

# **Long-term Results of Extracorporeal Shockwave Treatment for Plantar Fasciitis**

## **A 5- to 6- year Follow-up**

Ching-Jen Wang, M.D.

Clinical Professor of Orthopedic Surgery  
Chang Gung University School of Medicine  
Chang Gung Memorial Hospital  
Kaohsiung, Taiwan



# Background

Proximal Plantar fasciitis is a common orthopedic disorder.

Non-operative treatments including NSAIDs, orthotics, physiotherapy, exercises and cortisone injection are the initial choice.

The results from such treatments varied considerably, and there was no consensus of opinions on the best method.

Surgical treatment with either open or endoscopic release of the plantar fascia is recommended in patients with failure to non-operative treatment.

However, the results of surgery are inconsistent and unpredictable.

## Background and Purpose

Extracorporeal shockwave treatment was introduced for alleviation of pain due to proximal plantar fasciitis with mixed short-term results.

However, the long-term results are lacking.

The purpose of this study was to evaluate the long-term results of shockwave treatment for plantar fasciitis with 5- to 6- year follow-up.

## Patients and Methods

Inclusion criteria consisted of patients diagnosed with plantar fasciitis established by clinical examination and radiographs of the heel.

Exclusion criteria included patients with systemic or local infection, diabetes mellitus, obstructive peripheral vascular disease, metabolic arthropathy such as gout, pregnancy or patients younger than 18 years.

## Patients and Methods

Between Feb. 1998 and Dec. 1999, 149 patients (168 heels) were enrolled in the study, including 79 patients (85 heels) in the shockwave group and 70 patients (83 heels) in the control group.

Radiographs showed the presence of a heel spur in approximately 75% of the cases.

19 patients were bilateral including 6 in shockwave group and 13 in control group.

Approximately  $\frac{1}{4}$  of patients were recreational athletes in distance running.

## Patients and Methods

Patients were randomly divided into the shockwave group with odd medical numbers and the control group with even medical numbers.

In **shockwave group**, patients received 1,500 impulses of shockwaves at 16 KV (energy flux density of 0.32 mJ/mm<sup>2</sup>) to the affected heel as a single time treatment. 58 patients (60 heels) received only one treatment, 16 patients (19 heels) received 2 treatments, and 5 patients (6 heels) received 3 treatments.

In control group, patients were treated with either single or multiple modalities including NSAIDs, orthotics, physical therapy, an exercise program, or a local cortisone injection.

# Patient's Demographics

	Shockwave group	Control group
No. of patients / heels	76 / 81	65 / 78
Gender (male / female)	18 / 58	25 / 40
Affected side (right / left)	39 / 42	44 / 34
Age (mean $\pm$ SD [range]), y	53.2 $\pm$ 11.0 [21-75]	51.6 $\pm$ 9.8 [20-74]
Duration of disease (mean $\pm$ SD [range]), mo	9.8 $\pm$ 9.6 [6 -36]	9.4 $\pm$ 12.9 [6-38]
Follow-up time (mean $\pm$ SD [range]), mo	64.1 $\pm$ 4.3 [60-72]	39.8 $\pm$ 9.9 [34-64]

# The Evaluation Parameters

## A 100-point Scoring System:

### I. Pain scores (70 points):

1. Pain on maximal distance for level walking (0-45 points),
  - Severe restriction, 0 points
  - No restriction, 10 points
2. Start-up Pain (0-5 points),
  - Yes, 0 points
  - No, 5 points
3. Pressure pain (0-20 points),
  - Severe pain, 0 points
  - No pain, 20 points

### II. Functional scores (30 points):

1. Pain at work (0-10 points),
  - Severe restriction, 0 points
  - No restriction, 10 points
2. Pain during free time/Sports (0-10 points),
  - Severe restriction, 0 points
  - No restriction, 10 points
3. Pain at night (0-10 points).
  - Severe restriction, 0 points
  - No restriction, 10 points
  - 0 m, 0 points
  - <100m, 15 points
  - <1000m, 30 points
  - >1000m, 45 points

# Methods of Evaluation

Pain intensity was recorded on a 10-point visual analog scale, with 0 for no pain and 10 for severe pain.

Radiographs of the heel were obtained before and after treatment.

Clinical outcomes:

**Excellent** – no heel pain on all activities of daily living including sports.

**Good** – having less than 50% of the original heel pain on certain activities, including sports.

**Fair** – having 50% to 75% of the original heel pain on certain activities.

**Poor** – having 75% or more of the original heel pain.

## The Results

Eight patients (9 heels) were excluded including 3 patients (4 heels) in the shockwave group and 5 patients (5 heels) in the control group for reasons including death and lost to follow-up.

Overall, 76 patients (81 heels) in the shockwave group and 65 patients (78 heels) in the control group completed the final analyses.

