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ORIGINAL ARTICLE

A comparison of shoe inserts in relieving mechanical heel pain

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SUMMARY. A longitudinal controlled study was undertaken to evaluate the effectiveness of generic heel pads and functional foot orthotic devices in relieving symptoms of heel spur syndrome. A random sample of 60 patients was selected for the study. An outcome study was administered before and after 3 months of treatment. All results recorded were statistically significant ($P<0.05$). Both groups of patients demonstrated a reduction in duration and severity of symptoms post-treatment. Patients receiving functional foot orthotic devices made from a standardized process obtained a better outcome on all measures.

INTRODUCTION

Plantar heel pain is a common pedal problem and in most cases is due to abnormal foot mechanics.[1,2] Heel spur syndrome is a term that is frequently used to describe mechanically induced plantar heel pain. Symptoms typically include an insidious onset of well-localized, non-radiating plantar heel pain, usually medial, worse after periods of inactivity and aggravated by prolonged walking and/or standing. Despite pain the patient is usually still able to bear weight on the heel.[3–6]

The most consistent finding on physical examination is localized tenderness. Radiographs are unremarkable and a well-defined plantar spur is thought to be a normal variant.[7] The diagnosis is based upon clinical findings rather than radiographic or other diagnostic studies.[8]

Most patients respond to conservative treatment[9–15] which may include local corticosteroid injections, NSAIDs, physical medicine, night splints, below-knee casts, taping and foot orthotic devices. Shoe inserts may range from inexpensive, over-the-counter heel pads to expensive, custom-made functional devices. Lynch found that functional foot orthotic devices were more effective in relieving mechanically induced heel pain than other conservative treatments.[12]

A longitudinal, randomized, controlled study was undertaken to evaluate the effectiveness of generic heel pads and functional foot orthotic devices. In addition, the authors were interested in evaluating the utilization of adjunctive therapies in both groups.

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METHODS AND MATERIALS

Sixty subjects were recruited and followed over at least a 3 month period of time. Volunteers were recruited into the study through public service announcements placed with local radio stations and notices placed in facilities within a 5 mile radius of the Ohio College of Podiatric Medicine. The subjects were required to meet clinical criteria for heel spur syndrome and were excluded if there was a history of malignancy, pregnancy, inflammatory arthritis, prior heel spur surgery or trauma. Women and men, in either group, were excluded if they wore, on a consistent basis, shoes that were not compatible with functional foot orthotic devices (FFODs). A prior history of heel pain or treatment was not an exclusion from the study. Initial screening was made by telephone and an initial appointment was made with the senior author who, after verifying eligibility, randomly assigned subjects to one of two groups. Prior to the study, all subjects signed an informed consent. Lateral radiographs were obtained on all subjects prior to treatment but were unremarkable.

No patients were excluded because of abnormal radiographic findings. Prior to treatment, all patients completed an outcome study with the senior author and they did this again, at least 3 months post-treatment with either the junior author or staff secretary. Patients were informed that at any time during the study, if they chose, they would be provided with adjunctive therapy to include NSAIDs, local steroid injections or ultrasound.

All patients requesting NSAIDs received DayPro®/1200 mg every day until the heel pain diminished, or until side-effects occurred. Patients requesting local steroid injections received a single injection of 0.4 cc of Celestone Soluspan®. Patients requesting ultrasound therapy received 1.5 watts/cm^2

Table 1 Characteristics of subjects

	Over-the-counter heel pads	Functional foot orthotic devices
Total patients	30	25
Sex: male	7	11
female	23	14
Average age (in years)	46	44
Average weight (in pounds)	183	204
Average duration of symptoms (in months)	13	12

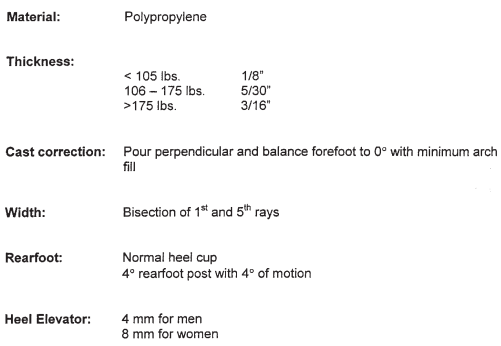

Fig. 1 Functional foot orthotic prescription.

