to treat partial-thickness tears: a prospective multicenter study. J Shoulder Elbow Surg. 2018;27(2):242-251. doi:10.1016/j.jse.2017.08.023

46. Bokor DJ, Sonnabend D, Deady L, et al. Preliminary investigation of a biological augmentation of rotator cuff repairs using a collagen implant: a 2-year MRI follow-up. Muscles Ligaments Tendons J. 2015;5(3):144-150. Published 2015 Oct 20. doi:10.11138/mltj/2015.5.3.144

47. Bokor DJ, Sonnabend D, Deady L, et al. Evidence of healing of partial-thickness rotator cuff tears following arthroscopic augmentation with a collagen implant: a 2-year MRI follow-up. Muscles Ligaments Tendons J. 2016;6(1):16-25. Published 2016 May 19. doi:10.11138/mltj/2016.6.1.016

48. Parodi D, Tobar C, Valderrama J, et al. Hip Arthroscopy and Hypothermia. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2012; 28(7):924-928. doi:10.1016/j.arthro.2011.12.012

49. Parodi D, Castrillo J, Seidel D. Peritrochanteric Decompression Via Endoscopic Release of the Proximal Insertion of the Gluteus MAjor. Poster presented at: ISHA Annual Scientific Meeting; October 17-19, 2024; Washington DC, USA

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