CHAPTER **50**

# PERCUTANEOUS PLANTAR FASCIOTOMY FOR RECALCITRANT PLANTAR FASCIITIS

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## INTRODUCTION

Plantar fasciitis is one of the most common causes of heel pain. The syndrome was first described in 1812 by Wood who incorrectly attributed the cause to tuberculosis. This pathology has been referred to as painful heel syndrome, subcalcaneal pain, medial arch sprain, stone bruise, calcaneal periostitis, and calcaneodynia.[1] The three broad categories for the etiology of plantar fasciitis include mechanical, degenerative, and systemic. Each is associated with a variety of causes that may attribute to heel pain.[2,3] People with plantar fasciitis often complain of heel pain with first steps in the morning and with increased activity throughout the day. Obesity, pronated gait patterns, and pes cavus type feet are a few of the predisposing factors that increase the strain along the fascia, which eventually exceeds the physiologic tolerance.

In the acute phase, the inflammation is usually localized to the origin of the plantar fascia at the medial tuberosity of the os calcis. When it becomes chronic, the pain extends distally along the fascia, which thickens and often forms nodules. On initial presentation, plantar fasciitis should be differentiated from other syndromes like tarsal tunnel, periostitis, entrapment of the nerve to abductor digiti quinti, and the medial calcaneal branch of the posterior tibial nerve. Other causes like rheumatoid spondylitis, rheumatoid arthritis, systemic lupus erythematosus, or gouty arthritis should be considered, especially in patients who are younger and/or have bilateral involvement.[4,5]

Conservative treatment for plantar fasciitis including orthotics, anti-inflammatory medications, stretching exercises, night splints, strapping, physical therapy, short leg casting and corticosteroid injections have been shown to provide relief of symptoms for the majority of patients.[2,6-9,10-13,14-16] The people who continue to have prolonged symptoms of heel pain with no resolution should consider surgical intervention. Plantar fasciotomy has been widely reported as an acceptable technique to treat painful chronic plantar fasciitis.

Since the 1950s, many surgical procedures with variable techniques have been introduced including total or partial plantar fascial releases with or without calcaneal spur resection, endoscopic surgery, and radiofrequency lesioning.[17-30] Plantar fasciotomies for treatment of chronic plantar fasciitis continues to be a relatively controversial topic due to the reported risk of complications including decrease in foot arch stability, lateral column pain, structural failure from overload, recurrent plantar fasciitis, stress reaction of calcaneus, stress fractures, and heel hypoesthesia.[31-39]

The percutaneous plantar fasciotomy procedure was first described by Harvey Pilzer in 1983. He reported 184 cases over a four-year period with consistently favorable results.[40] Then, an 18-month follow-up study was performed by Michael Berlin in 1985 that showed excellent results in 62 of 82 patients. He also concluded that rigid orthotics are an important postoperative consideration since 13 of the 20 patients with favorable or poor results chose not to wear orthotics.[20] Since then, there have been several articles on new surgical techniques with variable results and multiple reports about the associated changes in foot loading.[32-35,39] Although percutaneous plantar fasciotomy has been shown to have favorable outcomes, there have been no recent articles with a large number of cases and long term follow-up since first introduced. In 1998, Benton-Weil et al reported an 83% satisfaction rate in 35 patients with an average follow-up of 34 months. However, there was no indication of the extent of plantar fascia resected.[19] Brown et al using a transverse plantar incision and complete fascial release, reported 76% complete relief of symptoms with no heel pain or numbness postoperatively.[21] Over a decade has passed since the last publication and no other comparable studies have been reported.

## MATERIALS AND METHODS

From 2001 to 2008, 85 patients underwent percutaneous plantar fasciotomy by the senior author through a single stab incision at the medial heel pad. The 82 feet in 76 patients (89.4%), who returned a signed consent and responded to the phone questionnaire were included in this study. Of the nine patients who were lost to follow-up, 6 had no forwarding address or phone number, data were missing for 2 patients, and one elected not to participate. The 76

Figure 1: Phone Patient Questionnaire

PRE-OPERATIVE:

Level of pain JUST PRIOR to surgery:

| No pain | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | The worst pain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | imaginable |

POST-OPERATIVE:

Level of pain AFTER surgery:

| No pain | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | The worst pain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | ❑ | imaginable |

Are you pain-free now?..... Yes No

Did you have any recurrence of pain? ..... Yes No

If yes: ❑ Same location ❑ Different location

If different: Where_____ What kind_____

Are you able to participate in your activities of daily living pain free? Yes No

How do you feel about the results of the surgery?

