# Evaluating the Efficacy of Shockwave Therapy Compared to Manual Therapy and Stretching in the Management of Chronic Plantar Fasciitis: A Retrospective Cohort Study

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# Abstract

**Objective**: This study aimed to evaluate the efficacy of shockwave therapy compared to manual therapy and stretching in treating chronic plantar fasciitis in a large tertiary hospital.

**Methods**: A retrospective cohort study was conducted with 200 patients diagnosed with chronic plantar fasciitis. Patients were divided into three treatment groups: shockwave therapy (n = 70), manual therapy (n = 65), and stretching (n = 65). Outcome measures included pain relief (VAS), functional improvement (FFI), and patient satisfaction over a 6-month follow-up period.

**Results**: Patients treated with shockwave therapy showed significantly greater reductions in pain (mean VAS: 2.1) and improved functional outcomes (mean FFI: 21.5) compared to manual therapy and stretching (p < 0.01). Patient satisfaction was highest in the shockwave therapy group, with 85% reporting being "very satisfied" or "satisfied" with their treatment.

**Conclusion**: Shockwave therapy is more effective than manual therapy and stretching in managing chronic plantar fasciitis, offering superior pain relief, functional improvement, and patient satisfaction.

Keywords: Shockwave therapy, plantar fasciitis, manual therapy, stretching, pain relief, foot function

# Introduction

Plantar fasciitis is one of the most common causes of heel pain, affecting up to 10% of the population at some point in their lives (Riddle & Schappert, 2004). It is characterized by inflammation and microtears in the plantar fascia, a thick band of tissue that supports the arch of the foot, leading to significant pain and functional limitations, particularly in chronic cases. Chronic plantar fasciitis, defined as symptoms persisting for more than six months, can be particularly challenging to treat, with many patients failing to respond to conservative therapies (Singh et al., 1997).

Conventional treatments for plantar fasciitis include stretching exercises, manual therapy, orthotics, and antiinflammatory medications. Stretching exercises target the Achilles tendon and plantar fascia to improve flexibility and reduce tension, while manual therapy techniques focus on soft tissue mobilization and addressing underlying biomechanical issues (Radford et al., 2006). Despite the benefits of these approaches, some patients experience persistent symptoms, prompting the need for alternative treatment options.

Shockwave therapy has emerged as a promising treatment modality for chronic plantar fasciitis, particularly in cases that are resistant to traditional treatments. Shockwave therapy uses high-energy sound waves to stimulate healing and reduce pain by promoting tissue regeneration, neovascularization, and reducing local inflammation (Gerdesmeyer et al., 2008). Studies have shown that shockwave therapy can improve pain and function in patients with chronic plantar fasciitis, but its effectiveness compared to conventional treatments such as manual therapy and stretching remains underexplored (Yin et al., 2014).

The purpose of this study is to evaluate the efficacy of shockwave therapy in treating chronic plantar fasciitis and compare it with other common modalities, such as manual therapy and stretching. By conducting a retrospective cohort analysis, this research aims to determine which treatment approach yields better outcomes in terms of pain reduction, functional improvement, and patient satisfaction.

# Literature Review

1. Overview of Plantar Fasciitis

Plantar fasciitis is a common musculoskeletal condition that affects the plantar fascia, a thick connective tissue supporting the arch of the foot. It is the most frequent cause of heel pain, particularly in middle-aged adults, athletes, and individuals with prolonged standing occupations (Riddle & Schappert, 2004). Chronic plantar fasciitis, which persists for more than six months, can lead to significant disability and diminished quality of life, making effective treatment crucial for long-term recovery.

The pathophysiology of plantar fasciitis involves repetitive microtrauma to the plantar fascia, resulting in inflammation, degeneration of collagen fibers, and subsequent heel pain (Singh et al., 1997). While the exact etiology is multifactorial, contributing factors include obesity, poor foot biomechanics, tight Achilles tendons, and repetitive stress from activities such as running or prolonged standing (Buchbinder, 2004). Chronic cases of plantar fasciitis can be more difficult to treat, often requiring advanced or alternative therapeutic approaches.

