Acta Scientific Orthopaedics (ISSN: 2581-8635)

Volume 8 Issue 2 February 2025

Case Series

Direct Evaluation of Gluteus Medius Tendon Healing in Patients Previously Operated on with Bio-inductive Collagen Patches

Dante Parodi[1,2], José Tomás Bravo[3]*, Daniela Seidel[4], Diego Villegas[1] and Carlos Tobar[1]

[1]*Department of Orthopedic Surgery, Clínica Las Condes, Santiago, Chile*

[2]*Facultad de Medicina, Universidad Finis Terrae, Santiago, Chile*

[3]*Facultad de Medicina, Universidad de Tarapacá, Arica, Chile*

[4]*The American British Cowdray Medical Center, México City, México*

***Corresponding Author:** José Tomás Bravo, Department of Orthopedic Surgery, Clínica Las Condes, Santiago, Chile.

DOI: 10.31080/ASOR.2025.08.1016

Received: November 26, 2024

Published: January 24, 2025

Abstract

Introduction: Gluteus medius (GM) partial and complete tears frequently cause lateral hip pain. Conservative treatment of these injuries presents significant challenges. In cases where nonsurgical management proves ineffective, open and endoscopic repair techniques may be employed. Collagen patches have been proposed as augmentation methods to mitigate nonhealing rates. However, no study has directly assessed healing through secondary evaluation. This study presents the first series of cases in which direct healing was observed following repair of the GM tendon with bio-inductive collagen patches.

Methods: This is a prospective, cohort observational study. In all cases, the author (DP) performed endoscopic GM repair using a collagen patch, Regeneten®, between 2019 and 2024.

Cases in which a second look, open or endoscopic, was performed by any cause were included. The modified Harris Hip Score (mHHS), iHOT-12, and Visual Analog Scale (VAS) scores preoperatively and postoperatively at the first surgery were recorded. The causes of the second look and evaluation of GM healing were assessed in all cases. Complications during the follow-up were recorded.

Results: Thirty consecutive patients underwent surgery for a gluteus medius partial tear with our endoscopic technique. Three cases (10%) required a second look to evaluate GM healing. All cases were women, with an average age of 59 (42-72) years and an average pain of 3.33 (2-5) years.

The preoperative mHHS, iHOT-12, and VAS were 55.33 (34-67), 57 (43-58) and 7 (6-8) respectively. The postoperative mHHS, iHOT-12, and VAS were 82.33 (80-85), 79.66 (77-82), and 1.66 (1-2), respectively at 6-month after the first surgery. Second-look arthroscopy was performed due to intra-articular pain, total hip arthroplasty due to hip osteoarthritis, and late collected hematoma secondary to trauma. The mean time from the first to the second surgery was 2.61 (0.83-4) years.

Direct tendon healing was observed in all cases, with complete dissolution of the collagen patch. The first surgery using a collagen patch did not cause any complications.

Conclusion: All cases evaluated through second-look surgery demonstrated complete healing of the previously repaired GM tear with a collagen patch observed directly. No complications were associated with the initial endoscopic surgery. The present study is the first to report on this matter in hip surgery.

Keywords: Gluteus Medius; Tendon Healing; Bio-inductive; Collagen; Patches

Introduction

Lateral hip pain is a clinical entity with an estimated prevalence of up to 25% in the population and is predominant in middle-aged women [1,2]. It encompasses bursitis, tendinopathy, and partial or complete tears of the hip abductor apparatus [3,4].

Classically, patients are treated symptomatically with nonsurgical management, which includes the use of anti-inflammatory drugs, physiotherapy, and multiple local steroids or PRP (platelets-rich plasm) infiltrations. This is due to the low diagnostic precision, little functional-anatomical knowledge, and limited available surgical options; all these factors are needed to perform surgical treatment [4-8]. Regarding the causes of long-term lateral hip pain, tears of the abductor muscle tendons are frequent and mainly compromise the gluteus medius (GM) tendon. These are frequently partial-thickness tears [9-12].

