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Treatment of Chronic Plantar Fasciitis with Extracorporeal Shock Wave

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Treatment of Chronic Plantar Fasciitis with Extracorporeal Shock Wave

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Extracorporeal shock wave therapy (ESWT) has shown success in the alleviation of painful heels and other orthopedic conditions such as tennis elbow, calcifying tendinopathy of the shoulder, and nonunion fractures of the long bones. The purpose of this study is to evaluate the effectiveness of ESWT on chronic plantar fasciitis, and to monitor the complication of ESWT.

Forty patients were enrolled in the study, however, 10 patients dropped out after first session due to intolerable pain during the course of treatment. Two patients were symptom-relief after the first session of treatment, and the other 2 patients were loss of follow-up. Therefore, 26 patients (11 men and 15 women) with an average age of 60.73 years (range, 42-76 years) had completed the total 2 sessions of treatment in this study. Each session of treatment was composed of 1500 impulses of shock wave at level 5 (0.26 mJ/mm²) with frequency of 2 Hz to the affected heel.

Of 26 patients with 4 weeks follow-up, 85% of heels achieving subjective improvement, and 92% of heels achieving objective improvement of pressure tolerance after 2 sessions of treatment. There were no significant systemic or local complications such as hematoma or ecchymosis that required special attention, nor were there any device-related problem. There is no statistic significance noted on the results of thickness of plantar fascia measured by ultrasonography.

Treatment of painful heels with extra-corporeal shock wave produced a high rate of success in pain relief and pressure tolerance, and negligible complications except local pain. (J Rehab Med Assoc ROC 2002; 30(3): 141 - 146)

Key words: plantar fasciitis, extracorporeal shock wave therapy, ultrasound, painful heel

INTRODUCTION

Plantar fasciitis is characterized by heel tenderness

of gradual onset, localized to the medial process of the calcaneal tuberosity and exacerbated by weight bearing. The most common site of heel pain is at the insertion of the densest plantar aponeurosis on the medial tubercle of

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the calcaneal tuberosity.^[1] Diagnosis is usually made on clinical grounds. Ultrasonography of the heel is useful in confirming the diagnosis, especially when alternative pathology such as fascia rupture is suspected.^[2,3] Conservative treatment is the treatment of choice. Many conservative modalities have had some success, including shoe inserts, orthotics, night splints, non-steroid anti-inflammatory drugs (NSAIDs), local steroid injection, physical therapy, and exercise programs.^[4-6]

Recently, extracorporeal shock wave therapy (ESWT) has been shown success in the alleviation of painful heels and other orthopedic conditions such as tennis elbow, calcifying tendinopathy of the shoulder, and nonunion fractures of the long bones.^[7-9] However, there is no uniform measurement to evaluate the effectiveness of ESWT. The purpose of this study is to evaluate the effectiveness of ESWT on chronic plantar fasciitis by subjective and objective measures such as pressure algometry and ultrasonography and to monitor the complication of ESWT.

MATERIALS AND METHODS

Patients were recruited between September 2000 and October 2001. Eligible patients had refractory painful heels that failed to respond to conservative treatment for at least 6 months. Conservative treatments included either a single modality or a combination of modalities, including NSAIDs, shoe inserts, orthotics, night splints, corticosteroid injection, physical therapy, heel exercise programs, and herbal medicine. The maximum thickness of the plantar fascia was measured on a longitudinal view of the heel by ultrasonography and should be over 5mm.

Patients were excluded if they had symptoms for less than 6 months, systemic or local infection, calcaneal fracture, diabetes mellitus, obstructive peripheral vascular disease, metabolic disease such as gout, malignancy, pregnant or less than 20 years old.

After the details of the procedures and the associated risks and complications of this therapy were fully discussed, all patients gave written informed consent. All current management should be ceased at least 2 weeks before ESWT.

Before ESWT started, all patients were arranged for

ultrasonography for the thickness of plantar fascia, pressure algometry for the limit of tolerable pressure of affected heel, and visual analog scale (VAS) for subjective intensity of pain. VAS is ranged from 0 to 10, with 0 indicating no pain and 10 indicating intractable pain.

