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Is Early Flare After Extracorporeal Shock Wave Therapy a Marker of Favorable Clinical Response in Plantar Fasciitis: A Retrospective Cohort Study

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ÖZ

Amaç: Bu çalışmanın amacı, plantar fasiit (PF) hastalarında ekstrakorporeal şok dalga tedavisini (ESWT) takiben gelişen erken dönem ağrı alevlenmesinin kısa dönem klinik sonuçlar açısından olumlu bir belirteç olup olmadığını araştırmak ve kalkaneal spur özellikleri ile ağrı alevlenmesi arasındaki ilişkiyi incelemektir.
Araçlar ve Yöntem: Bu retrospektif gözlemsel kohort çalışmasına, Nisan 2025 ile Ekim 2025 tarihleri arasında üçüncü basamak bir merkezde PF tanısı alan 18–65 yaş aralığındaki 69 yetişkin hasta dahil edildi. Tüm hastalara lokal anestezi uygulanmaksızın haftada bir kez olmak üzere üç seans standart ESWT protokolü (12 Hz, 3,0 bar, seans başına 2000 şok) uygulandı. Tedaviden sonraki 72 saat içinde topuk ağrısında geçici artış yaşayan hastalar alevlenme-pozitif grup olarak sınıflandırıldı. Ağrı ve fonksiyon, tedavi öncesinde ve tedavi sonunda Görsel Analog Skala (VAS) ve Ayak Fonksiyon İndeksi (FFI) ile değerlendirildi. İstatistiksel analizlerde eşleştirilmiş t-testi, Wilcoxon işaretli sıralar testi, bağımsız örneklem t-testi ve başlangıç farklılıklarını düzeltmek amacıyla ANCOVA modelleri kullanıldı.
Bulgular: Erken dönem ağrı alevlenmesi 26 hastada (%37,7) görüldü ve çoğunlukla tedaviden sonraki ilk birkaç saat içinde ortaya çıktı. Her iki grupta da VAS ve FFI skorlarında anlamlı iyileşme saptandı ($p<0,05$). Bununla birlikte, ağrı ve fonksiyondaki mutlak değişim skorları açısından gruplar arasında anlamlı fark bulunmadı. Başlangıç skorları için düzeltme yapıldıktan sonra, ağrı alevlenmesi durumu ne ağrıdaki azalma ($p=0,701$) ne de fonksiyonel iyileşme ($p=0,435$) ile bağımsız olarak ilişkili bulundu. Kalkaneal spur varlığı ve spur uzunluğu ile ağrı alevlenmesi arasında da anlamlı bir ilişki saptanmadı.
Sonuç: Erken dönem ağrı alevlenmesi, plantar fasiitte ESWT sonrasında sık görülen ve kendiliğinden düzelen bir reaksiyondur; ancak kısa dönem klinik yanıtın daha iyi olacağını öngören bir belirteç değildir.

Anahtar Kelimeler: ağrı; prognoz; tedavi sonucu; topuk dikeni

ABSTRACT

Purpose: This study aimed to investigate whether an early pain flare following extracorporeal shock wave therapy (ESWT) serves as a marker for favorable short-term clinical outcomes in patients with plantar fasciitis (PF) and to examine the association between calcaneal spur characteristics and flare occurrence.
Materials and Methods: This retrospective observational cohort study included 69 adults (aged 18–65) diagnosed with PF at a tertiary center between April and October 2025. All patients completed a standardized ESWT protocol consisting of three weekly sessions (12 Hz, 3.0 bar, 2000 shocks/session) without local anesthesia. Patients were categorized as flare-positive if they experienced a transient increase in heel pain within 72 hours post-treatment. Pain and function were assessed using the Visual Analog Scale (VAS) and Foot Function Index (FFI) at baseline and end of treatment. Statistical analyses included paired t-tests, Wilcoxon signed-rank tests, independent samples t-tests, and ANCOVA models to adjust for baseline imbalances.
Results: An early flare occurred in 26 patients (37.7%), typically within hours of treatment. Both groups showed significant improvements in VAS and FFI scores ($p<0.05$). However, there were no significant differences between groups in absolute change scores for pain or function. After adjusting for baseline scores, flare status was not independently associated with pain reduction ($p=0.701$) or functional recovery ($p=0.435$). Calcaneal spur presence and length were not associated with flare occurrence.
Conclusion: Early pain flare is a common, self-limited reaction following ESWT but does not predict superior short-term clinical response in plantar fasciitis.