Multiple authors have described tears of the GM and minor tendons as "the hip rotator cuff" [13,14], a consequence of a progressive degenerative process, as occurs with rotator cuff tears in the shoulder [10,15-17]. Therefore, the anatomical precision of the hip abductor apparatus and the morphology of these tears have gained relevance among orthopedic surgeons. The insertional anatomy of the GM [18] and the characteristics of its tears have recently been described, allowing the development of surgical repair.

Surgical interventions are indicated in cases where conservative treatment does not achieve satisfactory results. Open and endoscopic techniques have been described, with good clinical outcomes and comparable results in terms of pain and functionality [19,20]. Nevertheless, open techniques are related to higher complication rates [21,22].

Although the clinical results with these techniques have been encouraging, 5-25% of the repairs do not present healing [23,24], which could lead to failed repair and worse clinical results. Bio-inductive collagen patches have been described to increase healing and were initially used in rotator cuff repairs in the shoulder [25]. In recent years, this bio-inductive collagen patch has been used in open repairs of the hip abductor apparatus [19], demonstrating its safety and favorable clinical and imaging healing results.

Our previously published article showed healing observed on magnetic resonance (MR) imaging at three months [26]. However, no mid-term records have directly assessed healing.

This study aims to present the first series of cases in which direct healing is observed after endoscopic repair of the GM tendon with bio-inductive collagen patches.

Methods

Between 2019 and 2024, patients with evidence of partial tear at the level of the GM tendon who underwent endoscopic repair using our previously described surgical technique by the author (DP), using Regeneten® bio-inductive collagen patches, were identified.

Cases in which a second look, open or endoscopic, was performed by any cause were included. The modified Harris Hip Score (mHHS), iHOT-12, and the Visual Analog Scale (VAS) preoperative and 6-months postoperative at the first surgery were recorded. The causes of second look and evaluation of GM healing were assessed in all cases included. Finally, complications during the follow-up were recorded.

Results

Thirty patients underwent surgery with our endoscopic technique, of which there were three cases (10%) in which a second look was performed to evaluate GM healing. All cases were women, with an average age of 59 (42-72) years, with 3.33 (2-5) years of average pain.

The preoperative mHHS, iHOT-12, and VAS were 55.33 (34-67), 57 (43-58) and 7 (6-8) respectively. The postoperative mHHS, iHOT-12, and VAS were 82.33 (80-85), 79.66 (77-82), and 1.66 (1-2), respectively at 6-month after the first surgery. Second-look arthroscopy was performed due to intra-articular pain, total hip arthroplasty due to hip osteoarthritis, and late collected hematoma related to trauma. The mean time from the first to the second surgery was 2.61 (0.83-4) years. No patient presented with Trendelenburg sign at the end of follow-up.

Direct tendon healing was observed in all cases, with complete dissolution of the collagen patch. The first surgery using a collagen patch did not cause any complications.

Case 1

A 42-year-old female patient presented, at her first consultation, with a 3-year history of lateral hip pain and a positive Trendelenburg sign, mHHS 67, iHOT-12 60, and VAS 7. Clinical examination and MR imaging revealed a partial tear of the GM tendon, compromising 25% of the thickness. Subsequently, a bio-inductive patch was implanted using an endoscopic approach. Six months postoperative, the patient presented an mHHS 85, iHOT-12 77, VAS 2 and no Trendelenburg sign with an MRI showing complete healing of the tendon at that time. Three years after the intervention, the patient underwent revision surgery for intra-articular pain due to femoroacetabular impingement and revision of the lateral peritrochanteric compartment because of concurrent mild lateral pain. During the procedure, a fibrous band extending from the vastus lateralis to the fascia was observed and resected to identify complete healing of the GM tendon (Figure 1).

Figure 1: A) MR coronal plane, femoroacetabular impingement and GM tendon healed. B) Absence of Trendelenburg sign. C) GM tendon under endoscopic vision, with complete healing and absence of the patch.

