

PLANTAR FASCITIS AND HEEL SPUR SYNDROME: A RETROSPECTIVE ANALYSIS

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The results of a retrospective analysis of a four-stage treatment regimen for painful plantar fasciitis and heel spur syndrome are presented in this paper. The study entailed 195 painful heels in 159 patients. The results indicated that nonsurgical treatment provided satisfactory relief of symptoms in 96.4% of patients.

In those patients with plantar heel pain recalcitrant to nonsurgical therapy, operative intervention proved to be necessary in order to achieve resolution of symptoms. All of the patients that required surgical intervention displayed a large calcaneal spur with prominent plantar cortical protrusion.

INTRODUCTION

Mechanically induced plantar heel pain, secondary to repetitive strain of the plantar fascia at its attachment to the tuberosity of the calcaneus, is an extremely common podiatric malady. A variety of treatment options are available for the management of this debilitating condition. Treatment modalities include biomechanical efforts to resist hyperpronation of the subtalar and midtarsal joints in midstance and propulsion, pharmacological efforts to counter inflammation, physical therapy designed to enhance flexibility and diminish tissue fibrosis, and surgical intervention that focuses on release of the fascia from the calcaneus and, in many cases, remodeling of the plantar tuberosity.

Although surgical intervention can be useful, the vast majority of patients respond satisfactorily to nonsurgical therapy. It is the purpose of this paper to review the results of both nonsurgical and surgical management of patients with plantar fasciitis and plantar calcaneal spur syndrome, both with and without radiographic evidence of a plantar calcaneal spur.

MATERIALS AND METHODS

A retrospective analysis of 195 painful heels, in 159 patients, treated between January 1, 1993 and December 31, 1994, was performed. All of the patients were treated and evaluated by the author and all were determined to have symptoms due to mechanically-induced repetitive strain of the plantar fascia at its attachment to the calcaneus.

The patients underwent a standard historical interview and physical examination, and were asked to subjectively grade their pain prior to initiation of treatment. The patients were also categorized based on body mass index, and their degree of routine daily weight bearing activity. Weight bearing activity was defined as being either sedentary, (continuous weight-bearing activity of less than one hour at a time throughout the day); partial weight bearing, (continuous weight-bearing activity between one to four hours per day); and constant weight bearing, (continuous weight-bearing activity longer than four hours per day).

The patients were treated in accordance with their degree of symptoms and past history. A variety of historical and treatment parameters were analyzed, including: age, sex, body mass index, level of activity, onset and duration of symptoms, scale of preoperative and postoperative pain, presence of prominent plantar protrusion, and presence of plantar calcaneal spur. Lateral foot radiographs for all patients were obtained, and inspected for the presence of a plantar calcaneal spur.

Radiographic findings were divided into three categories. The first category was for heels displaying no evidence of plantar calcaneal spur formation (Fig. 1). The second category showed radiographic presence of a typical plantar heel spur with a smooth plantar cortex, that became contiguous with the distally elongated shelf-like spur (Fig. 2). The radiographs in category three all showed a prominent cortical protrusion plantar and posterior to the distally elongated shelf-like bone spur (Fig. 3).



Figure 1. Lateral foot radiograph without evidence of plantar calcaneal spur, in a patient with heel spur syndrome.

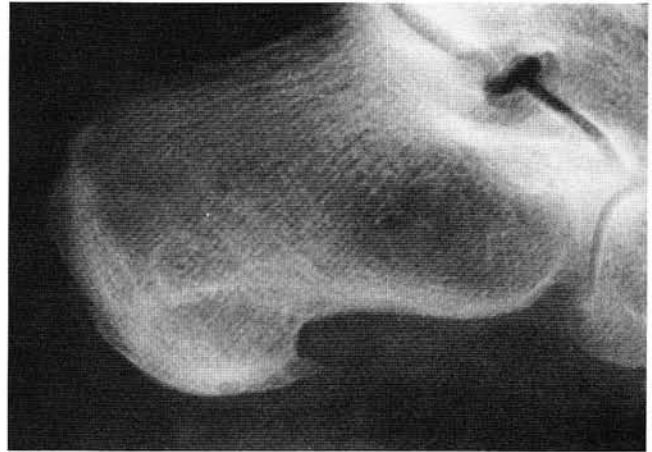


Figure 2. Lateral foot radiograph showing plantar heel spur.



Figure 3. Lateral foot radiograph showing prominent plantar protrusion.

All patients were initially treated nonsurgically in accordance with the hierarchy of treatment detailed in Table 1. All of the patients were instructed to perform flexibility exercises on a daily basis, following initial professional instruction and training. Anti-inflammatory medication was increased in potency depending upon the clinical situation. Immobilization was maintained, primarily during those periods when the patient was active, and the patient was allowed to remove the splint when non-weight bearing. Surgical intervention, in all cases, was performed via a direct plantar approach that allowed release of the fascia and remodeling of the distal elongation and plantar protrusion of the calcaneal spur.

