Al-Rafidain J Med Sci. 2026;10(2):253-257.
DOI: https://doi.org/10.54133/ajms.v10i2.2938

AJMS

Online ISSN (3219-2789)

Research Article

Percutaneous Partial Plantar Fascia Release as a Minimally Invasive Treatment Following Failure of Conservative Management for Chronic Plantar Fasciitis: A Prospective Study

Raed Abbas Saadoon[1], Ahmed Sabah Kadhim[2]*, Mohammed Jaffer Jawad[1]
[1]*Department of Orthopedic Surgery, College of Medicine, Mustansiriyah University, Baghdad, Iraq;* [2]*Department of Anesthesia Techniques, Madenat Alelem University College, Baghdad, Iraq*

Received: 25 March 2026; Revised: 5 May 2026; Accepted: 13 May 2026

Abstract

Background: Chronic recalcitrant plantar fasciitis influences 5–10% of patients who are unresponsive to conservative treatment, necessitating surgical intervention. Percutaneous partial plantar fascia release is an emerging minimally invasive technique, but there is limited prospective evidence available proving the safety and effectiveness of the technique under general anesthesia. ***Objective***: To evaluate the clinical outcomes, safety, and efficacy of percutaneous partial plantar fascia release done under general anesthesia. ***Methods***: This prospective interventional study comprised 32 patients with chronic plantar fasciitis, unresponsive to a minimum of six months of conservative management. All patients underwent percutaneous medial plantar fascia release under general anesthesia. We used the visual analog scale (VAS) and the American Orthopedic Foot and Ankle Society (AOFAS) score to measure the outcomes of surgical intervention at baseline and six months after surgery. ***Results***: The mean VAS score decreased from 8.1±0.9 preoperatively to 1.6±0.8 at six months after surgery (−6.5; $p<0.001$). The mean AOFAS score increased from 46.73±8.73 to 93.80±10.46 (47.07; $p<0.001$). There was no significant difference between the patients with calcaneal spur and those without it ($p > 0.05$). Complications were infrequent (6.25%). ***Conclusions***: Percutaneous partial release of the plantar fascia under general anesthesia is a safe and effective minimally invasive procedure for chronic plantar fasciitis that provides significant pain relief and improves functional status with a minimal incidence of complications. Large-scale comparative studies with extended follow-up are needed.

Keywords: Fasciitis; Fasciotomy; Minimally invasive surgical procedures; Plantar; Visual analog scale.

التحرير الجزئي للُّفافة الأخمصية عبر الجلد كعلاج طفيف التوغل بعد فشل العلاج التحفظي لالتهاب اللفافة الأخمصية المزمن: دراسة مستقبلية

الخلاصة

الخلفية: يؤثر التهاب اللفافة الأخمصية المزمن والمستعصي على 5-10% من المرضى الذين لا يستجيبون للعلاج التحفظي، مما يستدعي التدخل الجراحي. يُعد التحرير الجزئي للُّفافة الأخمصية عبر الجلد تقنية حديثة طفيفة التوغل، إلا أن الأدلة المستقبلية المتاحة التي تثبت سلامتها وفعاليتها تحت التخدير العام لا تزال محدودة. **الهدف :**تقييم النتائج السريرية، والسلامة، والفعالية لإجراء التحرير الجزئي للُّفافة الأخمصية عبر الجلد تحت التخدير العام. **الطرائق**: شملت هذه الدراسة التداخلية المستقبلية 32 مريضاً يعانون من التهاب اللفافة الأخمصية المزمن، ممن لم يستجيبوا لما لا يقل عن ستة أشهر من العلاج التحفظي. خضع جميع المرضى لعملية التحرير الجزئي الإنسي للُّفافة الأخمصية عبر الجلد تحت التخدير العام. استخدمنا المقياس التماثلي البصري (VAS) ومقياس الجمعية الأمريكية لجراحة العظام للقدم والكاحل (AOFAS) لقياس نتائج التدخل الجراحي قبل الجراحة وبعدها بستة أشهر. **النتائج**: انخفض متوسط درجة المقياس التماثلي البصري (VAS) من 8.1 قبل الجراحة إلى 1.6 بعد ستة أشهر من الجراحة (مقدار التغير: -6.5؛ $p<0.001$). وارتفع متوسط درجة مقياس (AOFAS) من 46.73 إلى 93.80 (متوسط التحسن: 47.07؛ $p<0.001$). لم يكن هناك فرق ذو دلالة إحصائية بين المرضى الذين يعانون من مهماز العقب (الشوكة العظمية) والذين لا يعانون منه. كانت المضاعفات نادرة (6.25%). **الاستنتاجات**: يُعد التحرير الجزئي للُّفافة الأخمصية عبر الجلد تحت التخدير العام إجراءً جراحياً آمناً وفعالاً وطفيف التوغل لعلاج التهاب اللفافة الأخمصية المزمن؛ حيث يوفر تخفيفاً ملحوظاً للألم ويُحسن الحالة الوظيفية مع حد أدنى من المضاعفات. هناك حاجة لإجراء دراسات مقارنة واسعة النطاق مع فترات متابعة طويلة.