| Extremely Satisfied | Somewhat Satisfied | Satisfied | Somewhat Dissatisfied | Dissatisfied |
|---|---|---|---|---|
| ❑ | ❑ | ❑ | ❑ | ❑ |

Would you recommend this surgery to a friend? ..... Yes No

Would you have this surgery again (if you needed it)?..... Yes No

Do you wear orthotics AFTER surgery? Yes No

*If yes:* ıCustom ıOver the Counter ıDon't Know

patients who were available for evaluation were included in the present analyses. There were 4 patients (8 feet) with staged bilateral plantar fascial releases and 2 patients (4 feet) with simultaneous procedures performed. All statistical analyses were conducted using SPSS (Version 13.0 for Windows, SPSS Inc, Chicago, IL). We analyzed the data for frequencies and means.

The mean ± SD age at the time of surgery was 53.1 ± 11.7 years (range 28-80 years), 57 (69.5%) were female and 25 (30.5%) were male. Any patient diagnosed with plantar fasciitis who had failed multiple conservative treatment modalities for at least 6 months with no history of previous heel surgery was included in this study. Patients who had previous heel surgery or pain not secondary to plantar fasciitis were excluded. The duration of pain and types of conservative treatments attempted prior to surgery were recorded. However, 11 of the 76 patients (13.4%) were noted to have less than 6 months of conservative treatment since they had previous therapy with no official written documentation prior to their initial visit or they had prior surgery on the contralateral foot with optimal results by the same surgeon.

Each patient included in the study was mailed a written consent and received a telephone questionnaire (Figure 1) which included an 11-point visual analog scale (VAS) of their pain level pre and postoperatively with several yes and no questions pertaining to their activity level, pain status at time of interview, and if they would recommend this surgery to a friend or undergo the same surgery again.

The clinical chart for each patient was reviewed in detail from the time of initial diagnosis to the last postoperative progress note. The patient's subjective evaluation, including level of pain, was obtained from their postoperative follow-up notes and rated as well, fair or poor. "Well" meaning the patient had no complaints, "fair" meaning the patient had a minor complaint or pain that resolved, and "poor" meaning the patient had a complaint or complication that did not resolve during the course of treatment. Each patient was seen on approximately 3 follow-up time points, at 2-5 days, 9-12 days, 13-30 days, 5-8 weeks and after 2 months. Some patients had extended follow-up visits depending on their postoperative course. The average follow-up time was 44.2 ± 29.3 months (range 1.9-97. 8 months).

Any complications including numbness, dehiscence, lateral column pain, arch instability, infection, nerve entrapment, recurrence of symptoms, prolonged scarring or others were recorded. Any pertinent co-morbidity or other causes of foot pain during their course of treatment for plantar fasciitis was recorded if it contributed to their post-surgical results and pain level. The patients received an overall assessment as well, fair or poor based on the postoperative course, pain level at the time of the phone interview, subjective rating up to their final visit, and the surgeon's evaluation.

## PROCEDURE

The patient was placed in supine position with the foot in a dorsiflexed position to place tension on the plantar fascia. The procedure was performed under monitored anesthesia care with an ankle tourniquet that was inflated for an average of 5 minutes. A small, 1 cm transverse incision was made over the plantar medial tubercle of the calcaneus, distal to the fat pad. The margins of the plantar fascia were palpated with a Freer elevator and then the medial and central bands or approximately 75% of the complete ligament was released with a beaver blade. Care was taken to leave the lateral band or at least 25% of the plantar fascia intact. The incision site was reapproximated with one suture and a steri-strip. Each patient was instructed to use crutches for 2 days following the surgery and ambulate afterwards in a postoperative shoe for about 2 weeks. Once the suture was removed, the patient was able to transition to regular shoes with no restrictions.

## RESULTS

The duration of pain and conservative treatment before surgical intervention ranged from less than 6 months to greater than 37 months (Table 1). The majority of patients had undergone treatment prior to their initial visit; however the specific time span was not included in our study unless it was specifically documented in their chart. The non-surgical modalities utilized preoperatively were both custom and over-the-counter orthotics, stretching exercises, night

**Table 1**

**DURATION OF PAIN PRIOR TO SURGERY**

| | NO. PLANTAR FASCIAL RELEASES | % |
|---|---|---|
| Less than 6 months | 11 | 13.4 |
| 6-12 months | 23 | 28.0 |
| 13-24 months | 17 | 20.7 |
| 25-36 months | 10 | 12.2 |
| Greater or equal to 37 months | 21 | 25.6 |