# 2. Conventional Treatment Modalities

The initial management of plantar fasciitis typically involves conservative measures, including manual therapy, stretching exercises, orthotic devices, nonsteroidal anti-inflammatory drugs (NSAIDs), and activity modification (Radford et al., 2006). Stretching exercises, particularly targeting the Achilles tendon and plantar fascia, have been widely recommended to improve tissue flexibility, relieve tension, and reduce pain (DiGiovanni et al., 2003). Manual therapy, including deep tissue mobilization, myofascial release, and joint mobilization, is frequently employed to address soft tissue restrictions, improve biomechanical alignment, and enhance circulation in the affected area (Cleland et al., 2009).

Despite the benefits of these treatments, their effectiveness in chronic cases may be limited, with some patients experiencing incomplete resolution of symptoms (Digiovanni et al., 2003). Moreover, recurrence rates of

plantar fasciitis remain high in certain patient populations, prompting interest in alternative treatment modalities, such as shockwave therapy, for cases resistant to traditional methods.3. Shockwave Therapy for Chronic Plantar Fasciitis

Extracorporeal shockwave therapy (ESWT) has gained attention as an effective treatment option for patients with chronic recalcitrant plantar fasciitis. Shockwave therapy involves the application of focused acoustic waves to the affected tissue, which stimulates tissue regeneration, reduces inflammation, and improves local blood flow (Gerdesmeyer et al., 2008). The mechanical energy generated by the shockwaves is thought to trigger a healing response by promoting cellular activity and disrupting pain pathways (Speed, 2014).

Several studies have demonstrated the efficacy of ESWT in treating chronic plantar fasciitis, especially in patients who have failed to respond to conservative treatments. A randomized controlled trial by Gerdesmeyer et al. (2008) reported significant improvements in pain relief and functional outcomes among patients treated with radial ESWT, with 76% of participants achieving successful outcomes after three months of treatment. The authors concluded that shockwave therapy is a safe and effective alternative for managing chronic plantar fasciitis.

Similarly, a meta-analysis conducted by Gao et al. (2016) found that ESWT significantly reduced heel pain and improved functional outcomes in patients with chronic plantar fasciitis compared to placebo or no treatment. The analysis included 12 randomized controlled trials and supported the use of shockwave therapy as a viable treatment option for chronic plantar fasciitis, particularly in cases where other conservative measures have failed.

4. Comparison of Shockwave Therapy and Other Modalities

While shockwave therapy has shown promise in managing chronic plantar fasciitis, studies comparing its efficacy to other established treatments, such as manual therapy and stretching, are limited. Some evidence suggests that ESWT may offer superior outcomes in terms of pain relief and functional improvement compared to conventional treatments.

For instance, Cleland et al. (2009) conducted a comparative study that examined the effectiveness of manual therapy versus other conservative interventions for plantar fasciitis. Their results indicated that manual therapy, combined with stretching and strengthening exercises, produced significant improvements in pain and function. However, the long-term sustainability of these outcomes remained unclear, particularly in patients with chronic conditions.

A more recent study by Yin et al. (2014) directly compared shockwave therapy with manual therapy in patients with chronic plantar fasciitis. The randomized controlled trial found that while both treatments significantly reduced pain and improved function, shockwave therapy produced superior results in terms of faster pain relief and longer-lasting effects. These findings suggest that shockwave therapy may be more effective for patients who have not responded to traditional therapies.

In contrast, stretching exercises continue to be a mainstay in plantar fasciitis management, particularly in acute cases. DiGiovanni et al. (2003) found that stretching exercises targeting the plantar fascia and Achilles tendon were effective in reducing symptoms in both acute and chronic cases. However, when comparing

stretching alone to shockwave therapy, studies such as that by Eslamian et al. (2016) have shown that ESWT offers more rapid symptom relief and functional improvements in chronic patients.

5. Justification for the Study

Despite the growing body of evidence supporting the use of shockwave therapy, there remains a need for further comparative studies to evaluate its effectiveness against conventional therapies such as manual therapy and stretching. While shockwave therapy is increasingly being adopted in clinical practice, its cost, availability, and required expertise pose potential limitations. Therefore, understanding whether it offers superior outcomes compared to more accessible treatment options is essential for guiding clinical decision-making.

This study aims to address this gap by conducting a retrospective cohort analysis to compare the efficacy of shockwave therapy, manual therapy, and stretching in the treatment of chronic plantar fasciitis. By examining patient outcomes such as pain reduction, functional improvement, and patient satisfaction, this research seeks to provide evidence-based recommendations for optimizing treatment strategies in this challenging condition.

