

Effect of Foot Orthoses as Treatment for Plantar Fasciitis or Heel Pain

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Clinical Scenario: Plantar fasciitis is a debilitating and painful problem present in the general population. It most often presents with moderate to severe pain in the proximal inferior heel region and is most commonly associated with repeated trauma to the plantar fascia. Plantar fasciitis, itself, is an injury at the site of attachment at the medial tubercle of the calcaneus, often due to excessive and repetitive traction. Plantar fasciitis is the most common cause of heel pain and is estimated to affect 2 million people in the United States alone.

Focused Clinical Question: For adults suffering from plantar fasciitis, are foot orthoses a viable treatment option to reduce pain?

Keywords: orthotics, temporary custom foot orthotic, conservative therapy, prefabricated orthotic

Clinical Scenario

Plantar fasciitis is a debilitating and painful problem present in the general population. It most often presents with moderate to severe pain in the proximal inferior heel region and is most commonly associated with repeated trauma to the plantar fascia. Plantar fasciitis, itself, is an injury at the site of attachment at the medial tubercle of the calcaneus, often due to excessive and repetitive traction. Plantar fasciitis is the most common cause of heel pain and is estimated to affect 2 million people in the United States alone.

Focused Clinical Question

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Summary of Search, “Best Evidence” Appraised, and Key Findings

- The literature search yielded 4 total studies meeting the inclusion and exclusion criteria: 1 randomly controlled trial, 1 retrospective cohort study, 1 prospective repeated-measures study, and 1 prospective cohort study.
- One randomly controlled trial found a 95% improvement in symptoms with a silicone insert 8 weeks posttreatment.²

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- The same randomly controlled trial showed that a prefabricated insert was better for reducing symptoms of plantar fasciitis than a custom-made orthotic insert ($P = .0074$).²
- A retrospective cohort study found a significant ($P \leq .0001$) decrease in symptoms after 5 weeks of using a prefabricated heel pad along with a custom-made orthotic device.³
- One prospective repeated-measures study demonstrated a 75% reduction in disability ratings after 12 to 17 days use of a custom semirigid orthotic.⁴
- A prospective cohort study found that the use of temporary custom foot orthotics followed by a stretching protocol significantly ($P \leq .001$) increased foot and ankle function in the short term and up to 12 weeks.⁵

Clinical Bottom Line

Custom orthoses are a clinically effective tool to decrease the pain associated with plantar fasciitis. Evidence has shown that this benefit can last up to 12 weeks. More research must be conducted to determine the effect of long-term use of custom orthotics on pain measures. The athletic population also needs more research investigating the effectiveness of custom orthoses.

Search Strategy

Terms Used to Guide Search Strategy

- Patient/Client Group: plantar fasciitis or heel pain
- Intervention/Assessment: Orthoses or inserts or prefabricated inserts or custom orthotics

- Comparison: none
- Outcome: pain and/or functional ability

Sources of Evidence Searched

- PubMed
- CINAHL
- SPORTDiscus
- The Cochrane Library
- MEDLINE
- PEDro Database

Inclusion and Exclusion Criteria

Inclusion Criteria

- Subjects diagnosed with plantar fasciitis
- Symptoms duration of at least 6 months
- Use of some form of custom orthoses or prefabricated inserts
- Use of some pain scale (verbal or Likert) as outcome measures
- At least 2 weeks of intervention treatment

Exclusion Criteria

- Use of other therapeutic modality such as ultrasound, electroshock, etc
- Undiagnosed plantar fasciitis
- No pain scale (verbal or Likert), questionnaire only
- Acute heel pain (symptoms \leq 6 mo)
- Case-study, case-control, expert opinion, or case-series designs

Results of Search

A total of 4 relevant studies were located and categorized as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 2011).

Best Evidence

The studies identified in Table 2 were classified as having the “best evidence.” They were selected based on their

high level of evidence and because of their relevance to the clinical question. The specific clinical application of orthotics was also the main intervention of all the included studies.

Implications for Practice, Education, and Future Research

The studies included in this critically appraised topic all addressed the use of orthotics to treat plantar fasciitis. The main outcome measure examined was pain. All 4 critically appraised articles demonstrated that orthotics were a viable treatment option for plantar fasciitis, and all reduced pain significantly. In the controlled study, patients who used a prefabricated insert had a significant reduction in pain compared with a stretching-only group.² Concurrently, a separate study found that the use of orthoses followed by a stretching protocol reduced all subjects’ pain at junctures of measurement (2, 4, 6, 8 wk). The 2 cohort studies also showed a significant reduction in pain when using custom orthotics.^{3,4} One cohort study specifically looked at pain while walking, a common chief complaint with plantar fasciitis.⁴ With pain being the most debilitating symptom of plantar fasciitis, these studies all show a clinical application for using orthotics to treat pain in patients with plantar fasciitis. It is worth noting that some, not all, of the literature reviewed also included quality-of-life questionnaires such as the Functional Foot Index scale. These scales use a series of questions to determine things other than pain, such as disability or function levels. Most of these studies also saw an improvement in these questionnaires. However, since different questionnaires are often used, we chose not to include these results, as they cannot be generalized across articles, unlike a simple visual analogue scale or Likert scale.

