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Original Research

Clinical Outcomes After Extracorporeal Shock Wave Therapy for Chronic Plantar Fasciitis in a Predominantly Active Duty Population

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ABSTRACT

Chronic plantar fasciitis is a common cause of foot pain, with conservative treatment providing relief for most patients. However, because of the common occurrence of this pathology, this leaves many patients dissatisfied. The purpose of the present study was to determine the effectiveness of extracorporeal shock wave therapy (ESWT) to treat chronic plantar fasciitis (PF) in a largely active duty population. A review of 82 patients (115 heels) who had undergone ESWT for chronic PF was performed. Outcome data were obtained by patient telephone interviews. All ESWT was conducted at 24 kV for 2000 shocks. Of the 82 patients (115 heels), 76 (93%; 111 heels) agreed to participate. Their mean age was 42 ± 10 years, with 41 males (54%) and 35 females (46%). The mean follow-up period was 42 ± 22 months. Of the patients, 73.6% were active duty military personnel. The mean preoperative pain score of 7.8 ± 2 had improved to 2.5 ± 2 at the last follow-up visit ($p < .0001$). Active duty patients reported a mean improvement in pain of 4.8 ± 3 compared with 6.8 ± 3 in non-active duty patients ($p = .005$). Of the 76 patients, 75 (98%) underwent 1 ESWT session, and 1 (2%) requiring 2 sessions. Overall, 74% of patients rated the outcome of their procedure as either good or excellent, with 87% stating that ESWT was successful. Ten patients (18%) left the military because of continued foot pain, with 76% able to return to running. For patients with chronic PF, these results support the use of ESWT to relieve pain in >85% of patients, with a preponderance for better pain relief in patients who are not active duty military personnel.

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Heel pain due to plantar fasciitis (PF) is a common musculoskeletal complaint, accounting for ~1% of patient visits to orthopedic surgeons annually (1). Although a common ailment, the etiology is not well understood and is likely multifactorial. Risk factors include obesity, reduced ankle dorsiflexion, excessive foot pronation, pes planus, and overuse (2–5). Regardless of the risk factors involved, it is widely believed that the development of microtears at the calcaneal–fascial interface is what leads to degeneration and disorganization of the plantar fascia fibers (6,7). Although the term fasciitis implies inflammation, histologic examination has revealed both inflammatory and noninflammatory changes, suggesting that not all cases result from chronic inflammation (8,9).

Emphasis has been placed on conservative management for initial treatment, including rest, ice, nonsteroidal antiinflammatory drugs, stretching, orthotics, and corticosteroid injections, which have been shown to provide pain relief in ≤90% of patients (10). If after 6 to 12 months of conservative treatment, symptoms persist, extracorporeal shock wave therapy (ESWT) has been demonstrated to provide symptom relief without the risks of operative management (10–13). This modality has been introduced for chronic degenerative and inflammatory processes that involve a bone–tendon interface, inducing a healing response through hyperemia, neovascularization, and inhibition of the pain receptors (12).

Indications have been established for the use of ESWT, including Achilles tendonitis, calcific rotator cuff tendonitis, and chronic painful PF with or without a calcaneal spur (12). However, for patients with chronic PF, the utility of ESWT has proved controversial, with some studies indicating statistically significant, but not clinically relevant, improvements compared with placebo (14,15). The purpose of the present study was to contribute to the increasing body of data

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Table 1
A statistical description of the cohort

Variable	Value
Patients interviewed (heels)	76 (111)
Age (y)	
Mean ± standard deviation	42 ± 10
Range	18 to 62
Gender	
Male	41 (54)
Female	35 (46)
Follow-up duration (mo)	
Mean ± standard deviation	42 ± 22
Range	5 to 72
Active duty	56 (74)
Body mass index (kg/m^2) (mean ± standard deviation)	
Active duty	27.9 ± 4.3
Non–active duty	27.4 ± 6.3

Data presented as n (%), unless otherwise noted.

supporting the use of ESWT for patients with chronic PF in a largely physically demanding, active duty military population.

Patients and Methods

After approval from our institutional review board, we performed a search of our surgical scheduling system for patients who had undergone ESWT (using procedure codes) for PF from January 2010 to November 2015. Our initial search yielded 179 patients (259 heels) who had received ESWT. The search excluded patients who had undergone concomitant ESWT for other foot-related conditions (e.g., chronic Achilles tendonitis). To be included, all the patients had to have undergone an initial period of conservative management for ≥6 months before undergoing ESWT, including daily plantar fascia and Achilles stretching, heel icing, night splints, and heel cushions. The patients were routinely examined preoperatively before ESWT, and the location of maximal tenderness was marked on the heel skin. ESWT was targeted at the area of tenderness, using 24 kV for 2000 shocks, with the patient under conscious sedation and without the use of local anesthesia. Postoperatively, the patients were allowed full weightbearing in a regular shoe, with a gradual return to daily activities as tolerated. Patients were not allowed to run or participate in strenuous weightbearing exercise until 4 weeks postoperatively. In addition, we restricted the use of nonsteroidal antiinflammatory drugs and counseled against applying ice to the treatment area for the first 6 weeks after ESWT. Protocol development, participant recruitment, and outcomes collection was performed by 2 of us (P.F., I.S.). The report was prepared by 3 of us (R.P., L.K., T.E.). The patients in the present study underwent ESWT by 2 of us (T.E., S.S.).