Case 2

A 72-year-old female patient presented at first consultation, with a 2-year history of lateral hip pain, mHHS 65, IHOT 12 68, and VAS 6. A 25% rupture of the GM was diagnosed through MR imaging, and the patient subsequently underwent endoscopic placement of a bio-inductive patch. Six months postoperative, the patient presented an mHHS 82, iHOT-12 80, VAS 1, and no Trendelenburg sign the MRI showed a completely healed Gluteus medius tendon. Four years later, the patient underwent a total hip arthroplasty for hip osteoarthritis. The GM appeared intact during the posterolateral surgical approach, and the bio-inductive patch was reabsorbed (Figure 2).

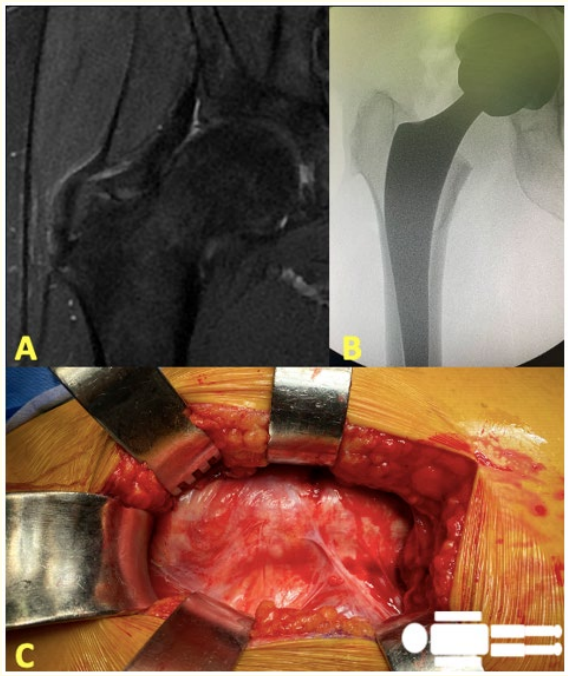

Figure 2: A) MR coronal plane, hip osteoarthritis, and GM tendon healed. B) Total hip arthroplasty. C) GM tendon under posterolateral approach vision, with complete healing and absence of the patch.

Case 3

A 60-year-old female patient presented, also at her first consultation, with a 5-year history of lateral hip pain, mHHS 34, IHOT 12 43, and VAS 8. A 50% rupture of the GM and trochanteric

bursitis were diagnosed through MR imaging, and the patient subsequently underwent endoscopic placement of a bio-inductive patch. Six months postoperative, the patient presented an mHHS 80, iHOT-12 82, VAS 2, and no Trendelenburg sign, also, the MRI showed a complete healing of the gluteus medius tendon. Eight months after surgery, the patient experienced a fall, resulting in the formation of a hematoma in the trochanteric region. Conservative treatment consisted of physiotherapy and analgesic medications. However, after two months of persistent pain, the patient underwent a revision peritrochanteric endoscopy, revealing complete healing of the GM tendon as in the previous cases.

Discussion

The cases presented here show complete healing of the tendon and complete dissolution of the patch. To date, this is the first record of a direct evaluation of repair healing with augmentation of bio-inductive collagen patches.

The literature regarding the use of this augmentation and healing is scarce. In addition, there is no record of endoscopically using the Regeneten® patch in the hip.

Day et al. reported the use of Regeneten® in nine partial lesions of the GM tendon using an open approach. They identified the lesion on the medial side of the GM tendon, made a longitudinal incision over the defect, debrided the area, and repaired it using double-row sutures. A patch was then placed over the repair site. Significant improvements in PROMs were observed at 6 months. However, they reported healing on MR in only 77.8% of patients. Despite this outcome, Day., *et al*. reported a significant increase in the cross-sectional area of the GM [27].

In our prospective cohort case series, tendon healing was confirmed by direct evaluation. No complications were noted. Notably, none of the second-look cases were due to lateral hip pain problems related to the repaired abductor apparatus.

We attribute our cohort's successful healing to using a collagen patch and not completing the lesion during the procedure. Additionally, we made multiple perforations at the greater trochanter and performed a partial tenotomy of the gluteus maximus distal insertion, decompressing the lateral space and maintaining the biomechanical continuity of the gluteus maximus-tensor fascia lata, which sets our study apart from previous ones [27-33]. Although direct assessment of tendon healing is more accurate than MR, a biopsy is the gold standard for assessing the tissue type present in the repair.

