

Distal Tarsal Tunnel Release With Partial Plantar Fasciotomy for Chronic Heel Pain: An Outcome Analysis

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ABSTRACT

This study evaluated the effectiveness of distal tarsal tunnel release with a partial plantar fasciotomy for chronic subcalcaneal pain syndrome in patients who failed nonoperative management through a retrospective review of all patients undergoing this procedure between 1994 and 1999. Distal tarsal tunnel release and a partial plantar fasciotomy were offered only to those patients with disabling heel pain and were performed under general anesthesia or ankle block. Seventy-five patients (80 heels), averaging 20 months of nonoperative treatment, were identified (group I). Postoperative outcome questionnaires (SF-36 and Foot Function Index [FFI]) were sent to these patients and 44 (46 heels) responded (group II). In group I, 88% of patients had a good to excellent result. Many continued with mild to moderate residual symptoms, which typically did not limit their activity. In group II, 91% of patients were somewhat to very satisfied with their outcome. Visual analogue scale scores for pain were reduced by a mean of 55. SF-36 scores, matched against a control group of patients receiving just nonoperative treatment, showed a statistically significant improvement in all pain and functioning subcategories. We conclude that a distal tarsal tunnel release with a partial plantar fasciotomy may successfully increase function and decrease pain in patients who fail nonoperative treatment.

Key Words: Distal Tarsal Tunnel Release; Partial Plantar Fasciotomy; Chronic Subcalcaneal Pain Syndrome

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INTRODUCTION

Subcalcaneal pain syndrome is a common pathologic entity that frustrates patients and practitioners alike. It has been associated with obesity,^{11,15,27} middle age,^{12,18} biomechanical abnormalities of the foot such as a tight Achilles tendon, pes cavus, and pes planus¹³ and athletic participation.^{6,20} The etiology of subcalcaneal pain is unknown. However, plantar fascia inflammation and microtrauma,^{19,26} compression neuropathy,^{4,6,16,28} heel spur¹⁰ and painful heel pad²¹ are frequently cited. A combination of causative factors may be present, or the true cause may remain obscure.

Although normally managed by nonoperative means, subcalcaneal pain remains a challenging problem. Conservative treatment, which is generally effective, can take weeks to months and even years before alleviating symptoms. There currently is no consensus on conservative modalities in the treatment of heel pain. Nonsteroidal anti-inflammatory drugs (NSAIDs), rest, heel cups, splints, orthotics, corticosteroid injections, casts, physical therapy, ice, and heat have all been used with some effectiveness.¹² Many studies have shown the effectiveness of a conservative treatment program. Greater than 90% of the patients receiving one of the above treatments will show signs of improvement and not require surgical intervention. It is the remaining 5 to 10% of patients with recalcitrant disabling subcalcaneal pain that present difficult decision-making for the clinician.

It is our belief that in those patients in whom symptoms persist for greater than 12 months despite all forms of conservative management, surgery may be indicated. There are numerous surgical procedures described in the literature for the treatment of subcalcaneal pain including excision of the heel spur, plantar fasciotomy, nerve decompression and a combination of the above procedures.²

The difficulty in the treatment of patients with subcalcaneal pain syndrome lies in making the correct diagnosis. Differentiating between variants of tarsal tunnel syndrome and plantar fasciitis can be very difficult in the

most astute clinician's hands. If a specific diagnosis cannot be made, a combination of surgical procedures may be necessary, including neurolysis and a soft-tissue release.

Various authors have described neurolysis and neurectomy. Kenzora¹⁶ reported release of the nerve of adductor digiti quinti through a midline plantar incision. Baxter and Pfeffer⁴ and Baxter, Pfeffer, and Thigpen⁵ reported excellent results in most of their patients after release of the first branch of the lateral plantar nerve. Baxter, Pfeffer, and Thigpen⁵ reported on 34 patients who had neurolysis of the nerve to the abductor digiti minimi, release of the plantar fascia medially, and removal of a small portion of the heel spur (if needed) to free the nerve. However, they advised against heel spur removal or complete plantar fascial release. Twenty-eight patients (82%) were satisfied, four (12%) were satisfied with reservations, and two (6%) were dissatisfied. Sammarco and Helfrey reported on their experience with this surgical approach and had similar results. Ninety-two percent of their patients had a satisfactory result following surgery.²⁴ Davies et al. again showed similar results with a partial plantar fasciotomy and nerve decompression.⁹ Although a majority of their patients showed excellent improvement, most continued with residual symptoms.

