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Original Research

Physical Examination Variables Predict Response to Conservative Treatment of Nonchronic Plantar Fasciitis: Secondary Analysis of a Randomized, Placebo-Controlled Footwear Study

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Abstract

Background: Plantar fasciitis is a common, disabling condition, and the prognosis of conservative treatment is difficult to predict.
Objective: To determine whether initial clinical findings could help predict patient response to conservative treatment that primarily consisted of supportive footwear and stretching.
Setting: Patients were recruited and seen at 2 outpatient podiatric clinics in the Chicago, Illinois, metropolitan area.
Patients: Seventy-seven patients with nonchronic plantar fasciitis were recruited. Patients were excluded if they had a heel injection in the previous 6 months or were currently using custom foot orthoses at the time of screening. Sixty-nine patients completed the final follow-up visit 3 months after receiving the footwear intervention.
Methods: Treatment failure was considered a $<$50% reduction in heel pain at 3 month follow-up. Logistic regression models evaluated the possible association between more than 30 clinical and physical examination findings prospectively assessed at enrollment, and treatment response.
Results: Inability to dorsiflex the ankle past -5° (odds ratio [OR] 3.9, $P = .024$), nonsevere ($\leq$7 on ordinal scale) first-step pain (OR 3.8, $P = .021$), and heel valgus in relaxed stance (OR 4.0, $P = .014$) each predicted treatment failure in multivariable analysis (receiver operating characteristic area under the curve = .769). Limited ankle dorsiflexion also correlated with greater heel pain severity at initial presentation ($r = -0.312$, $P = .006$).
Conclusions: Patients with severe ankle equinus were nearly 4 times more likely to experience a favorable response to treatment centered on home Achilles tendon stretching and supportive therapy. Thus, earlier use of more advanced therapies may be most appropriate in those presenting without severe ankle equinus or without severe first step pain. The findings from our study may not be clinically intuitive because patients with less severe equinus and less severe pain at presentation did worse with conservative care.

Introduction

Plantar fasciitis is the most common cause of plantar heel pain [1,2] and is an ongoing recognized economic burden. It is commonly defined as an overload injury of the proximal plantar fascia at the infracalcaneal insertion. Some studies suggest plantar fasciitis is more common in athletes [3] and those who are obese [4]. Others report it affects approximately 10% of both the general and running populations [1]. In the United States, it accounts for nearly 1 million patient visits each year [5], and direct costs associated with prescription therapy and outpatient visits alone exceed 284 million dollars annually [6]. Plantar fasciitis has a significant negative impact on general health-related quality of life that is independent of body mass index [7].

The primary etiology of plantar fasciitis is unknown, and there is not a large body of evidence supporting one treatment over another. In the vast majority of cases, symptoms are resolved within a year of onset, regardless of treatment type [8]. There are multiple treatment options, available including stretching, foot orthoses, corticosteroid injections, night splints, extracorporeal shock wave therapy, and surgery [9]; however, it is

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generally accepted that fewer than 10% of patients will require surgery [10]. Considerable research exists on the effectiveness of various treatments [11-15] and on factors associated with the development of plantar fasciitis [16-19]. Evidence for factors predictive of a positive or negative outcome with the use of supportive foot therapy and patient-directed interventions for plantar fasciitis, however, is absent from the current literature.

With the more recent paradigm shift that is starting in the United States health care system that supports value-based payment dependent on patient outcomes, it is imperative this condition be treated in a more efficient and effective manner. The primary aim of this study was to determine whether clinical findings observed during initial presentation can be predictive of treatment response in patients receiving conservative, supportive therapy for nonchronic plantar fasciitis. A secondary aim was to determine which, if any, baseline observations are associated with degree of functional impairment and/or heel pain severity.

Materials and Methods

Participants

This was a secondary data analysis of 77 subjects who participated in a randomized controlled trial (ClinicalTrials.gov Identifier NCT00765843) to evaluate the efficacy of 3 different foot orthoses conditions for the treatment of proximal plantar fasciitis [20]. All participants were ambulatory adult men and women with nonchronic heel pain (ie, symptoms for less than 12 months). All subjects were recruited from 2 podiatry specialty clinics located in the greater Chicago metropolitan area. The data analysis received an exempt status determination from the Institutional Review Board.

All included patients had pain at the plantar fascial attachment to calcaneal tubercle and/or pain distal from the tubercle along the plantar fascial band with typical poststatic dyskinesia or pain with activity after rest. Patient history, physical examination, plain radiograph assessment, and diagnostic ultrasound were used to rule out other etiologies of heel pain, including proximal or local nerve entrapment, arthritis, bone cyst or tumor, or stress fracture.

Patients with a previous heel injection within the past 6 months or who were currently using custom foot orthoses were excluded. Patients with any of the following pathologies also were excluded: proximal musculoskeletal pathology (eg, knee or hip arthritis, sciatica secondary to back pathology, significant limb length discrepancy), use of gait assistive devices (eg, crutches, canes, walkers), inability to wear supportive closed toed shoes, or lack of range motion at the first metatarsophalangeal or subtalar joints.

Overall Study Design

Details regarding the full randomized controlled trial can be found in a previous publication [20]. To summarize, 77 patients met the eligibility criteria and agreed to participate. Patients were randomized at their screening visit into 1 of 3 treatment groups: custom foot orthoses, prefabricated orthoses, or sham orthoses. Participants and investigators were blinded to group allocation. Blinding was possible by using the same 3-mm neoprene top cover on each type of orthoses and providing each subject with standardized shoes (Brooks Dyad, Brooks Sports Inc., Bothell WA) in which the orthoses were to be worn.

All participants received a standardized baseline assessment, including a comprehensive lower extremity biomechanical examination during the screening/enrollment visit from a single examiner. The same single examiner also measured the shoes, casted the patient, fit, and dispensed the orthoses and shoes. Treatment also was instituted at that time. Participants were evaluated again at 1 and 3 months for follow-up. Those patients reporting less than 50% improvement in their heel pain symptoms (using an average of their ordinal pain scale first step and end-of-day pain scores) at 3-month follow-up were classified as having had an unfavorable treatment response, whereas those reporting greater than or equal to 50% improvement were classified as having had a favorable treatment response.

Assessments

Each participant completed an ordinal pain scale (1-10) first step pain, end-of-day pain, and Foot Function Index-Revised (FFI-R) surveys regarding their study foot at enrollment. These scales are recognized as reliable and valid outcomes measures [11,21,22]. Patients completed these instruments in a private examination room during the visit. Information regarding other potential covariates including, but not limited to, age, gender, duration of symptoms, height, weight, laterality, foot type, duration of symptoms, and coexisting medical conditions also was recorded (Table 2).

Additionally, a standardized lower extremity biomechanical examination was performed by a single podiatric physician with greater than 20 years of experience (B.J.). The biomechanical examination measurements were performed via the techniques described (B.J.) [23]. The measurements were performed with a standard goniometer, with all measurements being done off-weight-bearing except the stance positions (relaxed and neutral calcaneal stance positions and tibial influence). Limb length was measured off-weight-bearing with a standard measuring tape, and the physician measured the anterior superior iliac spine to the medial malleolus and the umbilicus to the medial malleolus.

In addition, visual gait analysis was performed to facilitate identification of asymmetries consistent with