* ***Corresponding author***: Ahmed S. Kadhim. Department of Anesthesia Techniques, Madenat Alelem University College, Baghdad, Iraq; Email: ahmedsabah@mauc.edu.iq

Article citation: Saadoon RA, Kadhim AS, Jawad MJ. Percutaneous Partial Plantar Fascia Release as a Minimally Invasive Treatment Following Failure of Conservative Management for Chronic Plantar Fasciitis: A Prospective Study. *Al-Rafidain J Med Sci.* 2026;10(2):253-257. doi: https://doi.org/10.54133/ajms.v10i2.2938

INTRODUCTION

Plantar fasciitis is the most frequent cause of pain on the bottom of the heel; it accounts for about 11-15 percent of foot problems that cause patients to visit a healthcare institution. [1,2]. The disorder usually causes a sharp pain in the medial calcaneal tubercle, especially when taking the first few steps in the morning or after a prolonged period of rest. [3] The cause is multifactorial, principally due to degenerative changes in the plantar fascia origin rather than acute inflammation, supported by evidence of microtears and collagen necrosis. [3,4] Identified risk factors include obesity, long-standing weight-bearing jobs, a reduction in ankle dorsiflexion, and flatfoot deformity; the highest incidence has been observed in the fourth to sixth decades of life. [5,6]. Most patients respond to the use of conservative management that consists of stretching exercises, orthotics, physiotherapy, nonsteroidal anti-inflammatory drugs, injections of corticosteroids, and platelet-rich plasma (PRP); the literature reports a success rate of between 80 and 90 percent in 6-12 months [6,7]. However, a small number of patients, about 5% to 10%, develop recalcitrant

plantar fasciitis, which is defined as pain and functional limitations that fail to respond after at least six months of aggressive conservative treatment. Thus, surgery is necessary [8]. Surgical management includes open plantar fascia release, percutaneous release, endoscopic plantar fascia release, and gastrocnemius recession for patients with gastrocnemius contracture [9]. The open plantar fascia release has risks, such as a longer recovery time, wound complications, medial longitudinal arch collapse, and pain in the lateral column secondary to a complete fasciotomy [10]. Endoscopic plantar fascia release was subsequently introduced as a minimally invasive alternative, exhibiting comparable efficacy with lower morbidity [11,12]. The introduction of percutaneous partial plantar fascia release, which selectively releases 30-50 percent of the medial plantar fascia, has proven to be an attractive alternative because it produces less scar tissue, has less risk of inducing infectious complications, and has been shown to have shorter postoperative recovery than traditional open operations [13]. However, while many authors recommend local or regional anesthesia, there are also certain advantages to using general anesthesia for certain patients, such as better muscle relaxation, more comfort , and more precise and controlled surgery, particularly for those who are anxious. Even though there is more clinical interest in it, there is still not enough evidence to support percutaneous partial release. There are only a few prospective studies that systematically look at its safety and effectiveness. The objective of this study is to evaluate the clinical outcomes and effectiveness of percutaneous partial plantar fascia release under general anesthesia in patients with chronic recalcitrant plantar fasciitis.

METHODS

Study design and setting

This prospective interventional study was conducted at Al-Yarmouk Teaching Hospital in Baghdad, Iraq, from January 2024 to March 2026. During the study period, 32 consecutive patients who met the eligibility requirements participated in this study. All patients were diagnosed with chronic plantar fasciitis and have been considered treatment failures, having received at least one local corticosteroid injection without experiencing symptom relief.