Because the etiology of subcalcaneal pain syndrome is not agreed upon and the natural history is not known, it is difficult for physicians to provide a scientifically founded surgical plan.

Over the past several years, due to the difficulty in assigning a specific diagnosis to these patients, we have performed a surgical release of the first branch of the lateral plantar nerve (i.e., distal tarsal tunnel release) with a partial plantar fasciotomy for the treatment of subcalcaneal pain syndrome. It is our goal to retrospectively review the results of this surgical approach to provide additional information to orthopaedic practitioners. To our knowledge, prior to this study, no surgical outcomes data is available in the literature to help define the role of operative intervention and the lifestyle impact of the surgery for this difficult-to-treat problem.

MATERIALS AND METHODS

A retrospective review was performed on patients undergoing a distal tarsal tunnel release with a partial plantar fasciotomy for recalcitrant subcalcaneal pain. Between 1994 and 1999, the two senior authors performed this procedure on 85 patients (92 heels). Ten patients (12 heels) were excluded due to previous surgery for heel pain (typically a failed endoscopic plantar fascia release). A total of 75 patients (80 heels)

comprised group I in this study (14 men, 61 women). The mean age was 46 years (range, 20 to 78). All patients in group I had tenderness over the medial tuberosity of the calcaneus, consistent with either the diagnosis of entrapment of the first branch of the lateral plantar nerve or plantar fasciitis. These patients underwent on average 20 months of conservative treatment including a stretching program, steroid injection(s), night splints, shoe modifications, orthotics, visco heels, ice massage, NSAIDs and casting. Patients typically presented with plantar medial heel pain, with some noting tenderness along the arch. Failure to respond to at least 12 months of conservative treatment along with disabling heel pain were the main indications for surgical intervention. Each patient underwent the same operative procedure (decompression of the first branch of the lateral plantar nerve and partial plantar fasciotomy).

Follow-up for group I was conducted by an extensive review of the patients' medical records (mean, 7.4 months). All patients in group I were sent clinical outcomes questionnaires to be completed and returned. A subset of patients in group I (59%) responded to this request (nine men, 35 women) and comprise group II. The mean age was 47 years (range, 25 to 78 years). For group II, the left side was operated on in 29 patients and the right side in 15 patients. Bilateral procedures were performed at separate times in two patients. Patients had symptoms present for an average of 17.8 months prior to surgical intervention. On average, this group was treated for approximately 14 months (range 7-72 months) prior to surgery. These patients comprise group II in this study (mean follow-up, 26.4 months).

Group II patients completed the short form general health status survey (SF-36). The SF-36 consists of 36 multiple-choice questions sorted into eight categories that describe overall health status. These categories are physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, vitality (the frequency of feeling full of energy versus feeling tired), social functioning, role limitations due to emotional problems, and general mental health. Low numeric scores reflect a perception of poor health, loss of function, and presence of pain. High numeric scores reflect a perception of good health, no functional deficits, and absence of pain. These data were collected from group II and compared against a group of patients with plantar fasciitis prior to the institution of any treatment, US norms,²⁹ and a group of patients with three-month follow-up after a primary total hip arthroplasty.¹⁷

In addition to the SF-36, patients also completed the Foot-Function Index (FFI).²² The FFI is a self-administered index consisting of 23 items divided into subscales. Past studies have proven the test/retest reliability as well as the internal consistency of this index.²² The FFI was

developed to determine the impact of foot pathology on function in terms of pain, disability and activity restrictions. These scores were recorded postoperatively and no comparative preoperative data is available.

Each patient in group II completed our own outcome report, which included a visual analog scale for preoperative (patients were asked to recall their preoperative pain) versus postoperative (current) pain. While asking patients to recall their preoperative pain level is not ideal, these recalled pain levels were correlated with comments in preoperative chart notes. We believe that these recalled pain scores may be lower than if preoperative scores had been taken. Other questions addressed in this questionnaire included duration of conservative treatment prior to surgery, duration of symptoms prior to surgery, pain severity, ability to return to normal activity, walking distance, time to return to work, activity restrictions, time to reach maximum improvement, and satisfaction ratings.



Fig. 1: The incision will be in line with the posterior aspect of the medial malleolus and extend distally to the plantar aspect of the foot.