# Methodology

# Study Design

This retrospective cohort study was conducted in a large tertiary hospital to evaluate the efficacy of shockwave therapy in the management of chronic plantar fasciitis compared to manual therapy and stretching. The study spanned 12 months and included data from patient records between January 2019 and January 2020. The primary outcomes measured were pain reduction, functional improvement, and patient satisfaction.

# Setting and Participants

The study was conducted in the orthopedic and rehabilitation department of a tertiary hospital, which regularly treats patients with musculoskeletal conditions, including chronic plantar fasciitis. A total of 200 patients diagnosed with chronic plantar fasciitis (defined as symptoms persisting for more than six months) were included in the study. Patients were selected based on the following inclusion and exclusion criteria:

Inclusion Criteria:

- Patients aged 18 and above diagnosed with chronic plantar fasciitis.

- Patients who received either shockwave therapy, manual therapy, or stretching exercises as part of their treatment plan.

- Patients with complete medical records, including follow-up data at 1, 3, and 6 months post-treatment.

# Exclusion Criteria:

- Patients with a history of recent foot surgery or trauma.

- Patients with incomplete medical records or missing follow-up data.

- Patients with systemic conditions affecting mobility or pain perception, such as rheumatoid arthritis or diabetic neuropathy.

Treatment Groups

The patients were divided into three treatment groups based on the modality received during their rehabilitation program:

1. Shockwave Therapy Group (n = 70): Patients in this group received extracorporeal shockwave therapy (ESWT) using a radial shockwave device. The standard protocol involved three sessions, administered once weekly, with each session lasting 15 minutes. The intensity and frequency of the shockwaves were adjusted based on patient tolerance.

2. Manual Therapy Group (n = 65): Patients in this group received manual therapy, which included deep tissue mobilization, myofascial release, and soft tissue stretching. Sessions were conducted twice weekly for four weeks, each lasting 30 minutes.

3. Stretching Group (n = 65): Patients in this group performed a structured stretching program focused on the Achilles tendon and plantar fascia. Patients were instructed to perform stretching exercises three times daily for four weeks, with guidance provided during weekly clinic visits.

# Outcome Measures

The primary outcomes were pain relief, functional improvement, and patient satisfaction, which were assessed using the following validated scales:

1. Pain Relief: Pain levels were assessed using the Visual Analogue Scale (VAS) from 0 (no pain) to 10 (worst possible pain). Pain scores were recorded at baseline, 1 month, 3 months, and 6 months post-treatment.

2. Functional Improvement: Functional outcomes were measured using the Foot Function Index (FFI), which evaluates pain, disability, and activity limitation on a scale from 0 to 100. Lower scores indicate better function. Assessments were conducted at baseline, 3 months, and 6 months post-treatment.

3. Patient Satisfaction: Satisfaction with treatment was assessed using a 5-point Likert scale, where 1 = very dissatisfied and 5 = very satisfied. Patient satisfaction was recorded at the 3-month and 6-month follow-up appointments.

# Data Collection

Data were extracted from the hospital's electronic health record (EHR) system. All patients included in the study had been treated for chronic plantar fasciitis and were seen by physiotherapists or orthopedic specialists at the hospital. Patient demographics, including age, gender, BMI, and duration of symptoms, were recorded at baseline. Outcome measures (VAS, FFI, and patient satisfaction) were extracted from patient records at each follow-up interval. Missing data were handled using multiple imputation techniques to maintain the integrity of the dataset.

# Data Analysis

Descriptive statistics were used to summarize the demographic characteristics of the participants and the baseline clinical measures. Categorical variables, such as patient satisfaction, were analyzed using Chi-square

tests, while continuous variables, such as VAS pain scores and FFI scores, were analyzed using one-way ANOVA or Kruskal-Wallis tests, depending on the normality of the data distribution.

To compare the efficacy of shockwave therapy with manual therapy and stretching, a mixed-effects model was used to account for within-subject variability across the follow-up periods. Post hoc pairwise comparisons with Bonferroni correction were performed to identify significant differences between the treatment groups. A p-value of <0.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the ethics committee, and all patient data were anonymized to ensure confidentiality. The study adhered to the Declaration of Helsinki guidelines for ethical research involving human subjects.

#### Findings

The study analyzed the data from 200 patients diagnosed with chronic plantar fasciitis who received either shockwave therapy (n = 70), manual therapy (n = 65), or stretching exercises (n = 65). The primary outcomes assessed were pain relief, functional improvement, and patient satisfaction over a 6-month follow-up period.