Keywords: heel spur; pain; prognosis; treatment outcome

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INTRODUCTION

Plantar fasciitis (PF) is the most common cause of heel pain in adults and is estimated to affect approximately 10% of the population at some point during life.[1] Patients typically report sharp, stabbing heel pain that is most pronounced during the first steps in the morning or upon weight-bearing after periods of rest.[2] Although traditionally classified as an inflammatory condition, accumulating histopathological evidence indicates that PF is more accurately described as a degenerative disorder, or fasciosis, characterized by collagen disorganization, fibroblastic proliferation, and vascular hyperplasia at the calcaneal insertion rather than acute inflammation.[3] The etiology of PF is multifactorial and commonly associated with obesity, pes planus, limited ankle dorsiflexion, and occupations involving prolonged standing.[4] Given its substantial impact on mobility and quality of life, identifying effective and biologically sound treatment strategies remains essential.

Extracorporeal Shock Wave Therapy (ESWT) is a noninvasive treatment modality that delivers focused acoustic waves to the plantar fascia with the aim of reducing pain and promoting tissue healing. While its exact mechanisms of action have not been fully elucidated, ESWT is believed to exert therapeutic effects through stimulation of tissue repair processes, modulation of nociceptive pathways, and targeting of degenerative changes characteristic of chronic plantar fasciitis.[5,6] A growing body of evidence from randomized controlled trials and systematic reviews has demonstrated that ESWT provides significant pain relief and functional improvement in patients with chronic PF, with a favorable safety profile and minimal serious adverse effects.[7-9]

Despite its overall tolerability, a transient increase in pain following ESWT is frequently reported and is typically regarded as a minor side effect.[10] However, emerging evidence suggests that this early post-treatment pain exacerbation, often referred to as a “flare” response, may reflect acute neurobiological activation related to treatment delivery rather than treatment failure. Experimental studies have shown that ESWT activates and sensitizes nociceptive C-fibers, resulting in axon-reflex–mediated vasodilation and neurogenic flare; notably, these effects are abolished by local anesthesia, underscoring their biological relevance.[11] Together, these findings suggest that early post-treatment pain and flare responses are closely linked to the biological activity of ESWT. Although the flare phenomenon has not been established as a definitive prognostic marker, it may plausibly indicate effective tissue stimulation and therefore warrants further investigation regarding its clinical significance.

We hypothesized that patients who experience an early post-ESWT pain flare may demonstrate greater short-term improvements in pain and function, as reflected by changes in Visual Analog Scale (VAS) and Foot Function Index (FFI) scores, compared with patients who do not report a flare. In addition, we explored whether the presence of a calcaneal spur may be associated with the occurrence of a pain flare. These hypotheses were formulated to examine potential associations rather than to establish a causal relationship.

MATERIALS and METHODS

This retrospective observational cohort study was conducted at a single tertiary Physical Medicine and Rehabilitation center and included patients treated between April and October 2025. The study protocol was approved by the Ministry of Health Antalya City Clinical Research Ethics Committee (Approval No: 17/144, Date: 27 November 2025). The study was designed and reported in accordance with the STROBE guideline.

Eligibility Criteria

We retrospectively reviewed the records of 69 adults aged 18–65 years with a diagnosis of plantar fasciitis who attended the Physical Medicine and Rehabilitation clinic between April and October 2025 and completed a standardized ESWT protocol.

Patients were eligible if baseline (pre-treatment) and end-of-treatment VAS and FFI scores were available and if post-treatment documentation included flare status within 72 hours.

The main reasons for exclusion were active infection or a history of chronic infection in the treatment area, receipt of a heel injection within the previous six months, participation in physical therapy for heel pain within the preceding six weeks, bilateral heel pain requiring medical treatment, a history of foot or heel fractures or surgery, systemic inflammatory disease, neurological or vascular insufficiencies, nerve entrapment and pathology, coagulation disorders, osteoporosis, malignancy, pregnancy, and missing key clinical data.