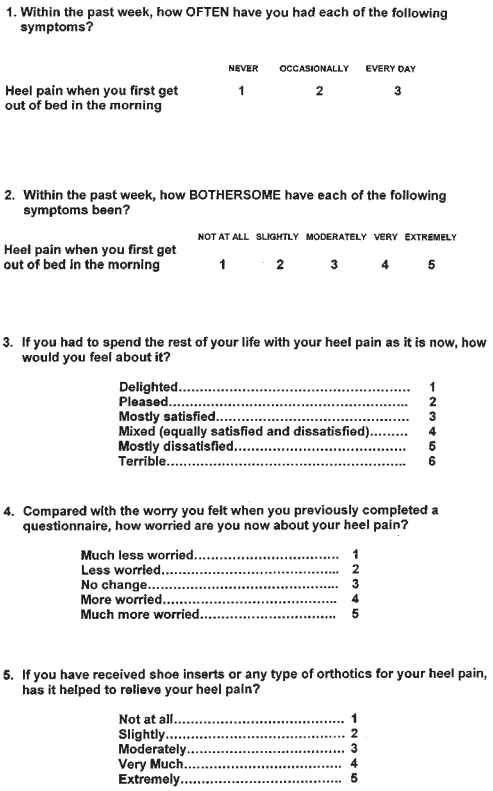

Fig. 2 Outcome measures.

for 4 min twice weekly for a period of 3 weeks. Active stretching exercises for the plantar fascia were demonstrated and recommended to all patients.

Patients selected for heel pads were given a pair of Dr Fabricant's Sports Heel®, 1/4 inch thick urethane heel pads with an oblique aperture positioned to take pressure off the medial tubercle.

Patients selected for functional foot orthotic devices had plaster impressions of both feet with the patient in a supine, non-weight-bearing position with the subtalar joint neutral and midtarsal joints pronated. The casts were then sent to Burns International®, an orthotic laboratory, where the same technician made the orthosis using a standardized prescription (Fig. 1). Both groups were instructed to wear their inserts continuously in all shoes. All of the data presented were analyzed using SPSS®. A Mann–Whitney rank sum test was used to analyze the unpaired data for statistical significance. Results were significant at $P<0.05$. A Pierson correlation coefficient was calculated for body weight and outcome measures and was statistically significant at $P<0.05$.

RESULTS

A total of 60 patients were enrolled in the study and randomly assigned to one of two groups. A total of 26 patients were enrolled in the functional foot orthotic group and 34 patients were enrolled in the heel pad group. Five patients were lost to follow-up during the study, leaving a sample of 25 patients receiving functional foot orthotic devices and 30 patients receiving heel pads (Table 1). There were no statistical differences ($P<0.05$) between characteristics listed in Table 1 for the two groups, except for body weight ($P = 0.04$) (Table 2). Patients receiving functional foot orthotic devices weighed more (19 lb) than patients receiving heel pads. Prior to the study, patients were asked to rank the severity and frequency of their morning heel pain (Fig. 2); there was no statistically significant difference between the two groups before treatment (Table 2). Patients receiving the heel pads used adjunctive therapies during the course of the study, specifically non-steroidal anti-inflammatories, more frequently than patients receiving functional foot orthotic devices (Table 3). The outcome measures used to assess the effectiveness of the treatment are given in Figure 2. A comparison of the outcome measure (Table 4) revealed that patients receiving functional foot orthotic devices reported a better outcome on all measures than patients

Table 2 Statistical analysis of subjects

	2-tailed P
Sex	0.11
Duration	0.96
Age	0.17
Weight	0.04
A.M. Heel pain duration (prior)	0.33
A.M. heel pain severity (prior)	0.45

Table 3 Number of patients requesting adjunctive therapy

	Over-the-counter heel pads	Functional foot orthotic devices
NSAIDs	18	5
Local steroid injection	7	8
Ultrasound	2	0

Table 4 Analysis of outcome measures

Outcome	Insert	Median	Interquartile range (25%–75%)	2-tailed *P*
A.M. pain duration	Pads	3	2–3	0.009
	FFOD	2	1–2	
A.M. pain severity	Pads	2.5	2–4	0.042
	FFOD	2	1–3	
Pain for rest of life	Pads	5	2.75–6	0.009
	FFOD	3	2–4	
Worry	Pads	2	1–3	0.003
	FFOD	1	1–2	
Relief	Pads	3	2–4	0.020
	FFOD	4	3–5	

Table 5 Correlation between body weight and outcomes

	r	*P*
1. Duration of heel pain prior	–0.14	0.308
2. Severity of heel pain prior	–0.26	0.057
3. Life with pain	–0.29	0.034
4. Worry about pain	–0.34	0.011
5. Relief	0.19	0.161

receiving heel pads. All of the results were statistically significant at less than 0.05 (Table 4).