Inclusion criteria

Age of 18 years or older. Clinical diagnosis of chronic plantar fasciitis (>6 months). Failure of conservative treatment after at least 6 months of using multiple types of modalities, including NSAIDs, physiotherapy, orthotic devices, supportive footwear, and at least one corticosteroid injection. Localized tenderness at the medial calcaneal tubercle. The necessity for at least one failed corticosteroid injection was used to ensure that patients had tried the primary non-surgical treatment options before continuing to surgical intervention.

Exclusion criteria

Previous foot surgery. Systemic inflammatory diseases such as rheumatoid arthritis, seronegative spondyloarthropathies, systemic lupus erythematosus, or other connective tissue disorders. Neurological disorders affect gaits. Active infection in the foot or ankle region. Severe foot deformities such as advanced flatfoot with complete arch collapse, severe cavovarus deformity, or other structural abnormalities.

Preoperative evaluation

Before being considered for surgery, each patient underwent a comprehensive clinical evaluation, radiographic imaging, a baseline pain assessment utilizing the Visual Analogue Scale (VAS) with a 0-10 scale, and a functional status assessment using the American Orthopedic Foot and Ankle Society score (AOFAS) with a 0-100 scale. Before participating, each participant signed a written consent form, and we recorded their age, sex, and the affected foot. Patient privacy and data anonymization were kept throughout the entire process. All procedures were done by experienced orthopedic surgeons.

Surgical technique

All patients had percutaneous partial plantar fascia release under general anesthesia in an aseptic environment. The surgeon located and marked the medial band of the plantar fascia since it is the clinically predominant element affecting most cases of plantar fasciitis (Figure 1).

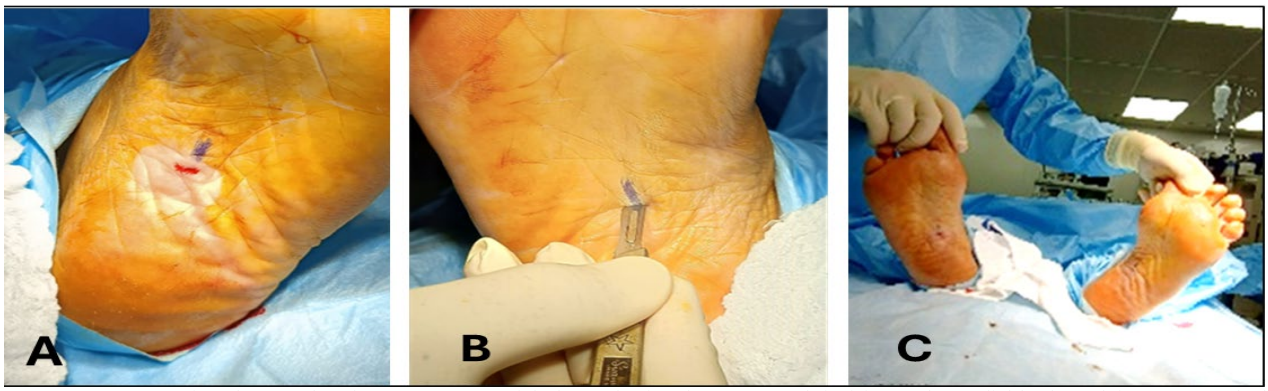

Figure 1: Intraoperative photographs of percutaneous partial plantar fascia release. (**A**) Stab incision at the medial heel overlying a pre-marked medial band. (**B**) Percutaneous blade insertion targeting 40–50% of the medial plantar fascia while preserving the lateral band. (**C**) End-of-procedure bilateral view showing minimal wound size without a suture.

A small stab incision was made on the medial aspect of the heel, and a No. 15 surgical blade was used to perform a controlled percutaneous release of approximately 40–50% of the medial plantar fascia from its calcaneal attachment. Care was taken to avoid injuries to the surrounding neurovascular structures. No calcaneal spur excision was performed. The wound was closed with a simple dressing without sutures.