Objective measurement of GM tendon healing and the Trendelenburg test provide valuable insights into the recovery process following hip surgery or injury. These assessments offer quantifiable data that can be consistently evaluated across patients and over time, allowing for more accurate tracking of progress and treatment efficacy. Subjective measures, such as pain levels and patient-reported outcome measures (PROMs), can be influenced by multiple factors. This is why we consider it relevant to measure these elements. However, further studies should be carried out to better objectively assess the clinical assessment of the GM tendon, with specific measurements of the strength of the abductor apparatus.

The present article is the first to report on this matter in hip surgery, evaluating what happens with Regenten *in situ*.

In the case series, all cases that were evaluated by second look presented complete healing on the previously repaired GM tear with collagen patch observed directly. There were no complications regarding the first endoscopic surgery.

In conclusion, this study represents a significant advancement in the understanding and treatment of GM tendon injuries. By demonstrating the efficacy of collagen patch augmentation in endoscopic hip surgery, presenting healing in all cases, the absence of recognizable elements of the patch, and emphasizing the importance of objective outcome measures.

Bibliography

1. Christofilopoulos P., *et al*. "Gluteus maximus tendon transfer for chronic abductor insufficiency: the Geneva technique". *Hip International: The Journal of Clinical and Experimental Research on Hip Pathology and Therapy* 31.6 (2021): 751-758.

2. Robertson WJ., *et al*. "Anatomy and dimensions of the gluteus medius tendon insertion". *Arthroscopy: The Journal of Arthroscopic and Related Surgery: Official Publication of the Arthroscopy Association of North America and The International Arthroscopy Association* 24.2 (2008): 130-136.

3. Tsutsumi M., *et al*. "The Gluteus Medius Tendon and Its Insertion Sites: An Anatomical Study with Possible Implications for Gluteus Medius Tears". *The Journal of Bone and Joint Surgery. American Volume* 101.2 (2019): 177-184.

4. Redmond JM., *et al*. "Greater Trochanteric Pain Syndrome". *Journal of the American Academy of Orthopaedic Surgeons* 24.4 (2016): 231-240.

5. Thomassen PJB., *et al*. "Endoscopic Treatment of Greater Trochanteric Pain Syndrome - A Case Series of 11 Patients". *Journal of Orthopaedic Case Reports* 9.1 (2019): 6-10.

6. Kenanidis E., *et al*. "Lesions of the abductors in the hip". *EFORT Open Reviews* 5.8 (2020): 464-76.

7. Ebert JR., *et al*. "A review of surgical repair methods and patient outcomes for gluteal tendon tears". *Hip International: The Journal of Clinical and Experimental Research on Hip Pathology and Therapy* 25.1 (2015): 15-23.

8. Kenanidis E., *et al*. "A roadmap to develop clinical guidelines for open surgery of acute and chronic tears of hip abductor tendons". *Knee Surgery, Sports Traumatology, Arthroscopy: Off Journal ESSKA* 29.5 (2021): 1420-1431.

9. Karpinski MR and Piggott H. "Greater trochanteric pain syndrome. A report of 15 cases". *The Journal of Bone and Joint Surgery. British Volume* 67 (1985): 762-763.

10. Dwek J., *et al*. "MR imaging of the hip abductors: Normal anatomy and commonly encountered pathology at the greater trochanter". *Magnetic Resonance Imaging Clinics of North America* 13 (2005): 691-704.

11. Connell DA., *et al*. "Sonographic evaluation of gluteus medius and minimus tendinopathy". *European Radiology* 13 (2003): 1339-1347.

12. Kingzett-Taylor A., *et al*. "Tendinosis and tears of gluteus medius and minimus muscles as a cause of hip pain: MR imaging findings". *American Journal of Roentgenology* 173 (1999): 1123-1126.

13. Bunker TD., *et al*. "Rotator-cuff tear of the hip". *The Journal of Bone and Joint Surgery. British Volume* 79 (1997): 618-620.

