DOI: https://doi.org/10.30795/jfootankle.2025.v19.1898

Original Article

Clinical outcomes of proximal medial gastrocnemius release in the treatment of non-insertional Achilles tendinopathy

José Antônio Veiga Sanhudo[1], Gabriele Elisete Piccinin[1], Deise Pancotto[1]

1. Hospital Moinhos de Vento, Rua Ramiro Barcelos, 910, Moinhos de Vento, Porto Alegre, RS, Brazil.

Abstract

Objective: To evaluate the outcomes of proximal medial gastrocnemius release (PMGR), a procedure with relatively low morbidity, in the treatment of non-insertional Achilles tendinopathy.

Methods: Twelve patients diagnosed with non-insertional Achilles tendinopathy, confirmed by clinical examination and nuclear magnetic resonance imaging, and refractory to conservative treatment, were treated with PMGR. Five patients had bilateral involvement, totaling 17 tendons treated.

Results: After a mean follow-up of 32 months, the mean American Orthopaedic Foot and Ankle score increased from 62.1 preoperatively to 90.2 at last follow-up. The mean pain score on the visual analog scale decreased from 6.7 preoperatively to 1.9 at last follow-up. While some patients experienced residual pain, it was milder than preoperative pain in all cases, and all participants reported satisfaction after the treatment.

Conclusion: Despite the small sample size and short follow-up period, the results were promising. As PMGR is a relatively simple procedure compared to tendon reconstruction techniques, it may be an attractive alternative treatment for this common and disabling disorder.

Evidence Level: III; Type of Study: Retrospective study.

Keywords: Achilles tendon; Gastrocnemius muscle; Tendinopathy; Tendon release; Minimally invasive surgical procedures.

Introduction

The Achilles tendon, or calcaneal tendon, is the strongest tendon in the human body. Due to its critical role in gait, it is frequently affected by tendinosis[1]. It is estimated that up to 6% of the population will experience calcaneal tendon issues during their lifetime[2]. Non-insertional Achilles tendinopathy is characterized by degenerative and inflammatory histological changes, typically located 2-6 cm from the calcaneal insertion[3]. Contributing factors include shortening of the posterior chain, especially the gastrocnemius, as shown by the Silfverskiöld test. Gastrocnemius contracture is associated not only with Achilles tendinopathy but also with several lower extremity disorders[4-6]. Once tendinosis is established, it can severely impair gait and physical activity, leading to a sedentary lifestyle and its related consequences[7].

The optimal treatment remains a matter of debate. Current functional rehabilitation protocols, which primarily involve stretching exercises, yield inconsistent results and typically require a long period before noticeable clinical improvement occurs, posing a significant challenge for patient adherence. When conservative treatment fails, surgical intervention is indicated. Several techniques have been described, including tenoplasty with resection of the degenerated tissue, with or without tendon transfer reinforcement[8-11].

Study performed at the Hospital Moinhos de Vento, Porto Alegre, RS, Brazil.

Correspondence: José Antônio Veiga Sanhudo. Rua Ramiro Barcelos, 910, 90560-032, Porto Alegre, RS, Brazil. **Email:** josesanhudo@yahoo.com.br **Conflicts of interest:** none. **Source of funding:** none. **Date received:** April 24, 2025. **Date accepted:** July 19, 2025.

How to cite this article: Sanhudo JAV, Piccinin GE, Pancotto D. Clinical outcomes of proximal medial gastrocnemius release in the treatment of non-insertional Achilles tendinopathy. J Foot Ankle. 2025;19(2):e1898.

Open surgical techniques for tendinosis have shown reasonable success; however, they typically require non-weight-bearing and immobilization periods ranging from two to six weeks[10,12-15]. Proximal medial gastrocnemius release (PMGR) is a relatively simple procedure, performed under sedation and local anesthesia through a 15-20 mm incision in the posterior knee region, which does not require postoperative immobilization or non-weight-bearing of the operated limb. Some authors have described its success in the treatment of several foot and ankle disorders, including Achilles tendinopathy[16-27].