The procedure was performed in an outpatient setting, with the patient in the supine position. Extracorporeal shock waves were generated using the Orthospec™ (Germany) generator. The location and depth of the treatment area were adjusted by the control guide, and surgical lubrication gel was applied to the contact area before treatment. Each patient was given 1,500 impulses of shock wave at level 5 (0.26 mJ/mm²) with frequency of 2 Hz to the affected heel. Vital sign and complaints about the heel were monitored throughout the course of treatment. Immediately after treatment, the affected heel was checked for ecchymosis, swelling, hematoma, etc., and patient was suggested not to take hot bath to the treated heel on the same day.

Two weeks after the first session of therapy, the patient was arranged the same examinations before the start of the 2nd session of therapy. The 2nd session of therapy used the same protocol as the 1st session.

Follow-up examination was scheduled at 2 weeks after the 2nd session. The same examinations including ultrasonography, pressure algometry, and subjective VAS were arranged. Data are presented as the mean ± standard deviation. Results were analyzed by paired t-test and Wilcoxon signed-ranks test, and statistical significance was set at a value of less than 0.05.

RESULTS

From September 2000 to October 2001, 40 patients were enrolled in this study. After the 1st session of treatment, 10 patients dropped out due to the intolerable pain during the course of treatment, 2 patients discontinued the treatment because of symptomatic relief, and loss of follow up of the other 2 patients. Twenty-six patients (11 men and 15 women) with an average age of 60.73 years (range, 42-76 years) had completed the total 2 sessions of treatment in this study. Thirteen had an affected right heel and 13 an affected left heel.

There were no cases of systemic or local complications such as hematoma or ecchymosis that required

Table 1. Comparison of results (for 26 patients before, 2wks after 1st session, and 2 wks after 2nd session) of extracorporeal shock wave therapy (ESWT) for plantar fasciitis.

Variable	Before	2wks after 1 st session	P value	2wks after 2 nd session	P value
VAS	5.92 ± 1.38	5.00 ± 1.38	0.001*	4.12 ± 1.61	0.001*
Pressure algometry (kg)	6.50 ± 2.34	8.39 ± 2.52	0.001†	10.08 ± 2.84	0.000†
Thickness of PF on ultrasonography (mm)	5.55 ± 0.87	5.69 ± 1.27	>0.05†	5.78 ± 1.41	>0.05†
Subjective improved		16(62 %)		22(85 %)	
Objective improved on pressure tolerance		18(69 %)		24(92 %)	
Less thickness of PF measured by ultrasonography.		11(42 %)		8(31 %)	

VAS= visual analog pain score. PF= plantar fascia. Data are mean ± standard deviation of the number of heels (%).

*Wilcoxon Signed Ranks Test. †Paired T test.

special attention, nor were there any device-related problems.

All of the result was showed at table 1. The average intensity of pain using the visual analog scale was 5.92 ± 1.38 before treatment, 5.00 ± 1.38 after the 1st session of treatment (P<0.05), and 4.12 ± 1.61 after the 2nd session of treatment (P<0.05). Sixteen of 26 heels (62%) showed subjective improvement after the first session of treatment, and 22 of 26 heels (85%) showed subjective improvement after completion of the total 2 sessions of treatment.

The average result of pressure algometry was 6.50 ± 2.34kg before treatment, 8.39 ± 2.52kg after the 1st session of treatment (P<0.05), and 10.08 ± 2.84kg after the 2nd session of treatment (P<0.05). Eighteen of 26 heels (69%) showed objective improvement in pressure tolerance of affected heel after the 1st session of treatment, and 24 of 26 heels (92%) showed objective improvement in pressure tolerance of affected heel after completion of the total 2 sessions of treatment.

The average thickness of affected plantar fascia was 5.55 ± 0.87mm before treatment, 5.69 ± 1.27mm after the 1st session of treatment (P=0.6), and 5.78 ± 1.41mm after the 2nd session of treatment (P=0.59). Eleven of 26 heels (42%) showed thinner plantar fascia (PF) of affected heel after the 1st session of treatment, but only 8 of 26 heels

(31%) showed thinner PF of affected heel after completion of the total 2 sessions of treatment.