Intervention

All patients received ESWT using a standardized protocol and the same device (The Modus Focused ESWT Device, Ankara-Türkiye, İnceler Medical). ESWT was administered once weekly for three consecutive weeks (three sessions in total) at 12 Hz, 3.0 bar and 2000 shocks per session. No local anesthesia was administered. Patients were advised to avoid analgesics and additional heel treatments during the study period but were allowed to maintain their usual daily activities.

Data Sources/ Measurement

All variables were obtained retrospectively from routine clinical records. Demographic characteristics (age, sex), body mass index (BMI), and symptom duration were extracted from the initial outpatient evaluation notes.

The primary exposure variable was flare status (flare-positive vs flare-negative). Flare reaction was defined as a transient increase in heel pain occurring within 72 hours after ESWT compared with the patient's baseline pain level. Flare status was determined retrospectively from follow-up records based on patient-reported pain aggravation documented during routine clinical follow-up. Flare duration and severity were recorded when explicitly documented and were reported descriptively.

Foot pain severity was assessed using the VAS (0–10). Functional status and disability were evaluated with the FFI, a validated self-reported outcome measure originally developed by Budiman-Mak et al.[12] The FFI consists of 23 items across pain, disability, and activity restriction subscales, with higher scores indicating greater impairment. The validated Turkish version of the FFI by Yalıman et al. was used in the present study.[13] The FFI has been widely applied in patients with plantar fasciitis to assess pain intensity, functional disability, and activity limitation. Flare, VAS, and FFI scores recorded immediately before ESWT (T0) and at the end of the standardized ESWT protocol (T1) were retrieved from the follow-up documentation.

Radiographic data were extracted from pre-treatment weight-bearing lateral foot radiographs; calcaneal spur was classified as present when a bony outgrowth ≥2 mm from the calcaneal tuberosity was noted.[14,15] Spur length was measured on the same radiograph as the maximum spur projection (mm) from the calcaneal tuberosity, using the hospital's digital imaging system. Heel laterality (right/left) was extracted from the clinical record and radiology report.

The primary outcomes were short-term changes in pain and function, calculated as ΔVAS and ΔFFI (T0 − T1) and compared between flare-positive and flare-negative patients. The secondary outcome was the association between calcaneal spur presence (yes/no) and flare occurrence (yes/no). Flare duration and severity were documented when available and reported descriptively only.

To minimize potential selection bias, all consecutive patients meeting the eligibility criteria within the study period were included. To address information bias and confounding, a standardized data extraction form was used, and baseline imbalances in pain severity were adjusted through ANCOVA models to ensure a more robust comparison of outcomes between groups.

Study Size

No formal sample size calculation was performed because this was a retrospective study; all eligible patients treated within the prespecified period and meeting the inclusion criteria were included in the final analysis.

Statistical Analyses

Statistical analyses were performed using IBM SPSS Statistics v30.0 (IBM Corp., Armonk, NY, USA) and jamovi v2.6.4 (jamovi project). Patients were categorized into flare-positive and flare-negative groups based on documentation of transient pain exacerbation within 72 hours after ESWT. Data analysis was performed using SPSS. Categorical variables are presented as numbers (%). Continuous variables are presented as mean ± standard deviation for normally distributed data and as median (interquartile range) for non-normally distributed data. Normality was assessed using the Shapiro–Wilk test. Within-group changes in VAS and FFI (T0 vs T1) were evaluated using the paired t-test or the Wilcoxon signed-rank test, as appropriate. Between-group comparisons of short-term clinical improvement (ΔVAS and ΔFFI, calculated as T0 − T1) were performed using the independent samples t-test for normally distributed data and the Mann–Whitney U test for non-normally distributed data. The association between calcaneal spur presence (yes/no) and flare occurrence (yes/no) was assessed using the chi-square test or Fisher's exact test, when appropriate. Flare duration and severity were reported descriptively only. A p-value <0.05 was considered statistically significant.

Prior to ANCOVA analyses, the assumptions of linearity between the covariate and outcome, homogeneity of regression slopes, independence of observations, and normality of residuals were evaluated. No substantial violations were identified; therefore, ANCOVA was considered appropriate for adjusted group comparisons.

RESULTS

Participants

A total of 106 patient records were screened. After applying the predefined inclusion and exclusion criteria, 69 patients with plantar fasciitis who completed the ESWT protocol were included in the final analysis (Figure 1).