Orthotics can be relatively inexpensive compared with many modalities commonly used to treat plantar fasciitis. Orthotics reduce symptoms, theoretically, by reducing and absorbing shock that is normally absorbed by the already taxed plantar fascia. Another theory behind some orthotic devices is to attempt to correct postural deviations or muscle deficiencies that may predispose one to get plantar fasciitis. A reduction in pain can also help ward off extremely costly surgical treatments. In all the studies, the orthotics were made in house and were often made after attending a class or workshop to teach

Table 1 Summary of Study Designs of Articles Retrieved

Level of evidence	Study design	Number located	Reference
2	Randomized controlled trial	1	Pfeffer et al ²
3	Cohort study	2	Seligman et al ³ Gross et al ⁴
3	Nonrandomized controlled cohort study or follow-up study	1	Drake et al ⁵

Table 2 Characteristics of Included Studies

	Pfeffer et al²	Seligman et al³	Gross et al⁴	Drake et al⁵
Study design	Randomly controlled trial	Retrospective cohort study	Cohort study	Prospective cohort study
Subjects	<p>236 total patients (160 women, 76 men). Fifteen centers for orthopedic foot and ankle treatment centers participated. Subjects were 16 y or older. Most patients reported pain of 6 mo or less.</p> <p>Those with any systemic, significant musculoskeletal complaints, sciatica, or local nerve entrapment were excluded. No subjects had had previous treatment of the injury.</p>	<p>10 total subjects from a hand and foot orthotic clinic in Ontario, Canada. Data from these subjects were included in the analysis if they had a diagnosis of unilateral or bilateral heel pain associated with plantar fasciitis and if before and after orthotic-use data were available on the parameter of interest.</p> <p>Subjects were excluded if they were nonambulatory, noncommunicative, or unable to complete the interviewer-administered questionnaire and/or had spasticity due to a neurologic disorder. Five of the 10 subjects had also tried other treatment options without relief.</p>	<p>15 total subjects (8 men and 7 women). Subjects were 18 y or older and reported having medial-arch or heel pain for a period of at least 1 mo before participation in the study. An additional inclusion criterion was tenderness to palpation along the posteromedial aspect of the longitudinal arch or over the medial calcaneal tubercle.</p> <p>Subjects were excluded if they reported any other lower extremity injury during the previous 6 mo; receiving a plantar steroid injection within the previous 3 mo; use of nonsteroidal anti-inflammatory medications within the previous 1 wk; use of custom foot orthotics previously; any other painful foot condition such as bunion, corn, or ingrown toenail; or any other lower extremity neuromuscular condition that affected activities of daily living.</p>	<p>15 subjects. Subjects reported heel pain and first-step pain in the morning for at least 12 wk. Inclusion criteria included being 18 y older, symptom duration of longer than 4 wk. Subjects also had to have 2 out of the following 3 symptoms: symptom reproduction with palpation of the proximal plantar fascia insertion or midsubstance of the plantar fascia, positive Windlass test, or first-step pain after period of inactivity.</p> <p>Participants were excluded if they had symptoms consistent with lumbar radiculitis, radiculopathy, or myelopathy; a history of foot or ankle fracture, with or without the presence of hardware from an open-reduction internal fixation; known or suspected pregnancy; systemic rheumatic disease; or were undergoing litigation for any medical condition or had a positive sign or symptom for tarsal tunnel syndrome.</p>