DISCUSSION

Plantar fasciitis is among the most common disorders of the foot and ankle. The most frequent site of pain and inflammation at clinical presentation is the attachment of the plantar aponeurosis to the medial prominence of the calcaneal tuberosity; however, pain can occur anywhere along the structure.^[10] Repetitive trauma and stress have been implicated as causal factors of plantar fasciitis.^[11-15] Nonoperative modalities are the preferred form of management for most patients.^[16] The results from conservative treatment vary and there is no uniform opinion on the best method of treatment of painful heels.^[1]

The mechanism of shock wave therapy is still not well known. However, the effect of extracorporeal shock waves has been proven in the treatment of pseudoarthrosis with a 75% success rate, and a positive effect has been reported in tennis elbow, calcified tendonitis of the shoulder, and heel spurs.^[17,18]

Ultrasonographic examination of plantar fascia is easy and quick to perform. The means of population plantar fascia thickness is greater for people with plantar

fasciitis than for people without heel pain ($P < .0005$) and that the difference is clinically significant.^[19-21] Ultrasonography of the heel is useful in confirming the diagnosis, especially when alternative pathology such as fascia rupture is suspected.^[2,3] The ultrasonic appearance of the plantar fascia in plantar fasciitis indicated inflammatory changes. In contrast with bone scintigraphy and MRI, it is inexpensive, quick, widely available, and does not entail radiation exposure.

The early clinical results of our study were very encouraging, with 85% of heels achieving subjective improvement, and 92% of heels achieving objective improvement of pressure tolerance after 2 sessions of treatment. Compared to documented results arranged from 56% to 92%, the improved rate was relatively high.^[8,22-24] No systemic or local complications that required special attention or any device-related problems were noted during and after the therapy. However, intolerable pain during the shock wave therapy was noted diffusely, so that 10 of total 40 enrolled patients (25%) dropped out after the 1st session of treatment. On the other hand, there is no statistic significance noted on the results of thickness of plantar fascia measured by ultrasonography, possibly indicating no prognostic value of ultrasonography in ESWT.

CONCLUSION

Treatment of painful heels with extracorporeal shock wave produced a high rate of success in pain relief and pressure tolerance, and negligible complications. Pain-control during the therapy such as local anesthesia or NSAIDs should be considered to prevent intolerable pain. However, it's inconclusive that if short-termed change of thickness of plantar fascia noted by ultrasonography after shock wave therapy could be compatible with clinical outcome. Long-term follow up of the treated heels should be accomplished.

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體外震波於慢性足底筋膜炎之療效評估

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足底筋膜炎是常見的病症，傳統治療以保守性治療為主，然而治療常是漫長甚至令人沮喪的。因此尋找一個更有效且方便的治療方式是急需且有意義的。體外震波近年來已被應用於骨骼肌肉疾病；然而，體外震波於慢性足底筋膜炎之臨床療效，標準的治療處方包括震波強度及數目尚無定論。本研究即要評估治療的短期效果，並觀察有無副作用的產生。

本研究共收集了今年至本院就診的足底筋膜炎患者共四十名，然而十名患者因治療時之疼痛而退出，兩位患者於第一次治療後便有明顯改善而未再進行第二次治療及追蹤，另有兩名患者失去追蹤。因此，計有二十六名患者完成本研究之所有步驟，包含十一名男性和十五名女性，平均年齡 60.73 歲，符合有六個月以上的症狀，並排除疼痛由跟骨骨折或其他免疫風濕疾病、腫瘤、感染以及其他神經病變所造成。每位病患接受 Orthospec™ 體外震波機間隔兩週，共兩次的震波治療。每次施行震波 1500 下，治療強度約在 level 5 (0.26 mJ/mm²)，震波頻率每秒兩次。在接受第一次震波之前以及接受第一次震波之後的第二及第四周分別進行 Limb Sonography、Visual analogue scale 以及 Pressure Algometer 評估。

結果再以 Visual analogue scale 及 Pressure Algometer 等主要療效指標以 Paired-T Test 及 Wilcoxon signed-ranks Test 比較治療前、後之差異，皆有統計上的進步 (P<0.05)。以超音波追蹤足底筋膜炎厚度的變化，發現並無統計上的意義。期間除有少數治療後的酸痛外，並無明顯副作用。本研究顯示體外震波於慢性足底筋膜炎之臨床應用上為一安全而有效之新選擇，而超音波顯示之足底筋膜炎厚度並不足以反映臨床上症狀之改善。(中華復健醫誌 2002; 30(3): 141 - 146)

關鍵詞：足底筋膜炎(plantar fasciitis)，體外震波治療(extracorporeal shock wave therapy)，
超音波(ultrasound)，足跟痛(painful heel)