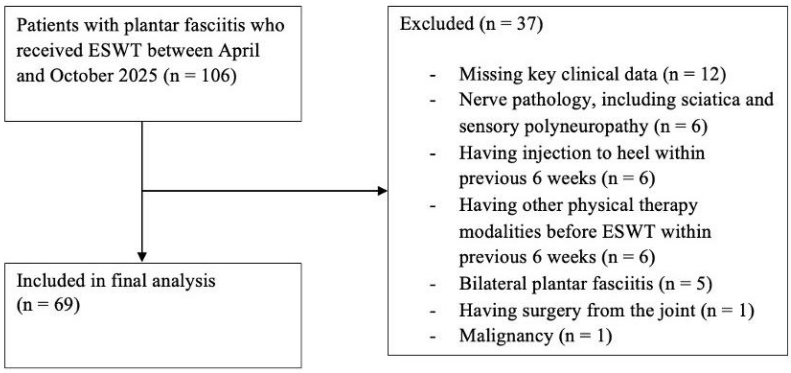


Figure 1. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) flow diagram.

Descriptive Data

A total of 69 patients with plantar fasciitis who completed the ESWT protocol were included in the final analysis. The demographic and clinical characteristics of the study population are summarized in Table 1. The mean age of the participants was 48.16±10.56 years. The majority of the cohort was female (n=42, 60.9%), and the median BMI was 30.12 (7.05) kg/m^2. The median duration of symptoms was 36 (75) weeks. Across the entire cohort, the median baseline VAS score was 9 (3),

which significantly improved to 5 (4) following treatment. Similarly, the median pre-treatment total FFI score was 65 (27), decreasing to 35 (32.5) at the end of the protocol.

Results

An early post-ESWT flare was documented in 26 patients (37.7%), while 43 patients (62.3%) reported no transient increase in pain. As shown in Table 1, the two groups were comparable regarding all baseline demographic variables, including age, gender distribution, BMI, and symptom duration (all $p>0.05$). Continuous variables are presented as mean (±SD) or median (IQR) based on normality. Categorical variables are presented as n (%).

Table 1. Baseline demographic and clinical characteristics of patients with and without post-ESWT flare.

Variable	*Flare group*	*Non-flare group*	*p-value*
Age	45.96 (±11.99)	49.49 (±9.52)	0.181
Female	17 (65.4 %)	25 (58.1 %)	0.550
Male	9 (34.6 %)	18 (41.9 %)	
Right heel involvement	12 (46.2 %)	18 (41.9 %)	0.727
Left heel involvement	14 (53.8 %)	25 (58.1 %)	
Body mass index (kg/m²)	30.72 (9.23)	29.74 (6.79)	0.911
Duration of heel pain (week)	29.00 (69.50)	52.00 (88.00)	0.699

Age is presented as mean ± SD. Body mass index, symptom duration, and all other continuous variables are presented as median (IQR). Abbreviations: ESWT, extracorporeal shock wave therapy; SD, standard deviation; BMI, body mass index; IQR, interquartile range.

Among patients who experienced a flare, the median intensity of the flare was 6.50 (5.00) on the VAS. Flare duration was 1–3 hours in 9 (34.6%) of patients, 3–6 hours in 8 (30.8%), 6–12 hours in 7 (26.9%), and more than 12 hours in 2 (7.7%).

Radiological findings, specifically the presence and length of calcaneal spurs, were similar between the groups ($p>0.05$). Clinical outcomes regarding pain intensity and functional status are presented in Table 2. No significant differences were observed in the absolute change scores (ΔVAS and ΔFFI) between the flare-positive and flare-negative groups ($p>0.05$). The distribution of short-term improvements in pain and function according to flare status is illustrated in Figure 2.

Table 2. Comparison of Clinical Outcomes Between Groups.