Studies have shown that medial gastrocnemius release in the calf region can alleviate ankle pain and improve function with an increase in ankle dorsiflexion range of motion. However, some reports indicate a potential for reduced strength, which makes PMGR at the level of the popliteal fossa a relatively safer alternative[28-33].

The objective of this study is to evaluate the outcomes of PMGR in improving pain and function in patients with non-insertional Achilles tendinopathy and gastrocnemius contracture.

Methods

A retrospective, observational, analytical study using medical records of adult patients submitted to PMGR for the treatment of non-insertional Achilles tendinopathy. This study was approved by the Institutional Review Board, and all research and methods were performed following the STROBE guidelines.

A convenience sample of 12 patients submitted to PMGR for non-insertional Achilles tendinopathy from January 2018 to June 2024 was analyzed. Inclusion criteria were age over 18 years, lack of improvement after at least six months of conservative treatment, clinical examination showing shortening of the posterior chain affecting the gastrocnemius (positive wrinkle sign in the Silfverskiöld test), and provision of written informed consent to participate in the study[34]. Exclusion criteria included the presence of systemic inflammatory disease or a history of prior surgery for non-insertional Achilles tendinopathy in the same lower extremity.

The sample included six female and six male patients, with a mean age of 58.5 years (range, 40-78) at the time of surgery. Three patients underwent surgery on the right side, four on the left side, and five bilaterally, totaling 17 operated feet. The mean postoperative follow-up was 23 months, ranging from six to 106 months.

Operative technique

After marking the surgical site with a surgical pen, the patient was placed in the prone position. Antisepsis was then performed on the posterior region of the knee to be operated on or both in cases requiring bilateral surgery. No tourniquet or prophylactic antibiotic therapy was used, and no anticoagulants were prescribed.

The center of the medial fovea of the popliteal region was marked with a dot, and a transverse incision of 15-20 mm was made 10 mm lateral to this point. Subcutaneous tissue was bluntly dissected, and the fascia was opened transversely to expose the proximal insertion of the medial gastrocnemius. A hook retractor or Mixter forceps was used to pull the tendon, further exposing its tendinous portion, which was then cut with a #15 or #12 scalpel blade (Figure 1). Hemostasis was performed as required. The subcutaneous fascia was closed with 3-0 Vicryl, and the skin with 4-0 Vicryl Rapide. The wound was closed using Steri-Strips only. No immobilization was used.

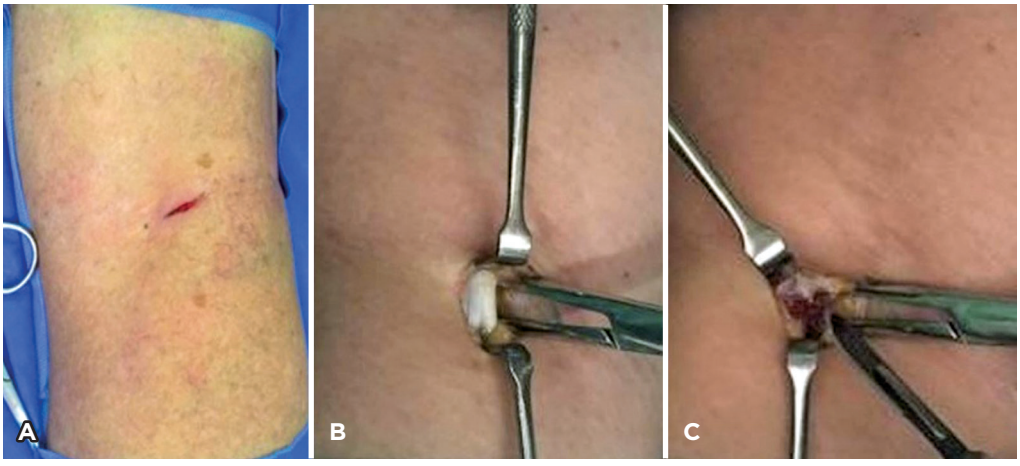

Figure 1. (A) Central marking on the medial fovea with a surgical pen. (B) Exposure of the gastrocnemius tendon with a Mixter forceps. (C) Final appearance after release of only the fascia, white fibers, of the medial gastrocnemius.