14. Kagan A 2nd. "Rotator-cuff tear of the hip". *The Journal of Bone and Joint Surgery. British Volume* 80.1 (1998): 182-183.

15. Robertson WJ., *et al*. "Anatomy and dimensions of the gluteus medius tendon insertion". *Arthroscopy: The Journal of Arthroscopic and Related Surgery: Official Publication of the Arthroscopy Association of North America and The International Arthroscopy Association* 24.2 (2008): 130-136.

16. Sher JS., *et al*. "Abnormal findings on magnetic resonance images of asymptomatic shoulders". *The Journal of Bone and Joint Surgery. American Volume* 77 (1995): 10-15.

17. Yamanaka K and Matsumoto T. "The joint side tear of the rotator cuff: a follow-up study by arthrography". *Clinical Orthopaedics and Related Research* 304 (1994): 68-73.

18. Robertson WJ., *et al*. "Anatomy and dimensions of the gluteus medius tendon insertion". *Arthroscopy* 24 (2008): 130-136.

19. Molly A Day., *et al*. "Repair of gluteus medius tears with bioinductive collagen patch augmentation: initial evaluation of safety and imaging". *Journal of Hip Preservation Surgery* 9.3 (2022): 185-190.

20. HartiganDE., *et al*. "Endoscopic repair of partial-thickness undersurface tears of the abductor tendon: Clinical outcomes with minimum 2-year follow-up". *Arthroscopy* 34 (2018): 1193-1199.

21. Chandrasekaran S., *et al*. "Outcomes of Open Versus Endoscopic Repair of Abductor Muscle Tears of the Hip: A Systematic Review". *Arthroscopy* 31.10 (2015): 2057-2067.

22. Walsh MJ., *et al*. "Surgical repair of the gluteal tendons: a report of 72 cases". *The Journal of Arthroplasty* 26 (2011): 1514-1519.

23. Okoroha KR., *et al*. "Defining minimal clinically important difference and patient acceptable symptom state after isolated endoscopic gluteus medius repair". *The American Journal of Sports Medicine* 47 (2019): 3141-3147.

24. Davies JF., *et al*. "Surgical treatment of hip abductor tendon tears". *The Journal of Bone and Joint Surgery. American Volume* 95 (2013): 1420-1425.

25. Schlegel TF., *et al*. "Radiologic and clinical evaluation of a bioabsorbable collagen implant to treat partial-thickness tears: a prospective multicenter study". *Journal of Shoulder and Elbow Surgery* 27.2 (2018): 242-251.

26. Parodi D., *et al*. "Endoscopic gluteus medius partial tear repair with collagen patch augmentation. Clinical and imaging results". *International Physical Medicine and Rehabilitation Journal* 9.1 (2024): 26-32.

27. Molly A Day., *et al*. "Repair of gluteus medius tears with bioinductive collagen patch augmentation: initial evaluation of safety and imaging". *Journal of Hip Preservation Surgery* 9.3 (2022): 185-190.

28. Chandrasekaran S., *et al*. "Outcomes of endoscopic gluteus medius repair: Study of thirty-four patients with minimum two-year follow-up". *The Journal of Bone and Joint Surgery. American Volume* 97.16 (2015): 1340-1347.

29. Davies H., *et al*. "Surgical repair of chronic tears of the hip abductor mechanism". *Hip International* 19.4 (2019): 372-376.

30. Domb BG., *et al*. "Outcomes of endoscopic gluteus medius repair with minimum 2-year follow-up". *The American Journal of Sports Medicine* 41.5 (2013): 988-997.

31. Voos JE., *et al*. "Endoscopic repair of gluteus medius tendon tears of the hip". *The American Journal of Sports Medicine* 37.4 (2009): 743-747.

32. Alpaugh K., *et al*. "Outcomes after primary open or endoscopic abductor tendon repair in the hip: A systematic review of the literature". *Arthroscopy* 31.3 (2020): 530-540.

33. Kirby D., *et al*. "Clinical Outcomes after Endoscopic Repair of Gluteus Medius Tendon Tear Using a Knotless Technique With a 2-Year Minimum Follow-Up". *Arthroscopy* 36.11 (2020): 2849-2855.