Variable	*Flare group*	*Non-flare group*	*p-value*	*Effect size (r/Phi)*
Calcaneal spur present	20 (76.9 %)	30 (69.8 %)	0.519	0.078
Calcaneal spur not present	6 (23.1 %)	13 (30.2 %)		
Calcaneal spur (mm)	4.75 (4.50)	5.20 (3.40)	0.937	0.009
Pre-treatment VAS	9.50 (2.25)	8.00 (3.00)	0.156	0.171
Post-treatment VAS	4.50 (4.25)	6.00 (4.00)	0.636	0.057
ΔVAS	4.50 (4.00)	2.00 (5.00)	0.123	0.186
Pre-treatment FFI-total	65.50 (13.50)	58.00 (33.00)	0.055	0.222
Post-treatment FFI-total	37.50 (34.25)	34.00 (32.00)	0.843	0.023
ΔFFI-total	28.50 (33.00)	12.00 (33.00)	0.067	0.221
Pre-treatment FFI-pain	81.00 (18.00)	70.00 (38.00)	0.034*	0.255
Pre-treatment FFI-disability	76.50 (17.75)	64.00 (36.00)	0.065	0.222
Pre-treatment-activity	20.00 (6.00)	17.00 (13.00)	0.082	0.209
Post-treatment FFI-pain	42.00 (44.00)	38.00 (42.00)	0.843	0.024
Post-treatment FFI-disability	42.00 (35.00)	40.00 (35.00)	0.862	0.021
Post-treatment FFI-activity	10.00 (18.50)	10.00 (10.00)	0.856	0.022

Continuous variables are presented as median (IQR), and categorical variables are presented as n (%). Effect sizes are reported as r for continuous variables (Mann-Whitney U test) and Phi for categorical variables (Chi-square test). Abbreviations: VAS, Visual Analog Scale; FFI, Foot Function Index; Δ, Change (baseline minus post-treatment).

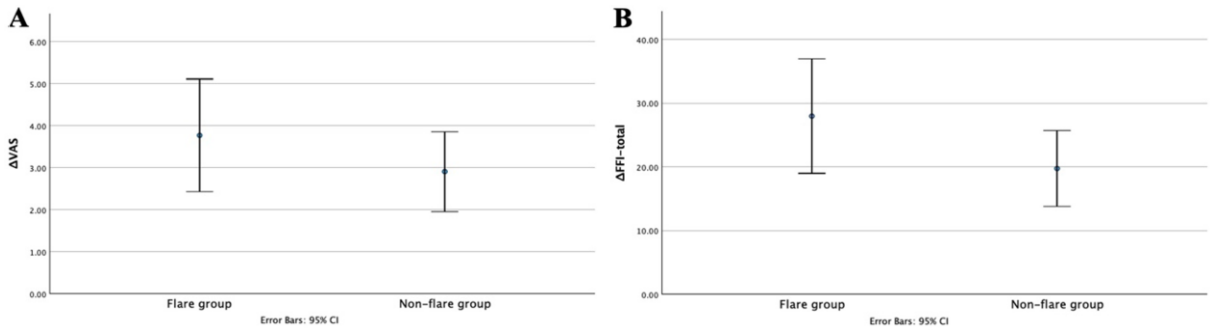


Figure 1. Short-term clinical improvement after ESWT by flare status.

ΔVAS (A) and ΔFFI-total (B) in flare-positive and flare-negative patients. Points represent mean values and error bars indicate 95% confidence intervals. Δ scores were calculated as T0 − T1 (pre-treatment minus post-treatment), with higher values indicating greater improvement. No between-group differences were observed. Abbreviations: ESWT, Extracorporeal Shock Wave Therapy; VAS, Visual Analog Scale; FFI, Foot Function Index; Δ, Change (baseline minus post-treatment).

At baseline, pre-treatment scores for VAS, total FFI, FFI-disability, and FFI-activity were similar between groups. However, the flare-positive group demonstrated significantly higher FFI-pain scores at baseline compared to the flare-negative group (81.00 vs. 70.00, p=0.034). In addition, although baseline FFI-total scores did not differ significantly between groups, the p-value (0.055) suggested a possible trend toward higher baseline disability in the flare-positive group. Therefore, ANCOVA was performed to account for potential baseline imbalances and to isolate the independent effect of flare status on clinical improvement.

We used separate ANCOVA models to examine whether early flare independently influenced short-term clinical improvement. For pain reduction (ΔVAS), the model included flare status as the fixed factor and baseline VAS as the covariate; after adjustment for baseline pain severity, ΔVAS did not differ between flare-positive and flare-negative patients ($F(1,66)=0.149$, $p=0.701$, partial $\eta^2=0.002$). Baseline VAS was significantly associated with pain improvement ($F(1,66)=20.350$, $p<0.001$). For functional recovery (ΔFFI-total), flare status was entered as the fixed factor and baseline FFI-total as the covariate; similarly, no adjusted between-group difference was observed ($F(1,66)=0.616$, $p=0.435$, partial $\eta^2=0.009$), while baseline FFI-total significantly predicted functional improvement ($F(1,66)=11.816$, $p=0.001$). Homogeneity of variance assumptions were satisfied for both models (Levene's $p=0.657$ for ΔVAS; $p=0.517$ for ΔFFI-total).