Intervention investigated	Control groups for this study were those assigned to the Achilles and plantar-fascia stretching-only group. Subjects were told to do the stretching approximately 10 min twice a day. The experimental groups were assigned to 1 of 4 orthotic devices including a silicone heel pad, a felt insert, a rubber heel cup, and a custom-made polypropylene neutral orthosis. The participants wore the devices for activities of daily living at home and were instructed not to drastically alter the time they wore their shoes from a normal day.	Subject data were collected retrospectively from a clinic. Each subject wore both heel pads and custom-fit orthotics for 5 and a half weeks. All patients then reported their pain verbally or with a Likert-type scale. Pain was ranked from 1 to 10. These scores were then compared with the scores given on the subjects/first visit to the clinic.	Subjects were asked to complete the Foot Function Index questionnaire followed by walking 100 m at a self-selected speed. Their times were recorded and subjects then completed a visual analogue scale (for pain). Bilateral custom semirigid foot orthotics were made for each subject. Subjects were told to wear the orthotics as much as possible for the next 12–17 d during waking hours. Each subject kept a daily log of wear time. Subjects then returned 12–17 d later to complete the pain and disability section of the Foot Function Index. Participants then completed the timed 100-m walk again followed by another visual analogue pain scale. They were then contacted 2–6 mo later to assess whether or not they still used their orthotics.	Bilateral custom semirigid foot orthotics were made for each subject. Subjects were told to wear the orthotics as much as possible for the next 12–17 d during waking hours.
Outcome measures	<p><i>Primary measure:</i> Foot Function Index</p> <p><i>Secondary measure:</i> Foot Function Index pain subset questions</p>	<p><i>Primary measure:</i> pain at time of initial visit vs pain after 5 wk of heel-pad and orthotic use</p>	<p><i>Primary measure:</i> 10-cm visual analogue scale</p> <p><i>Secondary measure:</i> Foot Function Index questionnaire (pain and disability subsections)</p> <p><i>Tertiary measure:</i> 100-m-walk times</p>	<p><i>Primary measures:</i> First-step heel pain via numeric pain-rating scale and Foot and Ankle Ability Measure activities of daily living subscale.</p> <p><i>Secondary measures:</i> Foot and Ankle Ability Measure sports subscale and the global rating of change score.</p>

(continued)

Table 2 (continued)

	Pfeffer et al ²	Seligman et al ³	Gross et al ⁴	Drake et al ⁵
Main findings	Analysis of pain scores revealed improvements in all groups that are demonstrated by a negative mean change score during the follow-up questionnaire. Patients with higher overall pain in the initial questionnaire improved more ($P = .0001$). Those with longer duration of pain improved the least ($P = .010$). Controlling for these factors caused the difference between groups to parallel the findings with the response rates more closely, this being that the prefabricated inserts showed more improvement than custom orthoses. None of the treatment groups produced a statistically significant difference in pretreatment and post-treatment pain scores; however, all groups did lower their mean pain scores in the posttreatment questionnaire.	Preorthotic scores were recorded at the initial visit, and postorthotic scores were recorded at the follow-up visit. Higher scores indicated worse pain. At the initial visit, the mean score was 5.70 ± 1.95 of 10 (range 2.0–9.0). Scores recorded an average of 5 wk after using the customized orthotic were 1.85 ± 1.13 (range 1.0–4.5). The mean difference in scores over the 5-wk period was 4.17 ± 1.92 (range 1.5–6.5). All subjects ranked their pain as being less after using the orthotic, and <i>t</i> -test analysis indicated a highly significant difference in pre-post scores ($t = 6.22$; 95% CI, 2.45–5.25; $P \leq .0001$).	Preorthotic 100-m-walk times (mean = 81.2 ± 15.3 s) were not significantly different ($t = 0.39$, $P = .70$) from postorthotic walk times (mean = 80.6 ± 13.8 s). Preorthotic pain ratings for the 100-m walk (mean = 3.0 ± 1.7) were significantly greater ($t = 1$, $P \leq .005$) than postorthotic pain ratings (mean = 0.7 ± 0.7). In addition, only 1 subject (6%) had a postorthotic 100-m-walk pain rating that was greater than the preorthotic value (a 2-mm difference). The percentage reduction in pain subsection scores after the intervention was 66%, and the percentage reduction in disability-subsection scores was 75%. Wilcoxon matched-pairs signed-ranks test results indicated that postorthotic values were significantly less ($t = 0$, $P \leq .005$) than preorthotic values for both subsections of the Foot Function Index. All subjects had postorthotic Foot Function Index scores that were less than preorthotic values for both subsections of this instrument.	Repeated-measures ANOVAs revealed statistically significant changes at all 3 follow-up times compared with baseline for all 3 primary outcomes (NPRS, $P < .001$; FAAM-A, $P = .001$; FAAM-S, $P < .001$). The mean GRC scores at 2, 4, and 12 wk were 4.4, 4.5, and 4.2, respectively. No participants reported adverse effects from wearing the total-contact foot orthotics, and all participants completed the study at 12 wk.
Level of evidence	2	3	3	3
Validity score	5/10 in the PEDro database	N/A	N/A	N/A