# Pain Intensity Before and After Treatment

## Visual Analog Scale<sup>a</sup> Score

Mean SD Range

### Shockwave group

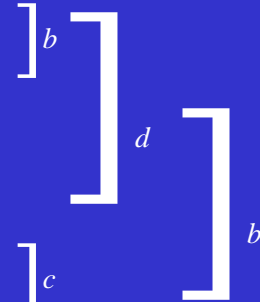
Before treatment (79 patients/85 heels) **4.0** 1.3 2-8

After treatment (76 patients/81 heels) **0.2** 0.7 0-4

### Control group

Before treatment (70 patients/83 heels) **4.1** 1.1 2-8

After treatment (65 patients/78 heels) **4.2** 1.7 2-8



<sup>a</sup>10-point visual analog scale for pain intensity; 0 = no pain, 10 = severe pain

<sup>b</sup>  $P < .001$ . <sup>c</sup>  $P = .478$ . <sup>d</sup>  $P = .179$ .

# Pain and Function Scores Before and After Treatment

## Pain Scores (Total 70 Points)

	Mean	SD	Range	
<b>Shockwave group</b>				
Before treatment	25.4	12.4	0-65	] <sup>a</sup> ]
After treatment	69.3	4.0	45-70	
<b>Control group</b>				
Before treatment	27.3	13.8	2-38	] <sup>b</sup> ]
After treatment	28.1	14.0	2-40	

## Functional Scores (Total 30 Points)

	Mean	SD	Range	
<b>Shockwave group</b>				
Before treatment	14.1	4.0	2-26	] <sup>a</sup> ]
After treatment	29.6	1.9	18-30	
<b>Control group</b>				
Before treatment	13.8	1.6	10-17	] <sup>d</sup> ]
After treatment	14.0	1.63	10-17	

**a P < .001. B P = .361. C P = .174. D P = .190. E P = .165**

# The Overall Clinical Results

	Shockwave group	Control group
Excellent	69.1% (56/81)	0
Good	13.6% (11/81)	55% (43/78)
Fair	6.2% (5/81)	36% (28/78)
Poor	11.1% (9/81)	9.0% (7/78)

$P < 0.001$

## Clinical Results vs B.M.I.

B.M.I.	Excellent	Good	Fair & Poor
Normal (N=25)	76% (19/25)	20% (5/25)	4% (1/25)
Overweight (N=34)	73% (25/34)	21% (7/34)	6% (2/34)
Mild Obesity (N=15)	73% (11/15)	20% (3/15)	7% (1/15)
Moderate Obesity (N=7)	72% (5/7)	14% (1/7)	14% (1/7)
Morbid Obesity (N=4)	100% (4/4)	0	0

Normal:  $18.5 \leq \text{BMI} < 24$ ; Overweight:  $24 \leq \text{BMI} < 27$ ; Mild obesity:  $27 \leq \text{BMI} < 30$ ; Moderate obesity:  $30 \leq \text{BMI} < 35$ ; Morbid obesity:  $\text{BMI} > 35$ .

**Body weight has no impact on the results of shockwave in the treatment of proximal plantar fasciitis.**

## The Recurrence

In control group, the frequency of recurrent symptoms averaged  $7.3 \pm 5.8$  times (1 to 25 times), and the duration of recurrence averaged  $5.4 \pm 2.8$  months (1 to 12 months).

In shockwave group, recurrence occurred in 12% (9/81) of patients including 2 patients (2 heels) choosing surgery and 7 patients (7 heels) receiving alternative treatments including herbal medicine.

Overall, recurrence of symptoms occurred in 12% (9/81) of the shockwave group, 55% (43/78) of the control group.

$P < 0.001$

# The Results of Radiographic Examination

## Radiographic changes:

Before treatment, 75% of cases showed heel spur on radiographs.

No discernible difference in the size and shape of the heel spur noted after treatment.

No regression of the heel spur or formation of a new spur.

# Discussions

Many studies reported that most of the conservative treatment for plantar fasciitis were found to be unpredictable and minimally effective.

*Gill LH, Foot Ankle Int 1996;17:527-532*

The results of this study showed that non-operative treatments for plantar fasciitis achieved only 55% good or excellent results, with a recurrent rate of 55%.

# Discussions

Many studies have reported good results for shockwaves in the treatment of plantar fasciitis in short-term.

*Chen HS et al CORR 2001;387:41-46.*

*Rompe et al Arch Orthop Trauma 1996;115:75-79.*

*Wang CJ et al Foot Ankle Int 2002;23:204-207.*

Some authors reported the results of shockwave are comparable with those after surgery with no surgical risks and complications.

*Weil et al J Foot Ankle Surg 2002;41:166-172.*

## Discussions

Our previous studies showed that shockwave treatment yielded 91% satisfactory results with a 6% recurrent rate for patients with plantar fasciitis with 12-month follow-up.

The results of this study showed that shockwave treatment provided 82.7% good to excellent results, with a 12% recurrent rate at 5- to 6-year follow-up.

Despite the changes in efficacy and recurrent rate, the overall findings demonstrated that shockwave treatment is more effective with less recurrence than conservative treatment for plantar fasciitis in long-term.

# Conclusions

Extracorporeal shockwave treatment is a new therapeutic modality that can safely and effectively treat patients with plantar fasciitis, with good long-term results.