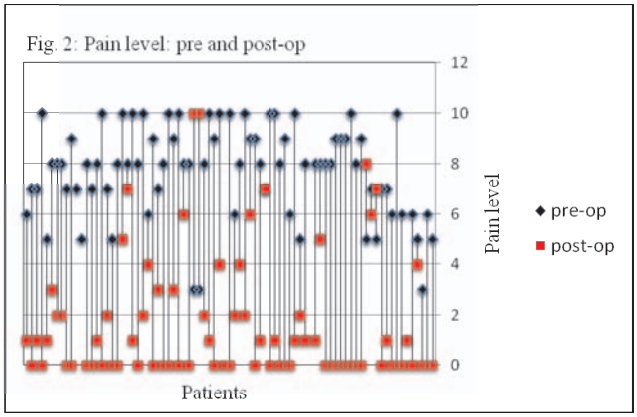


Figure 2.

splints, anti-inflammatory medications, corticosteroid injections, nonweight bearing and short leg walking casts, ice, physical therapy, and Equilizer boots. The number of subjects attempting each conservative treatment is shown in Table 2. Of the 82 feet, 76 received cortisone injections with an average of 1.84 ± 1.19 (range 1-8). Orthotics were worn by 76 of 82 feet (92.7%) of which 43 were custom-made and 68 were over the counter insoles.

An 11-point VAS, with 0 being no pain and 10 being the worst pain imaginable, was used to obtain the preoperative and postoperative pain level as shown in Table 3A. Of the 78 feet evaluated, pain level before the plantar fascial release was 7.72 ± 1.83 (range, 3–10) and after surgery was 1.67 ± 2.50 (range, 0–10). The change in pain level for each patient is depicted in Figure 2. Of the 76 feet, there were 4 with increased pain level. Overall, the pain level decreased by 6.04 ± 3.62 and 93.4% improved as seen in Table 3A. Thirty-nine of the 79 feet or 50% reported no pain upon ambulating postoperatively and 65 (79.3%) were pain-free at the time of the phone interview. Table 4 shows the postoperative data based on the patient questionnaire. There were 34 (41.5%) subjects with recurrence of pain during their postoperative course with 23 (67.6%) being at the same location before surgery and 10 (29.4%) being at a different location. Sixty-six (80.5%) feet were able to participate in daily activities pain-free and with no limitations. Seventy-two (87.8%) were satisfied with their postoperative status as shown in Table 4. Based on the patient questionnaire, 54 subjects (65.9%) used orthotics postoperatively. Overall, 73 (89.2%) would recommend the percutaneous plantar fascial release to a friend and 72 (89.0%) reported they would have the surgery again.

Table 5 shows the postoperative follow-up information based on the retrospective chart review. The clinical assessments show: 100% feet were well at 2-8 days and at 9-12 days, 90.9% were well at 13-30 days, 87.5% were well with 12.5% fair at 5-8 weeks and 70.3% were well with 29.7% fair at greater than 2 months. The overall clinical evaluation showed 75 (91.5%) were well, 6 (7.3%) were fair and 1 (1.2%) was poor. There were 15 (18.3%) minor complications including 7 postoperative scarring, 6 nerve entrapments and 1 periostitis of posterior heel with incomplete resolution. No cases of dehiscence, infection, numbness, arch collapse, or lateral column pain relating to the surgery were noted on final follow-up.

**Table 2**

## NON-SURGICAL MODALITIES

| | NO. PLANTAR FASCIAL RELEASES | % OR MEAN± SD |
|---|---|---|
| **Orthotics** | 76 | 92.7 |
| Custom | 43 | 56.6 |
| Over-the-Counter | 68 | 89.5 |
| Unknown | 2 | 2.6 |
| **Stretching Exercises** | 29 | 35.4 |
| **Night splint** | 32 | 39.0 |
| **Anti-inflammatory medications** | 40 | 48.8 |
| **Corticosteroid injections** | 76 | 92.7 |
| Number of injections | 76 | 1.84 ± 1.19 |
| **NWB cast/ Short leg cast** | 59 | 72.0 |
| **Other conservative treatment** | 26 | 31. |
| Ice | 11 | 42.3 |
| Physical Therapy | 10 | 38.5 |
| CAM Boot | 12 | 46.2 |

## DISCUSSION

The majority of patients with plantar fasciitis are successfully treated with conservative modalities of at least 6 months. According to the literature, success rates vary from 46-100%.[16] Wolgin et al conducted a retrospective study to evaluate the long term results of 100 patients treated conservatively and showed 82% had complete resolution of symptoms. However, 31 patients stated that they would have considered surgery at the time they sought medical attention. He concluded that patients with higher risk of pain were either overweight, had bilateral symptoms, or had prolonged duration of symptoms of greater than 6 months.[16] Approximately 5% of patients fail nonoperative intervention, and may need surgery for their chronic plantar fasciitis.[19,36]