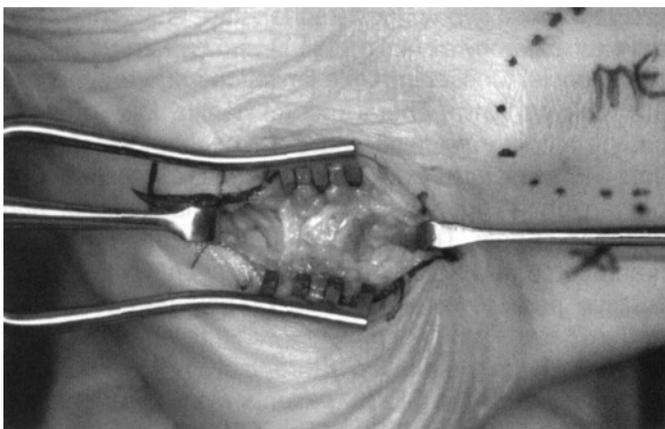


Fig. 2: The fascia overlying the abductor hallucis muscle is divided and retracted distally to expose the deep fascia underlying the abductor hallucis, which is released from proximal to distal to the level of the plantar fascia.

Because preoperative data on pain were not available for patients in groups I and II, we used data from other patients to serve as a basis for interpreting pain scores. A pilot study performed earlier in our clinic assessed pretreatment pain and quality of life variables (SF36) in patients presenting for first-time conservative treatment of plantar fasciitis. Eighty-three patients with a diagnosis of plantar fasciitis (30 men, 57 women; mean age 49 years) had completed the VAS pain scale and SF36 prior to treatment.

Procedure

Under general or regional anesthesia, the extremity is prepped and draped to the midcalf level after placement of a tourniquet on the thigh. A curvilinear incision is made in line with the posterior aspect of the medial malleolus and extended distally to the plantar aspect of the foot (Fig. 1). Dissection is carried down to the fascia overlying the abductor hallucis muscle. This superficial fascia is divided and the muscle belly is retracted distally to allow exposure of the deep fascia underlying the abductor hallucis. This in turn is then released from proximal to distal to the level of the plantar fascia (Fig. 2). The nerve is decompressed, but a formal neurolysis is not performed. The plantar fascia is then identified and the medial 50% of its width is transected under direct vision. The wound is irrigated and closed using 2-0 Vicryl suture and staples or sutures in the skin. The patient is then placed in a splint for two weeks on crutches. At follow-up, sutures are removed and a walking cast or a walker boot is applied for four weeks. Following immobilization, a longitudinal arch support is recommended for a period of three to six months.

RESULTS

Seventy of the 80 feet (88%) in group I had an excellent or good rating at the time of last follow-up visit (Table 1). MRI findings consistent with plantar fasciitis may include fluid, increased signal around the plantar fascia and hyperintensity involving the calcaneal attachment and adjacent soft tissue. These are correlated with postoperative outcome and summarized in Table 2.

For group II patients, the mean preoperative visual analog scale (VAS) for pain was 80 and postoperatively this decreased to 25; the mean for the group of patients who had plantar fasciitis prior to receiving any treatment was 60 (Fig. 3). Thirty-nine of 44 patients (89%) rated their pain as severe prior to surgery whereas one of 44 patients (2%) rated their pain as severe at the time of follow-up (Fig. 4). Patients were asked to characterize their pain preoperatively versus postoperatively. Eighty percent of respondents noted constant pain preoperatively, which decreased to 18% postoperatively. Preoperative

Table 1: Group I Surgical Outcome Based on Chart Review

Clinical Rating	n	%
Excellent	29	36.25
Good	41	51.25
Fair	6	7.5
Poor	4	5

Table 2: Correlation Between Positive MRI and Surgical Outcome

	Clinical Rating			
	Good-Excellent		Poor-Fair	
	n	%	n	%
Positive MRI	26	87	4	13
Negative MRI	5	71	2	29

restrictions of activity were compared to postoperative restrictions of activity (Fig. 5). Preoperatively, 50% of respondents had severe functional limitations compared to 2% postoperatively. Following surgery 31 of 44 patients (71%) were able to return to all their normal activities. Only five of 44 patients were able to walk greater than one mile prior to their surgery; 28 of 44 patients were able to do this at the time of last follow-up (Fig. 6).