Postoperative protocol and outcome measurements

Patients were allowed immediate weight-bearing as tolerated, and analgesics were prescribed for 5–7 days. Stretching exercises were initiated two weeks later. Follow-up visits are done at two weeks, six weeks, three months, and six months. Clinical assessment, such as careful wound observation and close monitoring of complications and degrees of pain improvement, was performed in a systematic manner at every follow-up visit. The VAS and AOFAS scores were recorded at the baseline and six-month terminal follow-up. All the scores were entered by an independent assessor, who was not part of the surgical procedure to reduce bias in performance and detection.

Ethical considerations

The local Research Ethics Committee of the College of Medicine, Mustansiriyah University, authorized the study protocol (Approval No. 2; 2 January 2024). A consent form was signed by all the participants in the study. The study follows the ethical principles outlined in the Declaration of Helsinki.

Statistical analysis

A paired t-test sample-size calculation was conducted using a minimal clinically important difference of two VAS points [14], a standard deviation of two, a significance value of 0.05, and a power of 80 percent. This calculation recommends at least ten participants. The resulting actual cohort size of 32 patients, hence, was much larger than the necessary sample size to ensure adequate statistical power. The analysis of the data was performed employing IBM SPSS Statistics version 26.0. Data are presented as frequencies and percentages for qualitative measures and as mean ± standard deviation (SD) for quantitative measures. The complication types and rates were described. The paired student's t-test was used to compare preoperative and 6-month postoperative VAS and AOFAS values. The independent samples t-test was used to compare the differences in outcome improvement between subgroups (those with a calcaneal spur and those without). Mean differences are reported with 95% confidence intervals (CI). We considered a p-value of below 0.05 to be statistically significant.

RESULTS

A total of 32 patients were enrolled in this study, with no loss of follow-up documented. Baseline demographic and clinical profiles of the study population are summarized in Table 1.

Table 1: Demographic and clinical profile of the study cohort (n= 32)

Variable	Category	Result
Age (year)		45.2±8.6 (22–65)
Sex	Female	20(62.50)
	Male	12(37.50)
Side affected	Right foot	22(68.75)
	Left foot	10(31.25)
Radiographic finding	Calcaneal spur present	25(78.12)
	No spur	7(21.88)

Values are presented as frequency, percentage and mean±SD.

Pain improved gradually after surgery, with noticeable improvements occurring after six weeks. At the 6-month follow-up, both the VAS and AOFAS scores showed a statistically significant improvement when compared with baseline scores ($p< 0.001$ for both). Pre- and postoperative VAS and AOFAS scores are summarized in Table 2.

Table 2: Pre- and postoperative outcome scores (n= 32)

Outcome Measure	Preoperative	Postoperative (6 months)	Mean Change	95% CI	*p*-value
VAS Score	8.10±0.9	1.60± 0.8	−6.5	−6.68 to −6.32	<0.001
AOFAS Score	46.73±8.73	93.80± 10.46	+47.07	+45.26 to +48.88	0.001

Values expressed as mean±SD. CI = confidence interval; VAS = Visual Analogue Scale; AOFAS = American Orthopedic Foot and Ankle Society.

Subgroup analysis comparing patients with radiographically evident calcaneal spurs to those without calcaneal spurs showed no statistically significant difference in functional improvement between the two groups ($p> 0.05$). Detailed subgroup comparisons are presented in Table 3. However, the small sample size of the spur-absent group (n= 7) constrains the interpretability of this finding. No major postoperative complications were recorded. There were two patients (6.25%) who faced mild transient paresthesia at the surgical site.

Table 3: Subgroup analysis of outcome improvements by calcaneal spur status

Outcome	Calcaneal Spur (%) (n= 25)	No Calcaneal Spur (n= 7)	Mean Difference	95% CI	*p*-value
VAS score improvement	−6.2±0.9	−6.7±0.8	0.5	−0.28 to 1.28	0.184
AOFAS score improvement	+48.2±9.1	+46.4±9.8	1.8	−7.52 to 11.12	0.673

Values expressed as mean ± SD. CI = confidence interval; VAS = Visual Analogue Scale; AOFAS = American Orthopedic Foot and Ankle Society.

This was resolved after three weeks of conservative care. There was no case of surgical site infection, nerve damage, arch collapse, lateral column pain, or rupture of the plantar fascia. There were no adverse events related to anesthesia, and all patients went home on the day of their surgery.