Table 1

TREATMENT HIERARCHY

THERAPY	STAGE I	STAGE II	STAGE III	STAGE IV
Biomechanical	Low Dye Commercial orthoses Heel cup	Custom orthoses Roller Sole	Immobilize NWB	Orthoses
Physical	US Flexibility Cold	Flexibility (US) Cold	Flexibility (US) Cold	Flexibility Cold
Pharmacological	NSAIDs	Indomethacin Local steroid	NSAIDs Oral Steroids	NSAIDs
Surgical	N/A	N/A	N/A	Explore, Fasciotomy, Exostectomy

RESULTS

There were 195 painful heels in 159 patients. The average patient age was 48.5 ± 13.8 years. There were 122 females (76.7%) and 37 (23.3%) males in the study. The ratio of females to males was 3.29:1. The mean body mass index for males was 31.72 ± 6.44 , and for females it was 33.15 ± 7.79 . Of the females in this study, based on the body mass index for females, 22% were categorized as being of acceptable weight, 5% were marginally overweight, 26% were overweight, 37% were severely overweight, and 10% were morbidly obese. For the males, based on the body mass index for males, 25% were categorized as being of acceptable weight, 14% were marginally overweight, 19% were overweight, 36% were severely overweight, and 6% were morbidly obese (Table 2).

Table 2

BODY MASS INDEX

INDEX CATEGORY	FEMALES	MALES
Acceptable weight	22%	25%
Marginally overweight	5%	14%
Overweight	26%	19%
Severely overweight	37%	36%
Morbidly obese	10%	6%

A sedentary lifestyle was led by 18.2% of the patients, while 34.6% were categorized as being partially weight bearing, and 47.2% were categorized as being constantly weight bearing (Table 3). The mean duration of symptoms prior to initiation of treatment, regardless of whether or not prior nonsurgical treatment had been attempted was 8.86 ± 13.45 months. The mean duration of treatment was 3.12 ± 2.66 months, and the mean follow-up period was 13.46 ± 5.63 months.

All of the patients related post-static dyskinesia prior to initiation of therapy. The mean duration of time necessary to alleviate post-static dyskinesia was 1.91 ± 1.73 months. An analog pain scale of 0-4 was used by the patient to rate heel pain (0-none, 1-mild, 2-moderate, 3-severe, 4-excruciating). The mean rank of heel pain subjectively rated by each patient prior to treatment was 3.0 ± 0.59 . After treatment, the mean rank of pain was 0.35 ± 0.56 . Patient satisfaction was the

goal of therapy, and therefore some of the patients deemed to have a satisfactory response to treatment ranked their pain a 1, and related only mild residual symptoms.

Sixteen (10.1%) of the patients responded satisfactorily to Stage I therapy, while 98 (61.6%) required Stage II therapy, and 39 (24.5%) went on to immobilization and Stage III therapy. Only 6 (3.8%) of the patients went on to require Stage IV therapy (Table 4).

Table 3

ACTIVITY LEVEL

C	Constant weight bearing (> 4 hours) (Repetitive Strain) 75 (47.2%)
P	Partial weight bearing (1-4 hours) 55 (34.6%)
S	Sedentary (< 1 hour) 29 (18.2%)

Table 4

RESULTS: TREATMENT OF PLANTAR PAIN

(n=159)	
Age	48.5 ± 13.8 years
Sex	122 (76.7%) Female, 37 (23.3%) Male
BMI	33.15 ± 7.79 Female, 31.72 ± 6.44 Male
Side	57 (35.9%) R, 66 (41.5%) L, 36 (22.6%) B/L
Activity	76 (47.8%) C, 54 (34%) P, 29 (18.2%) S
Onset	154 (97.4%) Insidious, 5 (2.6%) Acute
Duration	8.86 ± 13.45 Months
PDS	159 (100%)
Pain (pre)	3.09 ± 0.59 (0-4 analog scale)
Pain (post)	0.35 ± 0.56 (0-4 analog scale)
Antalgic	59 (37.1%) Yes, 100 (62.9%) No
Spur	141 (73.8%) Yes, 100 (62.9%) No
PPP	12 (6.3%) Yes, (8.5% based on 141 spurs)
Res. PSD	1.91 ± 1.73 months
Res. Sympt	3.12 ± 1.73 months
Stage of Tx	16 (10.1%) Stage I, 98 (61.6%) Stage II, 39 (24.5%) Stage III, 6 (3.8%) Stage IV, (96.2% Non-Surgical Success)

A plantar calcaneal spur was noted on the lateral radiographs of 145 (74.4%) of the heels evaluated, while 50 (25.64%) of the heels displayed no evidence of plantar calcaneal spur. Twelve (8.3%) of the heels with radiographic evidence of a plantar calcaneal spur, displayed prominent plantar protrusion, and of these patients, six (50%) ultimately required surgical intervention in an effort to satisfactorily alleviate pain (Table 5).