Thirty-two of 44 patients returned to work on a full-time basis. Ten patients were retired or unemployed prior to surgery and remained so after surgery. Two patients did not return to employment following surgery. One was employed in a part-time retail position and was unable to return to work due to long hours standing, and the other was a schoolteacher and did not return to work due to heel discomfort. Fifty-five percent of patients returning to work did so within two months. Six of the 32 patients (19%) returning to work on a full-time basis changed jobs. In all cases, this was done to reduce the amount of time spent standing on the job. There were two patients with workers compensation claims associated with their treatment. Average time for return to work in these patients was 5.5 months. One patient returned to a previous employer at a standing job and one patient changed jobs to a primarily sitting position.

When asked about their satisfaction with the surgery for the treatment of heel pain, most patients were satisfied, with 79% stating they were satisfied or very satisfied with the outcome. However, 11 patients (25%) stated they would not undergo the same procedure for similar symptoms on the opposite extremity, compared to 33 (75%) who stated they would want similar treatment. At time of follow-up, 21 of 44 patients use orthotic devices in their shoes and 24 of 44 patients admit to shoewear

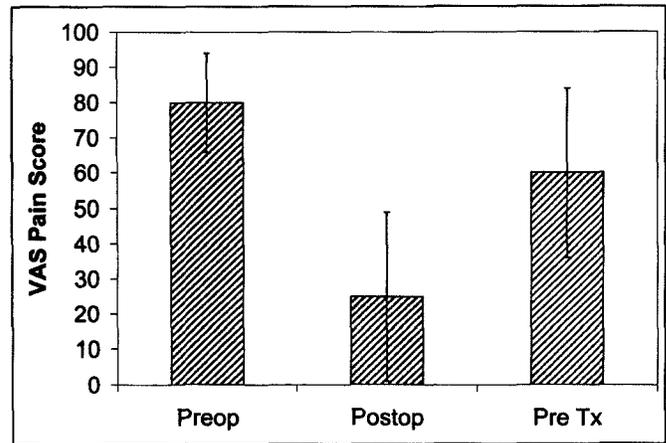


Fig. 3: Visual analog scale (VAS) pain scores from group II patients (preoperative recall score and current postoperative score) and from patients presenting with plantar fasciitis for first-time conservative treatment.

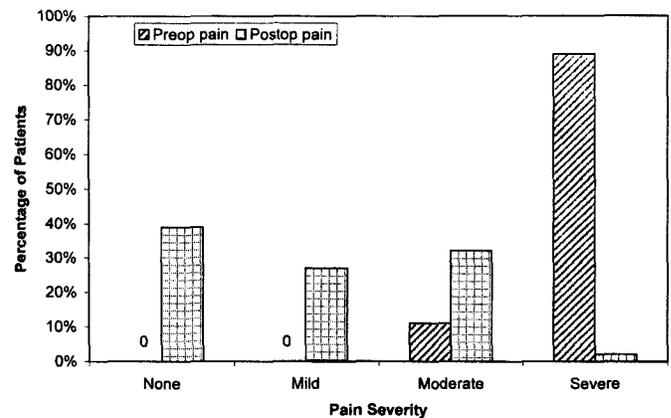


Fig. 4: Percentage of group II patients in pain severity categories of none, mild, moderate and severe.

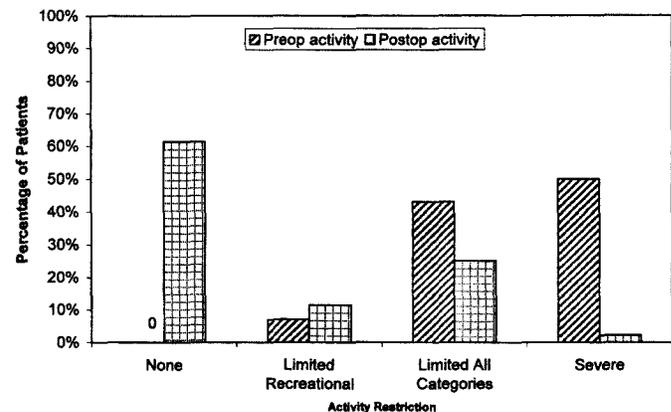


Fig. 5: Percentage of group II patients in activity categories of no restrictions, restrictions limited only to recreational activities, restrictions limited in all activities of daily living and severe restrictions in all activities of daily living.