DISCUSSION

The present prospective study has shown that percutaneous partial plantar fascia release under general anesthesia provides significant improvements in pain and function for patients with chronic recalcitrant plantar fasciitis. The VAS score showed a clinically meaningful and statistically significant reduction at six months postoperatively ($p< 0.001$). This level of pain relief is consistent with that reported in the literature for minimally invasive techniques of plantar fascia release. Balalis *et al*. conducted a retrospective cohort study involving 23 patients who underwent percutaneous plantar fascia release under local anesthesia and reported slightly higher pain relief, with the mean Visual Analog Scale (VAS) score decreasing from 8.9 to 1.9 at six months, along with a patient satisfaction rate of 91.3% [13]. Likewise, Negm *et al*., in a prospective case series of twenty patients undergoing percutaneous plantar fasciotomy, reported a significant decrease in VAS scores of 6.8 ± 1.06 to 1.7 ± 2.54 at the six-month follow-up. The average time taken before all the patients were back on full activity was 3.85 weeks [15]. These results are further reinforced when compared to other studies that utilized different forms of minimally invasive techniques. Yu *et al*. reported a significant improvement in VAS scores from 6.53 ± 1.19 to 1.18 ± 0.76 at 12 months post-op ($p< 0.05$) following a two-portal medial endoscopic plantar fasciotomy [11]. Kandasamy *et al*. used percutaneous ultrasonic tenotomy in treating 22 patients with plantar fasciitis; the result showed a significant reduction in VAS scores that diminished from a preoperative range of 6.38–8.62 to a postoperative range of 0.51–2.77 [16]. Both studies closely align with the amount of pain relief observed in the current cohort. Functional recovery, assessed using the validated AOFAS score, was also significantly improved at six months ($p< 0.001$), with most patients accomplishing excellent functional status. These functional improvements correspond with those reported in similar studies of percutaneous fasciotomy. Negm et al. conducted a prospective case series including 20 patients who underwent percutaneous plantar fasciotomy, where the AOFAS score improved, increasing from 44.75 ± 8.61 to 90.9 ± 13.35 after six months. [15] Maes et al. also found that after performing a percutaneous total plantar fasciotomy, the AOFAS score improved from 42.8 to 89.9 three months after surgery [17]. Our cohort achieved similar functional improvements with a more conservative partial release of 40–50%, indicating that a complete fasciotomy may not be essential for obtaining a significant clinical benefit. The studies mentioned above show that improvements in VAS and AOFAS are generally matched with our findings, no matter which minimally invasive technique was used. That means that the biomechanical unloading of the plantar fascia may be the main reason for the clinical benefit, not the type of surgical method. However, differences in patient selection, outcome measures, and follow-up durations limit direct numerical comparisons. Yu *et al*. reported an increase in AOFAS from 52.41 ± 5.23 to 93.29 ± 3.91 at 12 months, which closely matches our functional improvements. In addition, there was no significant difference in outcomes between patients with calcaneal spurs and those without [11]. This result is the same as our own subgroup analysis ($p > 0.05$). This spur-independent pattern is also supported by the study of Balalis *et al*., who found no relation between spur size and clinical outcome, and by Yilmaz *et al*., who noticed no significant difference in all outcome parameters between the patient who underwent endoscopic release with and without excision of the calcaneal spur [13,18]. These convergent findings indicate that the presence of spurs or their surgical excision does not have a significant effect on surgical outcomes, thereby suggesting that routine spur excision is not necessary. This conclusion is based mostly on the agreement of published evidence and not on our data alone. Our spur-absent subgroup was small ($n= 7$); therefore, we need to be cautious when making definitive conclusions and focus on the importance of making a larger comparative study. Our study showed a good safety profile with only two patients (6.25%) reporting mild transient paresthesia that spontaneously resolved in three weeks. There were no reports of infection, nerve damage, collapse of the arch, pains along the lateral column, or rupture of the plantar fascia. Our complication rate is similar to that reported by De Prado *et a*l., who observed a 6.4% rate in their percutaneous fasciotomy cohort [19]. This low rate of complications further supports the known advantages of percutaneous techniques in comparison with open approaches [20]. The lack of significant complications in our study is most likely because the procedure is minimally invasive, and the fact that partial and selective resection of 40-50% of the medial plantar fascia does not disrupt the windlass mechanism in the same way that a complete fasciotomy would [21–23]. Furthermore, the percutaneous methods attempt to achieve this partial release with minimal disruption of tissue, smaller incisions, and faster recovery times compared to the open medial/plantar approaches [15,20,24]. General anesthesia was chosen in this study to improve the circumstances in this surgery, as percutaneous partial plantar fascia release requires the blade to be positioned accurately, and the depth of penetration must be controlled. General anesthesia provides better muscle relaxation and prevents involuntary movement in patients. This is especially advantageous for people who are anxious or in cases where local infiltration may not be fully effective. As a result, it guarantees a reliable 40-50% medial fascial release while maintaining the overall integrity of the fascia. There were no anesthesia-related adverse events in this group, and all patients were discharged on the day of surgery. Nonetheless, the direct comparison with alternative anesthetic modalities is not the scope of the current study.