After identification of our initial cohort, all preoperative demographic data were obtained from our electronic medical records, which are also used for patient surgical scheduling. An attempt was made to interview all 179 patients from the home telephone numbers available in our electronic medical records to obtain the postoperative outcomes data. The postoperative outcomes data included a current 11-point numeric rating scale (NRS), the Roles and Maudsley (R&M) score (16), whether the patient was able to run, whether the patient had left the military because of the heel pain, and whether the patient believed the ESWT had worked well to treat the pain. The R&M score has been used in previous studies reporting on the use of ESWT for chronic PF (12,17–19). The data were analyzed, with attention given to the data type and distribution, and the cohort was then described in statistical terms. Moreover, tests of the null hypothesis between the outcome measures were analyzed using paired Students t tests for parametric data and χ^2 tests for nonparametric data, with statistical significance defined at the 5% ($p \leq .05$) level.

Results

Of the 179 patients who met our inclusion criteria and were available for data collection and analysis, 82 (46%) were successfully interviewed by telephone after a minimum of 2 attempts. Of these 82 patients (119 heels), 5 (6%) declined to participate in the telephone survey and 1 (1%) had undergone subsequent plantar fasciotomy within 7 months of ESWT for continued symptoms. This left 76 patients (93%; 111 heels) available for analysis.

The mean age of the interviewed patients was 42 (range 18 to 62) years, with 41 males (54%) and 35 females (46%). The mean follow-up period was 42 (range 5 to 73) months. Of the 76 patients, 56 (74%) were on active duty military at the time of treatment (Table 1). Of the 76 patients, 75 underwent 1 ESWT session and 1 required 2 sessions. The mean body mass index of the patients on active duty military was 27.9 ± 4.3 kg/m^2 compared with 27.4 ± 6.3 kg/m^2 for non–active duty patients ($p = .715$). The mean preoperative 10-point categorical pain score was 7.8 ± 2, which had improved to 2.5 ± 2 at the last follow-up point, representing a 68% reduction in pain ($p < .0001$; Fig.). Using the R&M score, 56 patients (74%) rated their outcome as good or excellent, and 1 (1%) rated it as poor. Of the 20 patients not on active duty at treatment, 85% rated their outcome as good or excellent compared with 70% on active duty ($p = .242$; Table 2). The mean preoperative score for foot pain for patients on active duty at surgery was 7.6 ± 2 compared with 8.6 ± 1 for non–active duty patients ($p = .03$). The mean postoperative pain for active duty patients was 2.8 ± 2 (representing a 63% reduction in pain) compared with 1.8 ± 2 for non–active duty patients (79% pain reduction). This difference was not statistically significant ($p = .06$). The mean improvement in pain was significantly greater for the patients not on active duty at the time of ESWT; specifically, 6.8 ± 3 compared with 4.8 ± 3 for those on active duty ($p = .005$; Table 3). Of the 56 patients (74%) on active duty at ESWT,

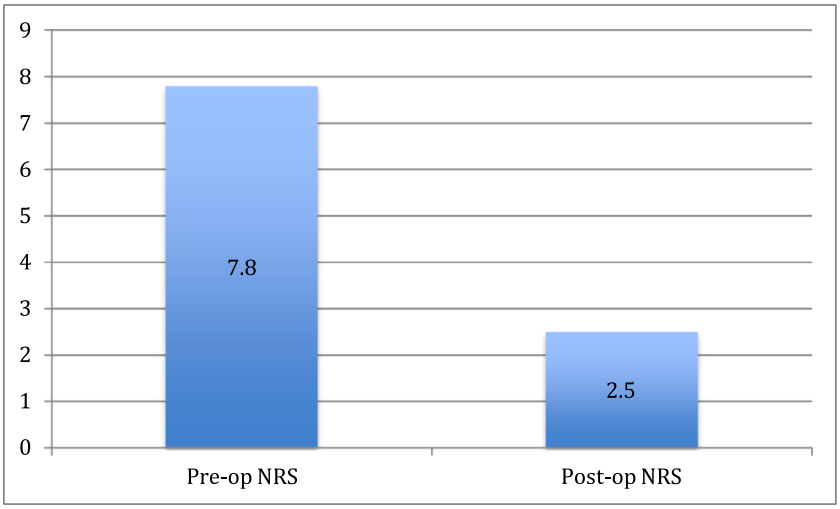

Fig. Comparison between preoperative (pre-op) and postoperative (post-op) numeric rating scale (NRS) ($p < .0001$).