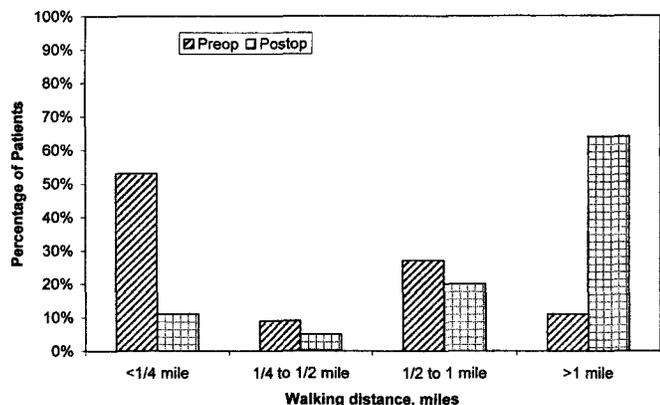


Fig. 6: Percentage of group II patients in categories describing walking distance.

limitations. Most patients required a long recovery period. Greater than 50% of the study cohort reported recovery to maximum medical improvement between six and 12 months postoperatively.

Each patient in group II completed the Foot Function Index (FFI) postoperatively. No preoperative FFI was completed at the onset of each patient's treatment, thus, change scores could not be evaluated. However, for all questions that queried patients on pain and function related to activities of daily living, mean scores were statistically significantly less than 50 (a midrange score on a scale of 0 to 100, with 0 meaning no pain or functional limitation and 100 meaning worst possible pain and severe limitations) but greater than 0 ($P < 0.01$, two-tailed, one-sample t test).

The results of the postoperative SF-36 were compared to a group of patients with plantar fasciitis prior to receiving any treatment and to a group representing the U.S. norms (Fig. 7). There was a statistically significant difference ($P < 0.01$ or less, one-way analysis of variance) between groups in physical functioning, role physical, and bodily pain. The percent difference (i.e., "improvement") between group II patients and patients with plantar fasciitis prior to conservative treatment was comparable to the percent increase in scores for physical functioning, role physical, and bodily pain seen at three-month follow-up after total hip arthroplasty compared to preoperative scores (scores at three-month follow-up are near maximal).¹⁷

There were two complications following the surgical procedure. A 46-year-old female developed a wound dehiscence. This responded to dressing changes but developed a hypertrophic scar, which required desensitization prior to footwear. She was only somewhat satisfied with her outcome but changed jobs and returned to full time employment. The second complication was in a 54-year-old female, who developed a deep venous throm-

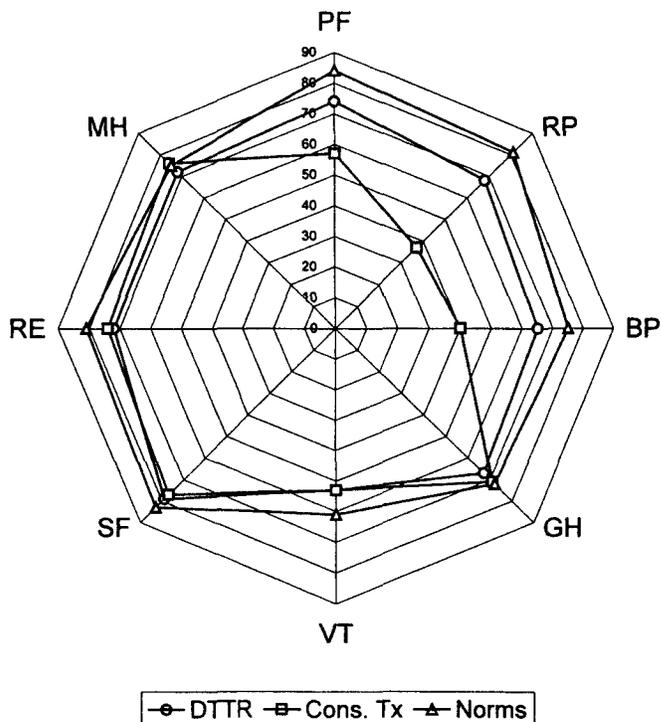


Fig. 7: Radar plot comparing SF36 scores for group II distal tarsal tunnel release (DTTR) patients, patients receiving first-time treatment for plantar fasciitis (Cons. Tx.), and U.S. population norms (men and women, all ages) from Ware et al. SF36 subcategories defined as: PF, physical limitations in performance of daily living; RP, problems encountered with daily activities or work due to physical health; BP, overall pain severity; GH, overall general health; VT, frequency of feeling full of energy vs. tired; SF, performance of social activities in lieu of health problem (e.g., osteoarthritis); RE, problems encountered with daily activities or work due to emotional health; MH, degree of nervousness or depression.

basis following surgery. She returned to her job as a nurse but remained only somewhat satisfied with the outcome.