Postoperative protocol

The procedure was conducted in an outpatient setting. Postoperatively, patients were permitted to bear weight on the operated limb(s) as tolerated, initially using crutches. Patients were reassessed at 7 and 14 days, when a rehabilitation program was initiated, focusing on gait training and exercises to stretch the posterior chain.

All patients were reassessed regularly. Data were collected preoperatively and at the last postoperative assessment through an online questionnaire and in-person clinical evaluations and compared for all patients.

The American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot scale, translated and validated for Portuguese, was used to conduct a functional assessment of the foot, evaluating patient-reported pain and function. The score ranges from 0 to 100, with 0 representing the worst and 100 the best possible outcome. Pain was assessed using the visual analog scale (VAS), and patient satisfaction with the surgery was measured using the question: "How satisfied are you with the surgery performed?" with answers of very satisfied, satisfied with some reservations, or dissatisfied.

Statistical analysis

Statistical analysis was performed using R version 4.3.1, with the RStudio interface version 2023.09.1+494. The Shapiro-Wilk test indicated that the data were not normally distributed; therefore, the results were compared using the medians in the Wilcoxon test.

Results

Over a mean follow-up period of 23 months, the mean AOFAS score increased from 62.1 preoperatively to 90.2 postoperatively, representing a mean improvement of 28.1. Pain levels, as measured by the VAS, showed a mean improvement of 4.8, decreasing from a mean preoperative score of 6.7 to a postoperative mean of 1.9. No patient was dissatisfied with the outcome of the procedure. No cases of superficial or deep infection, nerve injury, deep vein thrombosis, or suture dehiscence were observed.

Descriptive analysis

Figure 2 shows boxplots of the AOFAS and VAS score distributions before and after the intervention. The lines inside the boxes represent the medians for each group, and the interquartile ranges (IQR) are defined by the upper and lower quartiles. The increase in AOFAS scores and the decrease in VAS scores after the intervention suggest clinical improvement.

Table 1 shows the number and percentage for each category of the 'side' variable, as well as the median (IQR) for the numerical variables.

The median AOFAS increased by 21.5 points from preoperative to postoperative measurements, while the VAS decreased by 6 points. To assess the statistical significance, two Wilcoxon tests were conducted, as detailed below.

Hypothesis testing

The Wilcoxon test results, comparing pre- and postoperative scores, are shown in Table 2. The observed p-values (both < 0.05) indicate statistically significant differences in both AOFAS and VAS scales, suggesting a relevant change in scores following the intervention. These statistically significant improvements in scale responses reflect a notable reduction in pain after the operation.

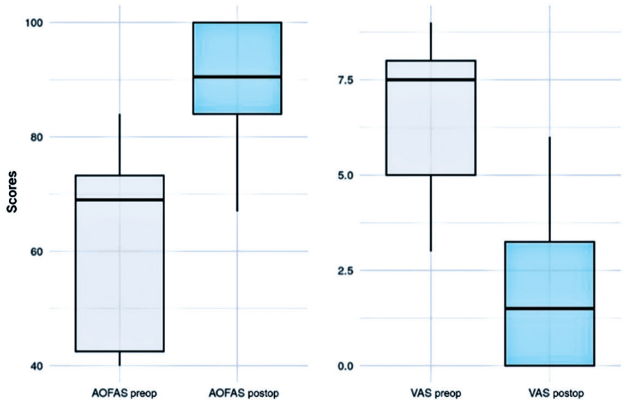

Figure 2. Boxplot of the pre- and postoperative scores.
AOFAS: American Orthopaedic Foot and Ankle Society; VAS: Visual analog scale.