A correlation coefficient was calculated between body weight and outcome measures (Table 5). Statistically significant results ($P<0.05$) were obtained for questions 3 and 4 of the outcome measures (Table 5). A low to moderate negative correlation was obtained for these measures.

DISCUSSION

Treatment of heel spur syndrome with over-the-counter heel pads requires little skill, is relatively inexpensive and may not even require the assistance of a health-care professional. The basis for this type of accommodative therapy is well grounded when one considers ground reaction forces at heel contact.[16] The structure of the heel and the function of the hindfoot are well suited to disperse peak ground reaction forces at contact in the normal functioning foot. It is thought that repetitive forces during ambulation produce heel spur syndrome in patients with abnormal function or structure of the hindfoot.[18] Shoe inserts of urethane foam have been shown to be effective shock absorbers.[16] Viscoelastic heel inserts[19] and PPT insoles with magnetic foil[20] are other examples of shock-absorbing inserts shown to be effective in relieving mechanically induced heel pain. The authors failed to find any randomized controlled studies that compared the effectiveness of different heel pads in relieving the symptoms of mechanically induced heel pain. A different choice of heel pad may have affected the results of the study.

Heel spur syndrome is often treated by custom foot orthotic devices.[1] Functional foot orthotic devices, a type of custom foot orthotic device, attempt to control hindfoot motion about a pre-determined position. Most commonly, a functional foot orthotic device strives to control motion of the hindfoot about a neutral subtalar position and a pronated midtarsal position prior to heel off in an attempt to restore normal peritalar function. Patients with heel spur syndrome are thought to have subtalar function that is either too pronated or too supinated during stance. In addition, the longitudinal midtarsal joint in heel spur syndrome patients is thought to be maintained in a supinated position during the latter part of midstance as a result of ground reaction forces occurring because of compensation for abnormal hindfoot function.[11]

The first step in prescribing a functional foot orthotic device is to perform a biomechanical examination to determine the apex of foot imbalance and the motion about major hindfoot articulations. Prognosis for control is a function of these factors.[21] During the study, there was no attempt made to exclude any type of mechanical imbalance or any type of planal dominance. The next step is to obtain a representative impression of the foot from which the functional foot orthotic device is to be made, which was done by the method of Root and Weed.[22] Once the negative is received at the lab, there are different cast corrections that can be utilized by the lab.[23,24] We chose to pour the positive cast perpendicular and to balance the forefoot to 0° with minimal arch fill. There are many different materials and thickness from which to choose when fabricating the shell of the device.[25] We chose to make the shell of the device from polypropylene and vary the thickness by body weight. Although rearfoot posts can be made of various materials, we chose a semi-rigid crepe material. The sagittal and frontal planes of the rearfoot posts may be varied depending on several factors. However, we chose a 4° rearfoot varus post for all patients with a 4 mm heel elevator for men and an 8 mm heel elevator for women.

A functional foot orthotic device for heel spur syndrome is much more complex than a heel pad. As with any process with multiple steps, variation of the process may produce different outcomes. For example, by obtaining an impression in a semi-weight-bearing technique, the longitudinal midtarsal joint is maintained in a supinated position due to ground reaction forces.[26] The foot orthotic device is then made such that normal pronatory longitudinal midtarsal motion is restricted, thereby reducing its effect in relieving symptoms of heel spur syndrome.[11]

The results of the study suggest that functional foot orthotic devices made from a standardized process are more effective in relieving symptoms of heel spur syndrome than generic shock absorbing heel pads (Table 4). This may be due to the fact that heel spur syndrome is more likely caused by abnormal peritalar mechanics than increased body weight (Table 5). In addition, subjects receiving functional foot orthotic devices use less adjunctive therapies than subjects receiving heel pads (Table 3). Increased utilization of adjunctive therapies adds to the overall cost and risk of therapy.[27–29]

CONCLUSION

Functional foot orthotic devices are more effective in relieving symptoms of heel spur syndrome, and require less adjunctive therapy, than generic shock absorbing heel pads.

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