A Comparative Study of Shock Wave Therapy and Medical Treatment in the Management of Plantar Fasciitis

Abstract

Introduction: Plantar fasciitis is a common problem presenting with heel pain and functional limitations. Given the contradictory results of previous studies on the effectiveness of medical and non-invasive treatments, this study was designed to compare the results of shockwave therapy and medical treatment on pain intensity, function, and treatment complications.

Materials & Methods: In a prospective cohort study, 80 patients with plantar fasciitis from an orthopaedic clinic were selected during a 2-years period and, after obtaining informed consent, were assigned to two groups of medical treatment and shockwave therapy. Shockwave therapy was performed with the Dornier Epos Ultra device and medical treatment included plantar fascia traction, ice massage, and NSAID medication. Pain and function indices were assessed at 12 weeks and one year after treatment using the VAS and Roles and Maudsley scales. Data analysis was performed with SPSS version 26.

Results & Discussion: The reduction in VAS score and improvement in function based on Roles and Maudsley in the shockwave therapy group was significantly greater than the medical treatment group ($P<0.05$). No significant difference was seen in the age and gender distribution of the two groups. The incidence of side effects in both groups was not statistically different, and all recorded side effects were transient.

Conclusion: Shockwave therapy has a stable and higher efficacy than medical treatment in controlling pain and functional improvement in plantar fasciitis and can be used as an effective and safety treatment.

Keywords: Plantar fasciitis, Shock wave therapy, Treatment outcome, Heel.

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Introduction

Plantar fasciitis is a common causes of heel pain, affecting one in ten individuals during their lifetime[1]. The term “plantar fasciopathy” provides a more accurate description of this clinical condition, as its nature is primarily degenerative and less frequently associated with inflammation. Predisposing factors include limitation in ankle dorsiflexion, increasing body mass index (BMI), and long time standing[2]. Although the condition is more prevalent among athletes, particularly runners, sedentary individuals are also at risk. Studies have shown that with appropriate treatment, approximately 80% of patients recover within 12 months[3,4].

Diagnosis is primarily clinical, with the hallmark symptom being severe, localized pain in the proximal plantar region of the foot, especially in the early morning, which worsens later in the day. Point tenderness at the attachment of fascia to the calcaneus is a common finding on physical examination[5–8]. Ultrasound has also been recognized as a cost-effective and reliable method for diagnosis[9].

First-line treatments include plantar fascia stretching exercises, cryotherapy, and non-steroidal anti-inflammatory drugs (NSAIDs). However, certain commonly used night splints and orthoses did not show significant effectiveness compared with placebo. In resistant cases, options such as corticosteroid injections and surgery may be considered, although the supporting evidence remains limited.

One novel, non-invasive approach is Shock Wave Therapy (SWT), which transmits high-energy sound waves to provoke repair of tissue and decreasing pain[10-12]. This method has U.S. Food and Drug Administration (FDA) approval as a non-surgical management in chronic plantar fasciitis and is used as a standard therapeutic option in many countries.

Given the high prevalence of plantar fasciitis, its adverse effects on quality of life, and abscent of conclusive document regarding the superiority of therapeutic methods, the present study was designed to compare the effectiveness of shock wave therapy and medical treatment in plantar fasciitis patients.

Materials & Methods

This was a prospective mixed-cohort study conducted at the Orthopedic Clinic of Firoozgar Hospital, Tehran, between 2023 and 2025. The study population consisted of patients with plantar fasciitis referred to this clinic. Based on the studies by Haake et al.[13], Aqil et al.[14], and Ogden et al.[15] ,Wang et al.[16] and considering α=0.05, β=0.2, P1=0.56, P0=0.23, and r=1, the sample size was calculated as 80 patients (40 in the shock wave therapy group and 40 in the medical treatment group). Sampling was performed using a convenience method.

Prior to initiating the study, ethical approval was obtained from Iran University of Medical Sciences and the hospital's Research Committee. After providing complete information regarding the study objectives and procedures, all participants signed informed consent forms. Patients were then allocated to either the shock wave therapy group or the medical treatment group.

Inclusion criteria

- Diagnosis of plantar fasciitis by a specialist physician
- 18 years or older of age
- Informed consent for participating in this study

Exclusion criteria

- Structural deformities of the lower limb
- History of surgery or shock wave therapy for plantar fasciitis
- Lack of cooperation or response during follow-up

Interventions

- **Shock Wave Therapy group:** Treatment was administered using the Dornier Epos Ultra device equipped with a 7.5 MHz linear ultrasound localization system. Three sessions were conducted every two weeks (±2 days). Each session included 4000 impulses with a positive energy flux density of 0.08 mJ/mm², administered under local anesthesia with 2 mL of 1% mepivacaine. The total positive energy delivered was 0.96 J/mm² with a positive pressure of 13.7 MPa.
- **Medical treatment group:** Patients received plantar fascia stretching exercises, ice massage, and NSAIDs for 12 weeks. The stretching protocol included specific exercises targeting the plantar fascia and calf muscles, performed at home three times daily, each session lasting 10 minutes. A physiotherapist provided training during the first session, and patients were instructed to perform the exercises regularly.