Table 1. Description of database variables

Variable	n = 12
Side, n (%)	
Bilateral	5 (41.67)
Right	3 (25.00)
Left	4 (33.33)
AOFAS preoperative, median (IQR)	69 (42.50-73.25)
VAS preoperative, median (IQR)	7.5 (5-8)
AOFAS postoperative, median (IQR)	90.5 (84-100)
VAS postoperative, median (IQR)	1.5 (0-3.25)
Follow-up (months), median (IQR)	23 (10.75-36.5)

AOFAS: American Orthopaedic Foot and Ankle Society; IQR: Interquartile range; VAS: Visual analog scale.

Table 2. Wilcoxon test results

Scale	p
AOFAS	0.00218
VAS	0.00216

AOFAS: American Orthopaedic Foot and Ankle Society; VAS: Visual analog scale.

Discussion

Proximal medial gastrocnemius release is particularly effective in patients with gastrocnemius contracture confirmed on clinical examination and non-insertional tendinopathy. This aligns with the findings of our study, in which we used the surgical technique described by Barouk[35]. Tallerico et al.[32] reported excellent results in the treatment of insertional Achilles tendinopathy with gastrocnemius recession, noting that patients without spurs appear to achieve better results than patients with spurs. Gurdezi et al.[16] observed more significant improvement in non-insertional tendinopathy compared to insertional tendinopathy treated with isolated PMGR and also highlighted that PMGR might be less effective in patients without gastrocnemius contracture[6,31,32].

Maffulli and Kader[13] suggest that the benefits of PMGR arise from the reduced tensile stress on the Achilles tendon following the release, which can reverse pathological changes, decrease local inflammation, and support healing. Restoring ankle dorsiflexion and reducing tensile stress on the Achilles tendon are key factors for enhancing function, and PMGR not only alleviates pain but also restores muscle strength and function without compromising ankle biomechanics[6,12,13,18].

In our study, the median preoperative VAS score was 7.5 (IQR 5-8), decreasing to 1.5 (IQR 0-3.25) postoperatively. This represents a 6-point reduction on the VAS scale, indicating a significant improvement in pain after the intervention. This pain reduction aligns with the findings of Gurdezi et al.[16], who reported a median VAS reduction from 7.8 to 0.4 in patients with non-insertional tendinopathy.

The AOFAS score showed a median improvement of 21.5 after the procedure, increasing from a preoperative median of 69 to a postoperative median of 90.5. This improvement aligns with the findings of Gurdezi et al.[16], who reported a mean increase of 29% in the AOFAS score, from 61.8 to 91.2, in patients with non-insertional tendinopathy treated with PMGR.

Gentchos et al.[24] reported complete pain resolution following gastrocnemius recession at the calf level (Strayer procedure) for Achilles tendinopathy refractory to prolonged conservative treatment. Duthon et al.[17] also noted significant improvements in the AOFAS score after gastrocnemius release at the calf level for non-insertional Achilles tendinopathy. However, although a more distal release at the calf level may achieve gastrocnemius lengthening, it also carries a higher risk of reduced plantar flexion strength and impaired performance, which may be particularly risky for athletes[17,24,31].

Patient satisfaction was assessed using a satisfaction index, with 100% of patients being either very satisfied or satisfied with their results. This high satisfaction rate aligns with the findings of Gurdezi et al.[16], who also reported a high satisfaction rate (6 out of 9 patients) after PMGR. The absence of postoperative immobilization facilitates faster recovery and earlier return to activities, contributing to this high degree of patient satisfaction[16,18].

The results of our study, along with the reviewed literature, suggest that PMGR is an effective technique for the treatment of non-insertional Achilles tendinopathy, leading to improvements in both pain and function scores[5-27]. PMGR is a minimally invasive technique with low morbidity compared to traditional open surgical treatments, such as open Achilles tendon debridement. Open procedures are associated with higher complication rates due to the approach, the required immobilization, and the extended recovery period[10-15,30]. The incision in PMGR, made at the proximal insertion of the Achilles tendon, reduces the risk of complications related to wound healing, especially in patients with comorbidities such as diabetes or vascular insufficiency[16,25].

The main limitations of our study include the small sample size, the relatively short follow-up period, and the absence of a comparative treatment group. However, the results observed with PMGR are compelling. Given its minimally invasive nature and low complication rate, PMGR appears to be an excellent alternative and potentially the primary surgical option for managing non-insertional Achilles tendinopathy.