<p>Conclusions</p>	<p>This article shows that Achilles and plantar-fascia stretching are effective for reducing mean pain scores in patients with proximal heel pain/ plantar fasciitis. The addition of an orthotic device may also decrease these scores even more. Prefabricated devices were shown to be more effective than custom devices but not to a statistically significant level. This was attributed by the author as potentially being an effect of the type of material used in the orthotics (more cushioning material vs less). The study also showed that subjects with a longer reported duration of symptoms had less of a decrease in pain scores than those with short duration of symptoms ($P = .010$). It was also found that those with a higher initial pain score on the questionnaire had the largest decrease in pain scores at the 8-wk follow-up ($P = .0001$). Overall, this article suggests that the use of a prefabricated orthotic along with Achilles and plantar-fascia stretching may decrease overall pain in an 8-wk period.</p>	<p>This study, though of poor design, showed strong significance ($P \leq .0001$) in decreasing pain scores with the use of a custom heel-pad and orthotics in elderly patients after a 5-wk time period. Although the study was done in older patients, the strong significance could translate to a normal population. Another study investigating this is warranted, along with a better study design. This article suggests that using the custom heel-pad and orthotic devices is a useful intervention for the treatment of heel pain associated with plantar fasciitis.</p>	<p>This study, though of poor design, showed statistical significance between preintervention and postintervention scores of the Functional Foot Index questionnaire and its subsections. The postintervention measurements were significantly lower ($P = .005$) than the preintervention scores. This study could advocate for the use of custom orthotics to treat symptoms of plantar fasciitis in patients. One strength of the study is the duration of symptoms that most subjects had entering the study (at least 1 mo); this shows that the orthotics could be responsible for the reduction of symptoms and disability from a long-standing occurrence. Future research must include stronger study designs in a prospective fashion. In addition, the long-term effects of these custom orthotics need to be investigated.</p>	<p>This study is of relatively poor design and did not control well for confounding variables. The study was of prospective design and otherwise had good methodology. Because of the nonrandomized nature of the study and the lack of a control group, the authors are unable to state that the decrease in symptoms is due solely to the total-contact foot orthotic or the stretching. However, based on the significant results ($P \leq .001$) it can be determined that the orthotics and stretching program more than likely assisted with the decrease in symptoms. Subjects were also verbally instructed to try not to alter their current weight-bearing activity habits. All subjects showed decreases in the outcome measurements and reported no adverse effects of the total-contact foot orthotics. This puts this intervention in a relatively low risk category as far as negative outcomes are concerned.</p>
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Abbreviations: NPRS indicates numeric pain-rating scale; FAAM-A, Foot and Ankle Ability Measure; FAAM-S, Foot and Ankle Ability Measure Sports Subscale; GRC, Global Rating of Change Score.

clinicians how to make the orthotic devices. This makes orthotics time efficient and easy to distribute. There are a variety of orthosis types available in a variety of price ranges, as well. However, there are a few limitations of this treatment. For one, pain was reduced in all patients but was not completely resolved. Disability and functional questionnaires did show improvement along with the diminished pain but did not reflect complete resolution of symptoms. As inexpensive as orthotics can be, they may still be out of the financial range of some patients or clinics. Future research needs to be conducted looking at the use of orthotics during athletic activity. The included studies did not specify the types of activities performed while the subjects were wearing the orthotics. Although theoretically the effects of the orthotics should not change with different activities, it cannot be stated for certain that athletes would receive the same benefits as nonathletes. Research also needs to be done on the long-term effects of wearing the orthotics on pain associated with plantar fasciitis. Future research should also examine the treatment techniques employed to achieve a complete resolution of symptoms.

References

1. Stuber K, Kristmanson K. Conservative therapy for plantar fasciitis: a narrative review of randomized controlled trials. *J Can Chiropr Assoc.* 2006;50(2):118–133.
2. Pfeffer G, Bacchetti P, Deland J, et al. Comparison of custom and prefabricated orthoses in the initial treatment of proximal plantar fasciitis. *Foot Ankle Int.* 1999;20(4):214–221.
3. Seligman D, Dawson D. Customized heel pads and soft orthotics to treat heel pain and plantar fasciitis. *Arch Phys Med Rehabil.* 2003;84(10):1564–1567.
4. Gross M, Byers J, Krafft J, Lackey E, Melton K. The impact of custom semirigid foot orthotics on pain and disability for individuals with plantar fasciitis. *J Orthop Sports Phys Ther.* 2002;32(4):149–157.
5. Drake M, Bittenbender C, Boyles R. The short-term effects of treating plantar fasciitis with a temporary custom foot orthosis and stretching. *J Orthop Sports Phys Ther.* 2011;41(4):221–231.