Follow-up and Assessment

Patients were evaluated at week 12 and one year after the final intervention. The assessment indices included:

- Roles and Maudsley score (4-grade scale: excellent, good, acceptable, poor)
- Visual Analog Scale (VAS; 0 = no pain, 10 = intolerable pain) for pain under various conditions (rest, night, local pressure, morning)
- Documentation of possible adverse effects

Statistical Analysis

Data were analyzed using SPSS version 26. Quantitative variables were described as mean ± standard deviation, and qualitative variables as frequency and percentage. Data normality was tested using the Kolmogorov–Smirnov test. Group comparisons were made using corresponding parametric or non-parametric tests. A significance level of 0.05 was adopted. Possible side effects were also recorded during follow-up.

All patient information was treated confidentially, and no costs were imposed on participants. The study was conducted with full approval of the Ethics Committee of Iran University of Medical Sciences.

Results

In this study, 80 patients with plantar fasciitis between 2023 and 2025 were included in two groups , 40 patients was treated with shock wave and 40 with medication. There were no statistically significant differences between the two groups in age and sex distribution (P > 0.05) (Table 1). Comparison of changes in VAS scores between the two groups using ANCOVA showed the shock wave therapy group was significantly greater pain reduction than the medical treatment group at both follow-up intervals (week 12, P < 0.001; month 12, P = 0.022; overall P < 0.05) (Table 2, Figure 1).

In the comparison of Roles and Maudsley scale changes between the shock wave therapy and medical treatment groups using ANCOVA, the reduction in the Roles and Maudsley score was significantly greater in the shock wave therapy group at both follow-up intervals (week 12, P = 0.003; month 12, P = 0.047) compared with the medical treatment group (P < 0.05) (Table 3, Figure 2).

There were no statistically significant difference between two groups in adverse effects at 12 weeks after treatment (P = 0.077). Given the transient nature of the observed adverse effects, no new complications were reported after 12month. In the shock wave therapy , seven adverse events were recorded, including pain during intervention in 3 patients (42.9%), localized erythema in 2 patients (28.5%), treatment-site swelling in 1 patient (14.3%), and severe headache in 1 patient (14.3%). In the medical treatment group, two adverse events were reported, both related to gastrointestinal intolerance to oral medication.

Table 1: Distribution of sex and age in the shock wave therapy and medical treatment groups

Variable		Shock Wave Therapy (n=40)	Medical Treatment (n=40)	P value
Sex	Male	16 (40.0)	10 (25.0)	0.152
	Female	24 (60.0)	30 (75.0)	
Age (years)		8.25 ± 47.28	9.21 ± 49.55	0.248

Table 2: VAS scores in two treatment groups

Treatment Group	VAS score				
	Before treatment	12 weeks after treatment	P value	12 months after treatment	P value
Shock Wave Therapy	1.14 ± 7.23	1.42 ± 4.30	> 0.001	1.53 ± 3.93	0.022
Medical Treatment	1.16 ± 6.50	1.15 ± 4.90		1.20 ± 4.28	

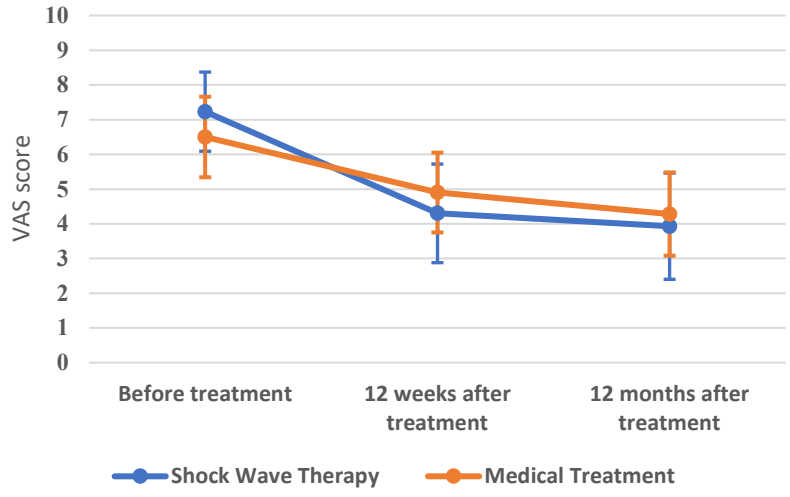

Figure 1: Comparison of changes in VAS scores between the shock wave therapy and medical therapy groups

Table 3: Roles and Maudsley scale changes in two groups					
Treatment Group	Scale Roles and Maudsley				
	Pre treatment	12 weeks after treatment	P value	12 months after treatment	P value
Shock Wave Therapy	0.53 ± 2.85	0.70 ± 1.78	0.003	0.71 ± 1.60	0.047
Medical Treatment	0.55 ± 2.53	0.55 ± 1.95		0.59 ± 1.75	