Conclusion

The results of our study, along with the reviewed literature, suggest that PMGR is a safe and effective treatment for non-insertional Achilles tendinopathy. The significant improvements observed in pain (VAS) and function (AOFAS) scores, alongside a 100% patient satisfaction rate, highlight the potential of PMGR for patients with gastrocnemius contracture who have not responded to conservative treatment.

Authors' contributions: Each author contributed individually and significantly to the development of this article: JAVS *(https://orcid.org/0000-0002-6321-9566) Cconceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process, performed the surgeries, data collection, statistical analysis, bibliographic review, survey of the medical records, formatting of the article, and clinical examination; GEP *(https://orcid.org/0009-0007-8918-932X) Cconceived and planned the activities that led to the study, interpreted the results of the study, participated in the review process, data collection, bibliographic review, and formatting of the article; DP *(https://orcid.org/0009-0007-1220-7665) Interpreted the results of the study, participated in the review process, data collection, bibliographic review, and formatting of the article. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID).

References

1. O'Brien M. The anatomy of the Achilles tendon. Foot Ankle Clin. 2005;10(2):225-38.
2. Morton, DJ. The human foot: its evolution, physiology and functional disorders. New York: Columbia University Press; 1935.
3. Kujala UM, Sarna S, Kaprio J. Cumulative incidence of Achilles tendon rupture and tendinopathy in male former elite athletes. Clin J Sport Med. 2005;15(3):133-5.
4. Jastifer JR, Marston J. Gastrocnemius contracture in patients with and without foot pathology. Foot Ankle Int. 2016;37(11):1165-70.
5. Cychosz CC, Phisitkul P, Belatti DA, Glazebrook MA, DiGiovanni CW. Gastrocnemius recession for foot and ankle conditions in adults: Evidence-based recommendations. Foot Ankle Surg. 2015; 21(2):77-85.
6. DiGiovanni CW, Kuo R, Tejwani N, Price R, Hansen ST Jr, Cziernecki J, et al. Isolated gastrocnemius tightness. J Bone Joint Surg Am. 2002;84(6):962-70.
7. Battery L, Maffulli N. Inflammation in overuse tendon injuries. Sports Med Arthrosc Rev. 2011;19(3):213-7.
8. Feilmeier M. Noninsertional Achilles tendinopathy pathologic background and clinical examination. Clin Podiatr Med Surg. 2017; 34(2):129-36.
9. Magnussen RA, Dunn WR, Thomson AB. Nonoperative treatment of midportion Achilles tendinopathy: a systematic review. Clin J Sport Med. 2009;19(1):54-64.
10. Pearce CJ, Tan A. Non-insertional Achilles tendinopathy. EFORT Open Rev. 2017;1(11):383-90.
11. Aicale R, Tarantino D, Maffulli N. Non-insertional Achilles tendinopathy: State of the art. In: Canata GL, d'Hooghe P, Hunt KJ, Kerkhoffs GMMJ, Longo UG, editors. Sports injuries of the foot and ankle: A focus on advanced surgical techniques. Berlin: Springer Berlin Heidelberg;2019. p. 359-67.
12. Maffulli N, Aicale R. Update on non-insertional Achilles tendinopathy. Fuß Sprunggelenk. 2019;17(4):248-56.
13. Maffulli N, Kader D. Tendinopathy of tendo achillis. J Bone Joint Surg Br. 2002;84(1):1-8.
14. Jarin I, Bäcker HC, Vosseller JT. Meta-analysis of noninsertional Achilles tendinopathy. Foot Ankle Int. 2020;41(6):744-54.