DISCUSSION

Based on the literature, a surgeon has multiple procedures to choose from in treating the patient with recalcitrant heel pain. Procedures have been described for drilling decompression, Steindler stripping, plantar fasciotomy (open and endoscopic), simple spur excision, rotational osteotomy, countersinking osteotomy, neurolysis of the nerve to the abductor digiti quinti, calcaneal nerve neurectomy and general decompression.²

Simple excision of a calcaneal spur has been reported in the literature. DuVries¹⁰ believed that the spur is the source of symptoms. He reported on 37 patients in whom the spur was removed through a medial incision over the heel with resolution of symptoms in all 37 patients. Snook and Chrisman²⁷ advocated removing a portion of the medial calcaneal tubercle anteriorly,

rather than the spur alone, to broaden the weightbearing area. They reported relief in eight patients that were treated in this fashion. Gormley and Kuwada¹⁴ combined heel spur resection, fascial release, and partial fasciectomy in 94 patients. Eighty-nine patients (95%) reported complete relief of heel pain after surgery with at least six months follow-up.

By far, the most commonly performed procedure for subcalcaneal pain has been a plantar fasciotomy. Leach et al. performed a plantar fascia release with removal of the bone spur, if present, in 15 athletes. Fourteen of the 15 athletes returned to their previous level of activity.¹⁹ Barrett et al.,³ in a multisurgeon prospective analysis of 652 patients treated with endoscopic plantar fasciotomy, reported 62 postoperative complications. However, 97% of the patients obtained heel pain relief with this operation and 87% had less pain than preoperatively by the 21st day. Benton-Weil et al.⁷ performed 51 percutaneous plantar fasciotomies for heel pain syndrome and noted an improvement in pain from a mean of 8.7 preoperatively to a mean of 2.1 postoperatively (scale 0 to 10).

Based on the various rating systems each of these studies utilized, it appears that most operations for subcalcaneal pain syndrome yield satisfactory results. However, the success rates of these surgeries are difficult to compare since there has been no standardized scoring system utilized in these studies. Sammarco and Helfrey used the Maryland Foot Score (MFS) to assess outcome following surgery and found an improvement from an average of 74.8/100 preoperatively to an average of 90.6 postoperatively.²⁴ Daly et al. developed a standard scoring system for use in patients with plantar fasciitis, which incorporated more pertinent data in the evaluation of outcomes but arbitrarily assigned a rating.⁸ Like the MFS, many categories in the commonly used scoring systems are of little relevance to patients with heel pain (hindfoot alignment, range of motion, stability).⁹ The most critical factors in determining a patient's outcome following treatment for subcalcaneal pain syndrome are pain relief and the ability to return to activities versus disability. Mental and emotional health, as it relates to a disability, is also an important component in determining outcomes following a surgical intervention.

The decision to use the distal tarsal tunnel release with a partial plantar fasciotomy is based on the presumption that one or both structures are responsible for the patients' symptoms of subcalcaneal pain. We do not believe the heel spur is responsible for the patients' presenting symptoms and thus did not remove this structure in any of our patients. Only the medial half of the plantar fascia was divided intraoperatively, since complete release has been associated with loss of height in the medial arch and possible lateral column syndrome.^{1,25}

Review of the patients' charts revealed an 88% good to excellent result. This is in line with other procedures described in the literature. However, the validity of this result is questionable since no standardized scoring system was used to arrive at each patient's rating. We looked at MRI results and their correlation with the patient's outcome rating. An MRI result consistent with plantar fasciitis did not result in a superior outcome when compared to patients who underwent the procedure with a negative MRI. We do not advocate the use of MRI in the evaluation of patients with standard plantar medial heel pain. However, in patients presenting with more medial pain, an MRI may be helpful to rule out any mass-occupying lesion in the tarsal canal.