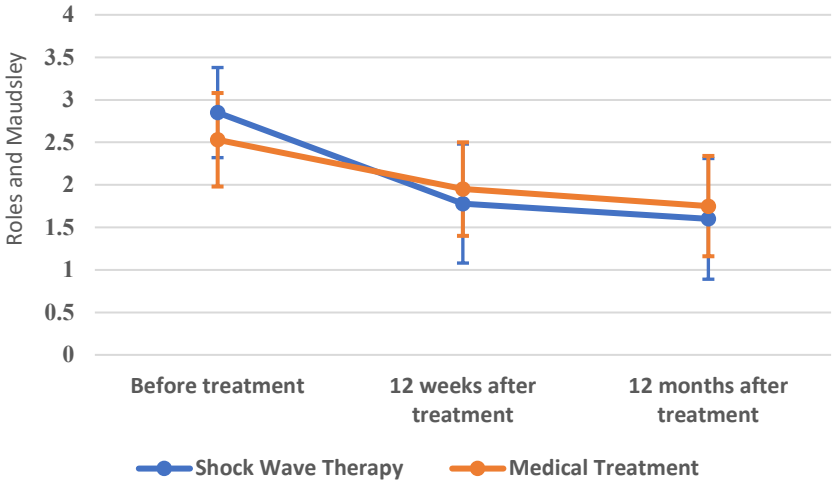

Figure 2: Comparison of Roles and Maudsley scale changes between the shock wave therapy and medical treatment groups

Discussion

Given the epidemiological importance of plantar fasciitis and its considerable impact on patients' quality of life, this study was designed to compare the effectiveness of shock wave with medical treatment in the management of this condition. Selecting Firoozgar Hospital as the study center provided the opportunity for a more detailed evaluation of therapeutic interventions in an affected population and contributed to the development of improved clinical treatment protocols.

The results of statistical analysis using ANCOVA showed that shock wave therapy demonstrated significantly greater effectiveness than conventional medical treatments in reducing pain intensity (based on VAS scores) and functional improvement (based on Roles and Maudsley scale) at both the 12-week and 12-month follow-up intervals ($P < 0.05$). The absence of significant demographic differences between the two groups further strengthens the validity of direct comparison between the therapeutic approaches. The findings of this study are consistent with some previous research. Wang et al. (2002) reported safety and effectiveness of shock wave therapy in treatment of plantar fasciitis, with one-year follow-up and without systemic or local complications[16]. Similarly, the meta-analysis by Aqil et al. (2013) demonstrated significant improvement in VAS pain scores compared with placebo, with therapeutic effects persisting up to 12 months[14].

In contrast, Haake et al. (2003) questioned the effectiveness of shock wave therapy, reporting no significant difference from placebo[13]. These discrepancies may be explained by variations in study design, inclusion criteria, device type, and energy intensity applied. On the other hand, Ogden et al. (2001), in a study of over 300 patients, reported substantial therapeutic success of the shock wave therapy versus placebo, further supporting the effectiveness of this approach[15].

Regarding adverse events, the present study found that although transient complications such as treatment-related pain, erythema, swelling, and headache were more frequently observed in treatment with shock wave, none persisted at 12-month follow-up, and no statistically significant difference compared with the medical treatment group was detected ($P = 0.077$). These findings support the relative safety and tolerability of shock wave therapy.

Overall, the results of this study confirm the efficacy, safety, and durability of treatment of plantar fasciitis

with shock wave compared with conventional medical treatment. Considering the inconsistencies in previous studies, further research with standardized designs, detailed evaluation of patient-specific factors, device types, and treatment energy levels is recommended to clarify the clinical applicability of this method.

Conclusion

The present study demonstrated that shock wave is more effective than medical treatment for pain relieving and functional improvement in plantar fasciitis. Significant decreasing VAS scores , also Roles and Maudsley scale improvement in the shock wave therapy confirm the clinical efficacy of this method. Furthermore, assessment of outcomes one year after treatment showed that the therapeutic benefits of treatment with shock wave are sustained.

In terms of safety, the incidence side effects with the shock wave was minimal and transient, with no persistent complications observed during long-term follow-up. This indicates that the method is both safe and well tolerated.

In conclusion, shock wave therapy can be considered an effective, low-complication, and durable treatment option for patients with plantar fasciitis. Expanding future studies to investigate treatment response factors, energy levels, and device types will contribute to optimizing this therapeutic approach.

Recommendations

Based on the findings of this study, future prospective research focusing on factors influencing response to different treatment modalities (such as initial symptom severity, patient characteristics, device type, and energy settings) may significantly improve clinical decision-making and the selection of optimal therapies for individual patients.

Moreover, applying the results of this study in healthcare policymaking—particularly in the targeted allocation of therapeutic resources—may help reduce the economic and social burden of plantar fasciitis on patients and healthcare systems.

Limitations of the Study

Despite the promising results, certain limitations should be considered when interpreting these findings. The relatively small sample size and recruitment from a single center may affect the generalizability of the results. In addition, advanced imaging techniques were not employed to comprehensively evaluate structural changes in the plantar fascia, limiting the assessment of underlying mechanisms of shock wave therapy.

Furthermore, psychological variables such as patient anxiety or treatment-related beliefs were not assessed, although they may influence pain perception and therapeutic response. Future studies should employ multicenter designs, larger sample sizes, and a more comprehensive evaluation of variables affecting treatment response.

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