Table 3. Analysis of covariance (ANCOVA) for clinical improvement (Δ scores) adjusted for baseline outcome scores.

Outcome variable	*Group*	*Adjusted Mean (SE)*	*95% confidence interval*	*p-value*	*partial η^2*
ΔVAS	Flare group	3.40 (0.55)	[2.30, 4.51]	0.701	0.002
	Non-flare group	3.13 (0.43)	[2.27, 3.99]		
ΔFFI-total	Flare group	25.23 (3.81)	[17.63, 32.83]	0.435	0.009
	Non-flare group	21.40 (2.94)	[15.53, 27.26]		

For ΔVAS, baseline VAS was included as the covariate; for ΔFFI-total, baseline FFI-total was included as the covariate. Abbreviations: ANCOVA, analysis of covariance; VAS, Visual Analog Scale; FFI, Foot Function Index.

Exploratory regression analyses showed that symptom duration was not associated with flare occurrence (OR = 1.00, 95% CI 0.993–1.01, p = 0.972), and calcaneal spur length was also not associated with flare development (OR = 1.002, 95% CI 0.81–1.28, p = 0.863). In addition, age (OR = 0.96, 95% CI 0.91–1.01, p = 0.121) and sex (OR = 0.57, 95% CI 0.19–1.68, p = 0.309) were not associated with flare occurrence. Exploratory ordinal logistic regression suggested no association of age (OR = 1.02, 95% CI 0.96–1.10, p = 0.502) or sex (OR = 1.61, 95% CI 0.29–9.29, p = 0.585) with flare duration. Spearman correlation analyses revealed no significant association between flare duration and baseline functional status (pre-treatment FFI-total; ρ = 0.106, p = 0.605) or baseline pain intensity (baseline VAS; ρ = 0.180, p = 0.380).

DISCUSSION

In this cohort of 69 patients with plantar fasciitis who completed ESWT, an early transient pain flare occurred in 37.7% of cases. Both flare-positive and flare-negative patients demonstrated significant short-term improvements in pain and function; however, the magnitude of improvement did not differ between groups. After adjustment for baseline scores, flare status was not independently associated with pain reduction or functional recovery. Exploratory analyses further showed no association between flare occurrence and age, sex, symptom duration, BMI, or calcaneal spur characteristics.

Although ESWT is widely accepted as an effective treatment for chronic plantar fasciitis, the clinical significance of early post-treatment pain flare remains poorly understood. Previous studies have primarily focused on treatment efficacy and safety, describing transient pain exacerbation as a minor adverse effect rather than a potential prognostic marker. To our knowledge, this is the first study specifically evaluating whether an early flare response predicts short-term clinical outcomes after ESWT. Our findings suggest that, despite being relatively common, flare reactions do not appear to provide additional short-term clinical benefit.

Our initial hypothesis was that patients who developed an early flare would demonstrate greater short-term clinical improvement than those who did not experience a flare. However, this hypothesis was not supported by our findings. Although flare was relatively common, it was not independently associated with greater pain reduction or functional recovery after adjustment for baseline differences. Nonetheless, the absence of a statistically significant association should be interpreted cautiously, as the relatively small sample size may have limited the ability to detect small but potentially clinically relevant effects.

The prevalence of flare in our cohort (38%) is consistent with previous reports describing transient discomfort after ESWT, generally ranging between 25% and 45%.[7,9,10,16] While treatment-related pain, swelling, erythema, and ecchymosis are recognized side effects of ESWT, flare reactions are typically mild, self-limited, and not associated with serious adverse outcomes.[10] In our study, most flare episodes occurred within the first few hours after treatment, with a median intensity of 6.5 on the VAS, highlighting the importance of counseling patients regarding this temporary response.