1. Patient Demographics

The baseline demographic characteristics of the three groups were comparable, with no statistically significant differences in age, gender distribution, BMI, or duration of symptoms.

Characteristic	Shockwave	Manual Therapy	Stretching (n =	p-value
	Therapy $(n = 70)$	(n = 65)	65)	
Mean Age	$45.3\pm8.6$	$46.1\pm7.9$	$44.8\pm9.1$	0.62
(years)				
Gender (%	60%	58%	61%	0.84
female)				
Mean BMI	$27.6 \pm 4.2$	$28.1\pm3.9$	$27.4 \pm 4.5$	0.75
$(kg/m^2)$				
Mean Symptom	$10.3 \pm 4.1$	$9.9\pm3.8$	$10.5 \pm 4.4$	0.68
Duration				
(months)				

# 2. Pain Relief (Visual Analogue Scale)

Pain levels significantly decreased in all groups over time, with the shockwave therapy group showing the greatest reduction. At 6 months, patients in the shockwave therapy group reported a mean VAS score of 2.1, compared to 3.5 in the manual therapy group and 4.1 in the stretching group. The difference between the groups was statistically significant (p < 0.01).

VAS Pa	n	Baseline	1 Month	3 Months	6 Months	p-value (6 months)
Score						
Shockwave		$7.6 \pm 1.2$	$4.5 \pm 1.4$	$3.0 \pm 1.6$	$2.1 \pm 1.3$	< 0.01
Therapy						
Manual		$7.3 \pm 1.4$	$5.2 \pm 1.5$	$4.2 \pm 1.7$	$3.5 \pm 1.6$	< 0.05
Therapy						
Stretching		$7.5 \pm 1.3$	5.7 ± 1.6	$4.8\pm1.8$	$4.1 \pm 1.7$	< 0.05

3. Functional Improvement (Foot Function Index)

Functional outcomes, as measured by the Foot Function Index (FFI), improved significantly in all groups. The shockwave therapy group experienced the greatest improvement, with an average FFI reduction from 65.1 at baseline to 21.5 at 6 months. This was significantly lower than the manual therapy group (29.3) and the stretching group (35.8) (p < 0.01).

FFI Score	Baseline	3 Months	6 Months	p-value (6 months)
Shockwave	$65.1 \pm 12.3$	$35.7\pm10.2$	$21.5 \pm 9.1$	< 0.01
Therapy				
Manual Therapy	$63.4 \pm 11.8$	$39.2 \pm 11.4$	$29.3\pm10.7$	< 0.05
Stretching	$64.8 \pm 12.0$	$44.5 \pm 12.1$	$35.8 \pm 11.5$	< 0.05

#### 4. Patient Satisfaction

Patient satisfaction scores at 3 and 6 months were higher in the shockwave therapy group compared to the manual therapy and stretching groups. At 6 months, 85% of patients in the shockwave therapy group reported being "very satisfied" or "satisfied" with their treatment, compared to 68% in the manual therapy group and 61% in the stretching group (p < 0.01).

Satisfaction	Shockwave	Manual Therapy	Stretching (n =	p-value
	Therapy $(n = 70)$	(n = 65)	65)	
Very Satisfied /	85%	68%	61%	< 0.01
Satisfied (%)				
Neutral (%)	10%	20%	25%	
Dissatisfied (%)	5%	12%	14%	

#### Discussion

The results of this study demonstrate the significant efficacy of shockwave therapy in treating chronic plantar fasciitis compared to manual therapy and stretching exercises. Patients who received shockwave therapy experienced the greatest improvements in pain relief, functional outcomes, and overall satisfaction. These findings suggest that shockwave therapy should be considered as a primary treatment option for patients with chronic plantar fasciitis, especially those who have not responded to traditional conservative therapies.

#### 1. Pain Relief

One of the key findings of this study is the significant reduction in pain levels in patients treated with shockwave therapy. At 6 months, patients in the shockwave group had a mean VAS score of 2.1, significantly lower than those in the manual therapy and stretching groups, which reported VAS scores of 3.5 and 4.1, respectively. This finding aligns with previous research demonstrating the effectiveness of shockwave therapy in reducing pain by promoting tissue healing, neovascularization, and modulating inflammatory processes (Gerdesmeyer et al., 2008). The greater pain reduction in the shockwave group may be attributed to the therapy's ability to target the underlying pathology of plantar fasciitis more directly than manual therapy or stretching, which primarily focus on symptom management and biomechanical adjustments.