Study Limitations

The study's small sample size, particularly in subgroup analyses, is a limitation. The lack of a control group does not allow direct comparison with non-surgical

management or other surgical techniques; this limits the ability to draw clear conclusions regarding relative effectiveness in our study. A six-month follow-up is useful in assessing the short-term outcomes but not long-term durability and risk of recurrence. The single-center design may also limit generalizability. In addition, the existing literature discussed showed no distinctly inferior or superior outcomes. These limitations could be due to publication bias in this surgical domain, which mostly displays positive results, and this should be considered when interpreting the significance of the current evidence. These findings need to be confirmed with additional large comparative studies with extended follow-up.

Conclusion

Percutaneous partial plantar fascia release under general anesthesia is a safe and effective minimally invasive surgical technique in the treatment of chronic recalcitrant plantar fasciitis. The procedure results in substantial and clinically relevant improvements in pain and functional outcomes, accompanied by a minimal complication rate. The presence of a calcaneal spur does not seem to influence postoperative outcomes; however, this conclusion is limited by the small size of the spur-absent subgroup. The results are promising; additional high-quality comparative studies with longer follow-up are needed to determine its conclusive role among surgical treatment options for plantar fasciitis.

Conflict of interests

The authors declared no conflict of interest.

Funding source

The authors did not receive any source of funds.

Data sharing statement

Supplementary data are available the corresponding author upon reasonable request.