Preoperative VAS pain scores were compared to postoperative VAS pain scores, as well as to a group of patients with heel pain prior to initiation of any treatment. The mean VAS dropped from 80 preoperatively to 25 postoperatively. In addition, as would be expected, patients undergoing operative intervention had significantly more pain than a group of patients presenting for initial treatment of their heel pain (VAS score 80 vs. 60). Preoperatively, 89% of patients graded their heel pain as severe versus 2% postoperatively. While these results show very good improvement following operative treatment, most patients continue with some mild to moderate residual pain. No patient was made worse in regards to pain severity following the procedure. Seventeen patients (39%) had complete resolution of pain. Compared to 82% experiencing constant pain preoperatively, only 18% had a constant pain sensation at follow-up. Two patients had no improvement and represent two of the three patients that were dissatisfied with their result. Despite the poor outcome in one of these patients, she was able to improve her walking distance to greater than one mile and return to her standing job. The FFI pain subscale confirms the findings of the VAS pain scores. This data demonstrates that patients experience the most heel pain at the end of the day and little to no heel pain before getting out of the bed in the morning. No preoperative FFI data was obtained, which limits the interpretation of this data. Furthermore, this index has only been validated as a reliable indicator of arthritis foot pain.²²

Patients also showed considerable improvement from an activity standpoint. Preoperatively, 50% of patients had severe limitations and 43% limited their daily and recreational activity. Following surgical intervention, only one patient had severe limitations on activity and 25% limited their daily and recreational activity. Patients also showed improvement in walking distance. While only 38% percent of patients could walk more than half a mile prior to surgery, 82% achieved this after the procedure.

Regarding the relationship between work and heel pain, the outcome did not seem to be influenced by the type of job or whether or not a worker's compensation claim was pending. Patients were evenly distributed among sitting jobs, standing jobs and a combination of sitting and standing jobs. The mean time for return to work was 2.1 months, with 55% of patients returning to work within two months. The workers compensation patients returned to work at an average of 5.5 months after the procedure. Two patients did not return to work as a result of continued symptoms following surgery. One of these patients became a housewife and has no plans to return to work in the future. These results add further support to the success of this procedure, but suggest that changing to a job that does not require long periods of standing may facilitate a return to full-time employment. Six (19%) of the 32 patients returning to full time work required such a job change.

To our knowledge, outcomes data utilizing the SF-36 has not previously been reported following surgery for heel pain. This study shows that the SF-36 survey has the sensitivity to document expected patient satisfaction after a distal tarsal tunnel release with a partial plantar fasciotomy. In group II, patients with a mean follow-up of 26.4 months, SF-36 survey results showed statistically significant differences in physical functioning, role physical and bodily pain when compared to a group of patients with heel pain and no previous treatment. We did not administer the SF-36 preoperatively to our patients. Because pre-operative patients have a higher mean VAS pain scale than the group of patients with heel pain without previous treatment, the inference is that we would expect to see even a greater difference in the categories if we had compared our results to a pre-operative SF-36. While there was a difference in these categories between these two groups, there remained a statistically significant difference in these same categories with the addition of the vitality category between the operative group and U.S. norms. Thus, although patients do indeed show statistical improvement, they do not return to the U.S. norms baseline, a trend also seen in reviewing SF-36 data following total knee and total hip arthroplasty.¹⁷

Although these results are encouraging, many patients continue with residual complaints of pain and activity restrictions. Recovery from the procedure can be lengthy despite a patient's ability to return to work. More than six months was required by 52% of patients to reach maximum improvement. We typically counsel our patients that it may take between eight and 12 months to reach maximum improvement. The reason for this lengthy recovery is unknown but does not appear to be associated with the duration of symptoms prior to surgery.

CONCLUSION

As advocated by the American Orthopaedic Foot and Ankle Society, nonoperative treatment for subcalcaneal pain syndrome should be recommended for 12 to 18 months prior to considering surgical intervention. In those patients with recalcitrant disabling heel pain, a distal tarsal tunnel release with a partial plantar fasciotomy can be offered. We consider this procedure as a last resort after all other treatment modalities have failed. Patients with pain that is constant and severe should be considered surgical candidates, but should be warned about the possibility of residual pain and activity restrictions as well as a prolonged recovery. With appropriate counseling in those that have exhausted all other means of treatment, this procedure has a very good success rate, yielding some level of satisfaction in 93% of patients. Investigation to standardize preoperative and postoperative outcomes by means of the SF-36 or some other tool should be a priority for the future.²³

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