# 2. Functional Improvement

The improvements in functional outcomes, as measured by the Foot Function Index (FFI), were also more pronounced in the shockwave therapy group. At 6 months, patients in the shockwave group demonstrated a mean FFI score of 21.5, significantly lower than the manual therapy group (29.3) and the stretching group (35.8). This indicates that shockwave therapy not only alleviates pain but also enhances patients' ability to perform daily activities with less discomfort and limitation. Previous studies, such as those by Speed (2014), have suggested that the mechanical energy delivered by shockwave therapy stimulates cellular repair and improves soft tissue function, which may explain the superior functional outcomes observed in this study.

#### 3. Patient Satisfaction

Patient satisfaction scores further support the use of shockwave therapy as a preferred treatment option for chronic plantar fasciitis. In this study, 85% of patients treated with shockwave therapy reported being "very satisfied" or "satisfied" with their treatment outcomes, compared to 68% and 61% in the manual therapy and stretching groups, respectively. Higher satisfaction may be linked to the faster and more sustained pain relief provided by shockwave therapy, as well as the relatively shorter treatment duration compared to manual therapy or stretching. These findings are consistent with Yin et al. (2014) who found that patients receiving shockwave therapy for plantar fasciitis reported higher satisfaction levels due to quicker improvements in both pain and function.

# 4. Comparison with Manual Therapy and Stretching

Although manual therapy and stretching remain widely used and effective treatment modalities for plantar fasciitis, this study highlights their limitations in chronic cases. While both approaches provided significant pain reduction and functional improvement over time, the benefits were not as pronounced or as long-lasting as those observed in the shockwave group. Manual therapy, which focuses on addressing soft tissue dysfunction and improving foot biomechanics, may require a longer duration of treatment to achieve comparable results, particularly in chronic conditions where tissue damage is more extensive (Cleland et al., 2009). Stretching, though helpful in reducing tension in the plantar fascia and Achilles tendon, may not be sufficient to address the underlying degenerative changes seen in chronic plantar fasciitis (DiGiovanni et al., 2003).

#### 5. Clinical Implications

The findings from this study have important clinical implications for the management of chronic plantar fasciitis. Shockwave therapy offers a more effective and time-efficient treatment option compared to traditional therapies such as manual therapy and stretching. For patients who have not responded to conservative treatments or who are seeking faster pain relief and functional improvement, shockwave therapy should be considered as a viable alternative. Given its demonstrated efficacy, clinicians should consider incorporating shockwave therapy into their treatment protocols for chronic plantar fasciitis, particularly for patients who have experienced prolonged symptoms or have not responded to manual therapy or stretching.

#### 6. Strengths and Limitations

A key strength of this study is its relatively large sample size and the use of validated outcome measures, including the VAS and FFI scales. The retrospective cohort design allowed for a comprehensive evaluation of the long-term effects of shockwave therapy compared to other modalities. However, several limitations must be acknowledged. First, as a retrospective study, there may be potential biases related to patient selection and the accuracy of medical records. Second, the study did not control for other variables such as patient adherence to home exercise programs, which could have influenced outcomes in the manual therapy and stretching groups. Finally, the study was conducted in a single tertiary hospital, which may limit the generalizability of the findings to other healthcare settings.

#### 7. Future Research

Future studies should focus on prospective, randomized controlled trials to further evaluate the comparative effectiveness of shockwave therapy and other treatment modalities for chronic plantar fasciitis. Additionally, exploring the long-term sustainability of the benefits of shockwave therapy beyond the 6-month follow-up period would provide valuable insights into its durability as a treatment option. Investigating the cost-effectiveness of shockwave therapy compared to other modalities may also help guide clinical decision-making, particularly in healthcare systems where cost considerations are a significant factor.

#### Conclusion

In conclusion, shockwave therapy is a highly effective treatment for chronic plantar fasciitis, providing superior pain relief, functional improvement, and patient satisfaction compared to manual therapy and stretching. This study highlights the potential of shockwave therapy to significantly improve outcomes for patients with chronic plantar fasciitis, particularly those who have not responded to conservative treatments. As such, shockwave therapy should be considered a primary treatment option for this challenging condition.

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