15. Paavola M, Orava S, Leppilahti J, Kannus P, Järvinen M. Chronic Achilles tendon overuse injury: complications after surgical treatment. An analysis of 432 consecutive patients. Am J Sports Med. 2000;28(1):77-82.
16. Gurdezi S, Kohls-Gatzoulis J, Solan MC. Results of proximal medial gastrocnemius release for Achilles tendinopathy. Foot Ankle Int. 2013;34(10):1364-9.
17. Duthon VB, Lübbeke A, Duc SR, Stern R, Assal M. Noninsertional Achilles tendinopathy treated with gastrocnemius lengthening. Foot Ankle Int. 2011;32(4):375-9.
18. Chimera NJ, Castro M, Manal K. Function and strength following gastrocnemius recession for isolated gastrocnemius contracture. Foot Ankle Int. 2010;31(5):377-84.
19. Laborde JM, Weiler L. Achilles tendon pain treated with gastrocnemius-soleus recession. Orthopedics. 2011;34(4):289-91.
20. Bull PE, Malloy McCoy AM, Thompson M, McGann MR, Berlet GC. The medial gastrocnemius release: A safe and effective alternative for treatment of isolated gastrocnemius contracture. Foot Ankle Orthop. 2022;7(1):24730114215S00123.
21. Arshad Z, Al Shdefat S, Iqbal AM, Bhatia M. Gastrocnemius release is an effective management option for Achilles tendinopathy: a systematic review. Knee Surg Sports Traumatol Arthrosc. 2022;30(12):4189-97.
22. White CJ, Seyed-Safi P, Ieong E, Rudge B. Gastrocnemius release in the treatment of Achilles tendinopathy: A systematic review. Indian J Orthop. 2024;58(5):470-83.
23. Molund M, Lapinskas SR, Nilsen FA, Hvaal KH. Clinical and functional outcomes of gastrocnemius recession for chronic Achilles tendinopathy. Foot Ankle Int. 2016;37(10):1091-7.
24. Gentchos CE, Bohay DR, Anderson JG. Gastrocnemius recession as treatment for refractory Achilles tendinopathy: a case report. Foot Ankle Int. 2008;29(6):620-3.
25. Saxena A, Widtfeldt A. Endoscopic gastrocnemius recession: preliminary report on 18 cases. J Foot Ankle Surg. 2004;43(5):302-6.
26. Kiewiet NJ, Holthusen SM, Bohay DR, Anderson JG. Gastrocnemius recession for chronic noninsertional Achilles tendinopathy. Foot Ankle Int. 2013;34(4):481-5.
27. Maffulli N, Del Buono A. Release of the medial head of the gastrocnemius for Achilles tendinopathy in sedentary patients: a retrospective study. Int Orthop. 2015;39(1):61-5.
28. Busquets R, Sanchez-Raya J, Sallent A, Maled I, Duarri G. Proximal medial gastrocnemius release: Muscle strength evaluation. Foot Ankle Surg. 2020;26(7):828-32.
29. DiLiberto FE, Nawoczenski DA, Tome J, DiGiovanni BF. Patient reported outcomes and ankle plantarflexor muscle performance following gastrocnemius recession for Achilles tendinopathy: A prospective case-control study. Foot Ankle Surg. 2020;26(7):771-6.
30. Rush SM, Ford LA, Hamilton GA. Morbidity associated with high gastrocnemius recession: retrospective review of 126 cases. J Foot Ankle Surg. 2006;45(3):156-60.
31. Chimenti RL, Cychosz CC, Hall MM, Phisitkul P. Current concepts review update: Insertional Achilles tendinopathy. Foot Ankle Int. 2017;38(10):1160-9.
32. Tallerico VK, Greenhagen RM, Lowery C. Isolated gastrocnemius recession for treatment of insertional Achilles tendinopathy: A pilot study. Foot Ankle Spec. 2015;8(4):260-5.
33. Pinney SJ, Sangeorzan BJ, Hansen ST Jr. Surgical anatomy of the gastrocnemius recession (Strayer procedure). Foot Ankle Int. 2004;25(4):247-50.
34. Sanhudo JAV, Canuto GM. Wrinkle sign for the Silfverskiöld test. J Foot Ankle. 2021;15(2):188-90.
35. Barouk P. Technique, indications, and results of proximal medial gastrocnemius lengthening. Foot Ankle Clin. 2014;19(4):795-806.