REFERENCES

1. Gautham P, Nuhmani S, Kachanathu SJ. Plantar fasciitis - an update. *Bangladesh J Med Sci*. 2015;14:3–8. doi: 10.3329/bjms.v14i1.17052.
2. Latt LD, Jaffe DE, Tang Y, Taljanovic MS. Evaluation and treatment of chronic plantar fasciitis. *Foot Ankle Orthop*. 2020;5. doi.: 10.1177/2473011419896763.
3. Tseng WC, Chen YC, Lee TM, Chen WS. Plantar fasciitis: an updated review. *J Med Ultrasound*. 2023;31:268. doi: 10.4103/jmu.jmu_2_23.
4. Trojian T, Tucker AK. Plantar fasciitis. *Am Fam Physician*. 2019;99:744–50. PMID: 31194492.
5. Hamstra-Wright KL, Huxel Bliven KC, Bay RC, Aydemir B. Risk factors for plantar fasciitis in physically active individuals: a systematic review and meta-analysis. *Sports Health*. 2021;13:296–303. doi: 10.1177/1941738120970976.
6. Rhim HC, Kwon J, Park J, Borg-Stein J, Tenforde AS. A systematic review of systematic reviews on the epidemiology, evaluation, and treatment of plantar fasciitis. *Life (Basel)*. 2021;11. doi: 10.3390/life11121287.
7. Di Caprio F, Gigli M, Ponziani L. Plantar fasciitis: a literature review. *J Orthop Trauma Rehabil*. 2025; 32:221–227. doi: 10.1177/22104917241303777.
8. Beauperthuy AG, Homolka L, Waldron P, Falgiano PA, Rowland RJ, Mercadal G, et al. Combination endoscopic plantar fasciotomy and gastrocnemius recession in the treatment of recalcitrant plantar fasciitis: clinical outcomes from a case series. *Foot Ankle Orthop*. 2026;11. doi: 10.1177/24730114251412894.
9. Nweke TC. Comprehensive review and evidence-based treatment framework for optimizing plantar fasciitis diagnosis and management. *Cureus*. 2025;17:e88745. doi: 10.7759/cureus.88745.
10. Macinnes A, Roberts SC, Kimpton J, Pillai A. Long-term outcome of open plantar fascia release. *Foot Ankle Int*. 2016;37:17–23. doi: 10.1177/1071100715603189.
11. Yu J, An J, Wang S, Liu W, Bu Z, Huang J, et al. Endoscopic plantar fascia release via dual medial deep fascia approach for refractory plantar fasciitis: an effective, safe, and rapid surgical approach. *Int Orthop*. 2025;49:1373. doi: 10.1007/s00264-025-06499-z.
12. Ward L, Mercer NP, Azam MT, Hoberman A, Hurley ET, Butler JJ, et al. Outcomes of endoscopic treatment for plantar fasciitis: a systematic review. *Foot Ankle Spec*. 2025;18:193–201. doi: 10.1177/19386400221129167.
13. Balalis KM, Dimitriou R, Balalis M, Christoforidis C, Chaniotakis C, Siligardou MR, et al. Clinical outcomes of percutaneous plantar fasciotomy in patients with refractory plantar fasciitis: a retrospective cohort study. *Maedica (Bucur)*. 2025;20. doi: 10.26574/maedica.2025.20.4.753.
14. Landorf KB, Twyford GN, Cotchett MP, Whittaker GA. Revised minimal important difference values for the visual analog scale and Foot Health Status Questionnaire when used for plantar heel pain. *J Foot Ankle Res*. 2024;17:e70021. doi: 10.1002/JFA2.70021.
15. Negm MA, Elshal EA, Abdelkader ME. Percutaneous release of plantar fasciitis. Al-*Azhar Assiut Med J*. 2024;22:1–6. doi: 10.4103/azmj.azmj_210_20.
16. Kandasamy S, Valencia A, Turner A, Wang J, Liu GT, Vanpelt MD. Percutaneous ultrasonic tenotomy for patients with plantar fasciitis: a retrospective review. *J Orthop Exp Innov*. 2026;7:2026. doi: 10.60118/001c.143383.
17. Maes R, Safar A, Ghistelinck B, Labadens A, Hernigou J. Percutaneous plantar fasciotomy: radiological evolution of medial longitudinal arch and clinical results after one year. *Int Orthop*. 2021;46:861–866. doi: 10.1007/s00264-021-05186-z.
18. Yilmaz E, Kirac M, Yozgatli TK, Bayram B, Ulku TK, Kocaoglu B. Comparison of endoscopic plantar fascia release with and without calcaneal spur excision for recalcitrant plantar fasciitis. *Foot Ankle Orthop*. 2026;11. doi: 10.1177/24730114261427476.
19. De Prado M, Cuervas-Mons M, De Prado V, Golanó P, Vaquero J. Does the minimally invasive complete plantar fasciotomy result in deformity of the plantar arch? A prospective study. *Foot Ankle Surg*. 2020;26:347–353. doi: 10.1016/j.fas.2019.04.010.
20. Bashi SAK, Isam Y. Functional outcome of mid-sole percutaneous plantar fasciotomy versus open plantar fasciotomy in treatment of refractory plantar fasciitis. *Genij Ortop*. 2026;32:65–73. doi: 10.18019/1028-4427-2026-32-1-65-73.
21. Cheung JTM, An KN, Zhang M. Consequences of partial and total plantar fascia release: a finite element study. *Foot Ankle Int*. 2006;27:125–132. doi: 10.1177/107110070602700210.
22. Brugh AM, Fallat LM, Savoy-Moore RT. Lateral column symptomatology following plantar fascial release: a prospective study. *J Foot Ankle Surg*. 2002;41:365–371. doi: 10.1016/S1067-2516(02)80082-5.
23. Thordarson DB, Kumar PJ, Hedman TP, Ebramzadeh E. Effect of partial versus complete plantar fasciotomy on the windlass mechanism. *Foot Ankle Int*. 1997;18:16–20. doi: 10.1177/107110079701800104.
24. Fallat LM, Cox JT, Chahal R, Morrison P, Kish J. A retrospective comparison of percutaneous plantar fasciotomy and open plantar fasciotomy with heel spur resection. *J Foot Ankle Surg*. 2013;52:288–290. doi: 10.1053/j.jfas.2012.10.005.