The biological basis of flare is likely related to transient activation of nociceptive C-fibers and the release of neuropeptides such as substance P and calcitonin gene-related peptide. Experimental studies suggest that these responses reflect biological activation induced by shock wave delivery rather than tissue damage.[11,18-23] The absence of local anesthesia in our protocol is therefore clinically relevant, as anesthetics may suppress C-fiber activation and alter the biological effects of ESWT.[11,23] Consequently, the flare reactions observed in our study likely represent the natural interaction between shock wave energy and peripheral nociceptive pathways.

Interestingly, patients who experienced flare demonstrated higher baseline FFI-pain scores, suggesting greater initial pain sensitivity. This finding is consistent with previous studies implicating central sensitization and enhanced nociceptive responsiveness in chronic musculoskeletal pain conditions.[24-27] However, after adjustment for baseline pain severity, flare status did not contribute to additional clinical improvement. This observation supports the concept that the regenerative and analgesic effects of ESWT occur largely independently of transient post-treatment pain responses.[28-30]

We also found no association between flare occurrence and calcaneal spur presence, spur length, or BMI. These findings are consistent with previous reports suggesting that calcaneal spurs are not reliable determinants of symptom severity and that standardized ESWT protocols remain effective across different body compositions.[31-35] Taken together, these results indicate that flare development is more likely driven by individual nociceptive responses than by structural or anthropometric factors.

Overall, our findings suggest that early pain flare following ESWT is a common but non-prognostic phenomenon. While it may reflect biological activation of nociceptive pathways, it does not appear to predict superior short-term pain relief or functional recovery. Clinicians should therefore reassure patients that transient pain exacerbation after ESWT is generally benign and should not be interpreted as either treatment failure or a marker of enhanced treatment success.

Although no significant differences were observed between the groups, both achieved improvements exceeding the reported minimal clinically important difference (MCID) for VAS and FFI. This indicates that both flare-positive and flare-negative patients experienced clinically meaningful improvement, further supporting that transient post-ESWT flare is not associated with superior treatment response.

Limitations and Strengths

There are several limitations to this study. Its retrospective design may lead to the underreporting of very mild or brief flares. Analgesic use during the treatment period was not objectively monitored. Although patients were advised to avoid analgesics, adherence to this recommendation could not be verified. Therefore, differences in analgesic consumption between flare-positive and flare-negative patients may have influenced pain-related outcomes and cannot be completely excluded. Another limitation is the relatively short follow-up period. Outcome assessment was performed immediately after completion of the three-week ESWT protocol, whereas the full therapeutic effects of ESWT may continue to evolve over several months. Therefore, potential associations between flare reactions and long-term clinical outcomes could not be evaluated. Future studies incorporating objective measures, such as Doppler ultrasound to assess local blood flow, ultrasound evaluation of plantar fascia thickness, or biochemical markers of inflammation, could further clarify the relationship between clinical flares and underlying tissue-level changes. Given the single-center design and standardized treatment protocol, our findings are most generalizable to similar tertiary care settings using comparable ESWT parameters. Caution is warranted when extrapolating these findings to different devices, energy settings, or patient populations. Nonetheless, the consistency of outcomes across flare-positive and flare-negative patients suggests that the clinical implications of early flare reactions may be broadly applicable in routine practice.

Conclusion

Early pain flare following ESWT for plantar fasciitis occurs in approximately one-third of patients but does not correlate with superior short-term functional or analgesic outcomes. Longer-term prospective studies are needed to determine whether flare reactions have prognostic significance beyond the immediate post-treatment period. Flare development appears independent of BMI and the presence of calcaneal spurs. Clinicians should manage patient expectations by framing flare as a common, transient, and benign reaction that does not serve as a marker for treatment efficacy.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical Committe Permission

This retrospective observational cohort study was conducted at a single tertiary Physical Medicine and Rehabilitation center and included patients treated between April and October 2025. The study protocol was approved by the Ministry of Health Antalya City Hospital Clinical Research Ethics Committee (Approval No: 17/144, Date: 27 November 2025). The study was designed and reported in accordance with the STROBE guideline.

Authors' Contributions

Concept/Design: ZDŞ, SYM, VA. Data Collection and/or Processing: ZDŞ, SYM, VA, EA, ŞDK. Data analysis and interpretation: ZDŞ, SYM, VA Literature Search: ZDŞ, SYM, VA. Drafting manuscript: ZDŞ, SYM, VA. Critical revision of manuscript: ZDŞ, SYM, VA, EA, ŞDK, SU. Supervision: SU.

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