Table 5**RADIOGRAPHIC FINDINGS**

195	symptomatic heels
50	revealed no plantar spur
145	displayed plantar spur
12	displayed prominent plantar protrusion

In those patients who ultimately required operative intervention, all were female, all were heavier than acceptable body weight, all were employed in occupations that required constant weight bearing, and all displayed a calcaneal spur with prominent plantar protrusion. Moreover, the Stage IV group's mean age, 26.7 ± 13.2 years, and mean duration of symptoms prior to initiation of therapy, 14.9 ± 11.9 months, were younger and longer, respectively, compared to the group of patients as a whole (Table 6).

Table 6**PATIENTS RECEIVING
STAGE IV THERAPY**

5 females (3.2%)	All displayed PPP
Age:	26.7 ± 13.2 years
BMI:	31.2 ± 15.8
Duration:	14.9 ± 11.9 months
Resolution of PSD:	3.25 ± 3 months
Total Time of Tx:	4.6 ± 3 months

DISCUSSION

The results indicate that the vast majority of patients exhibiting mechanically-induced plantar fasciitis, with or without the presence of a plantar calcaneal spur, respond satisfactorily to appropriate non-surgical therapy. The study did not distinguish between isolated nonsurgical measures. It did, however, evaluate the effectiveness of combinations of treatment modalities. All of the stages of treatment involved at least the combination of biomechanical, pharmacological, and physical therapy.

The general hierarchy of treatment involves some form of control of hyperpronation of the subtalar and midtarsal joints, anti-inflammatory medication, and ultrasound prior to flexibility exercises. It is interesting to note that the use of a commercially available arch support, as compared to a customized accommodative foot orthosis, was effective in only 16 (10.1%) of the patients treated in this study. Such a device can be a useful, and relatively inexpensive, tool for the treatment of plantar fasciitis and heel spur syndrome, however a clear majority of patients (98/159 or 61.6%) required more rigorous biomechanical control, and progressed to the use of a customized foot orthosis.

The resolution of post-static dyskinesia appears to be a good indicator of the success of treatment, and precludes satisfactory resolution of symptoms rather consistently. In those patients that failed to satisfactorily respond to nonsurgical intervention, two of the five individuals (60%) had satisfactory resolution of post-static dyskinesia (PSD) prior to going to the operating room for treatment of persistent focal, plantar central tenderness after prolonged weight bearing.

The resolution of PSD is thought to correspond to resolution of plantar fasciitis. Clinical examination of these patients prior to operative intervention failed to show tenderness in the fascia upon activation of the plantar windlass mechanism. The point of maximum tenderness moved posterior to the attachment of the plantar fascia to the calcaneus and directly plantar to the radiographically evident prominent plantar protrusion.

It is interesting to note that all of the Stage IV patients displayed prominent plantar protrusion on the lateral foot radiograph, and one of the patients displayed an inflamed plantar bursa at the time of operative intervention. Based on this observation, the author believes that the presence of a prominent plantar protrusion is a poor prognostic indicator relative to the potential success of non-surgical treatment. Furthermore, it is the author's belief that operative intervention in these patients is best achieved through an open plantar approach that enables direct access to the prominent plantar protrusion. In all cases of Stage IV treatment, the resected prominent plantar protrusion displayed pathological findings consistent with cartilaginous capped bony proliferation, in essence, an osteochondroma. The prominent plantar protrusion may actually represent healed stress fracture (Steve Conner, D.P.M., personal communication). At the time of surgery, the cartilaginous cap projected plantarly into the subcutaneous fat pad of the heel. As a result of the plantar projection of fibrocartilage, the prominent plantar projection actually appeared larger under direct operative visualization and palpation than what was expected based on the appearance of the ossified spur represented on the lateral foot radiograph.

CONCLUSION

Plantar fasciitis and heel spur syndrome are commonly observed in middle-aged patients, particularly those individuals who are overweight, or performing activities that require prolonged weight bearing. Plantar fasciitis is the result of repetitive strain injury of the fascia at the attachment of the plantar fascia. Females seeking treatment for the condition outnumber males almost 3:1. Symptoms caused by this disorder develop insidiously, and are usually present for approximately nine months before the patient seeks professional care. Post-static dyskinesia is present in all cases of plantar fasciitis, and further attests to the wear-and-tear nature of this condition. A plantar calcaneal spur, as viewed on the lateral foot radiograph, is usually present (74% of cases) at the time of the patient's initial presentation, and the appearance of a prominent plantar protrusion seems to correlate with a poor response to initial therapy and the patient may require operative intervention in an effort to satisfactorily alleviate symptoms.

The combination of biomechanical, pharmacological, and physical therapy appears to be an effective treatment regimen for the management of this common malady. Although a variety of techniques are available, the use of an open plantar approach to the prominent plantar protrusion is an effective way to visualize the pathological anatomy and expose the underlying target structures of the plantar surface of the heel, in those patients who have failed to achieve a satisfactory response to non-surgical intervention.