In our patient population, 11 of the 82 feet had undergone less than 6 months of documented treatment since their initial diagnosis but this does not seem to

**Table 3A**

## QUESTIONNAIRE: PRE- AND POST-OPERATIVE PAIN LEVEL

| Pain level | Pre- | | Post- | |
|---|---|---|---|---|
| | N | % or mean ± SD | N | % or mean ± SD |
| 0 | 0 | | 39 | 50.0 |
| 1 | 0 | | 13 | 16.7 |
| 2 | 0 | | 8 | 10.3 |
| 3 | 3 | 3.8 | 3 | 3.8 |
| 4 | 0 | | 4 | 5.1 |
| 5 | 8 | 10.3 | 2 | 2.6 |
| 6 | 8 | 10.3 | 3 | 3.8 |
| 7 | 11 | 14.1 | 3 | 3.8 |
| 8 | 21 | 26.9 | 1 | 1.3 |
| 9 | 11 | 14.1 | 0 | |
| 10 | 16 | 20.5 | 2 | 2.6 |
| average | 78 | 7.71 ± 1.83 | 78 | 1.68 ± 2.51 |

correlate with the final outcome. The majority of the patients received therapy prior to their first visit, however there was no clear indication in the chart; therefore, the time was not factored into the treatment course. Only one of the 11 subjects resulted in a poor outcome based on the overall evaluation although he had attempted several nonoperative measures including orthotics, night splints, stretching exercises and 2 cortisone injections prior to surgery. This patient developed periostitis of the posterior heel on the same foot, 2 months following the surgery. The patient had temporary relief with Tuli's heel cups and multiple injections and was lost to follow-up.

According to the literature, the types of conservative therapies utilized during the course have variable results. In the 100 patients studied, Wolgin et al showed that the most commonly used modality with the greatest success rate (83%) were stretching exercises and cushioned inserts. On the other hand, injections had the least favorable outcome (35%).[16] In a prospective study, Lynch et al showed that taping and orthoses are more effective than non-steroidal anti-inflammatory medications or accommodative modalities in 85 patients.[10] In 1996, Gill et al conducted a study on 411 patients with 77% weighing over 150 pounds. He concluded that the most favorable treatment was the use of a cast and the least favorable were Tuli's heel cups.[7] An outcome study by Martin et al showed 69.7% good outcome in 157 patients when treated by 6 months with less optimal results when treated after 12 months. He found that the stretching, night splints, orthoses and heel pads were equally important but with low compliance. The only exception was with the use of night splints.[11] Wapner et al had successful resolution in 11 of the 14 patients with the use of molded ankle foot orthosis in 5 degrees of dorsiflexion used as night splints in conjunction to other therapeutic regimens.[15]

**Table 3B**

## QUESTIONNAIRE: PRE- AND POSTOPERATIVE PAIN LEVEL

| | NO. PLANTAR FASCIAL RELEASES | % OR MEAN± SD |
|---|---|---|
| Change of Pain Level | 76 | - 6.04 ± 3.62 |
| % pain decreased | 71 | 93.4 |
| % same | 1 | 1.3 |
| % pain increased | 4 | 5.2 |

In 1985, Berlin reported 89% good to excellent relief in 82 patients undergoing percutaneous plantar fasciotomy. He made a transverse puncture incision over the origin of the fascial pain, severed the medial attachment and then performed a partial fasciotomy laterally. When used for the correct indications, consistently favorable results were achieved.[20] Our study shows a patient satisfaction of 87.8%, which is comparable to a similar study in 1998 by Benton-Weil et al. They reported an 83% patient satisfaction in 51 patients with percutaneous plantar fasciotomy procedure, but there was no indication on the extent of plantar fascia released.[19] There have been many articles reporting the success of open plantar fascial releases and endoscropic plantar fasciotomy as well; however, these procedures have also been reported to cause prolonged recovery, stress fractures, wound complications or dehiscence, arch

**Table 4**

## PATIENT QUESTIONNAIRE POST-OPERATIVE INFORMATION

| | NO. PLANTAR FASCIAL RELEASES | % |
|---|---|---|
| **Pain-free now** | 65 | 79.3 |
| **Recurrence of pain** | 34 | 41.5 |
| Same Location | 23 | 67.6 |
| Different Location | 10 | 29.4 |
| Both | 1 | 2.9 |
| **Participation in Daily Activities** | 66 | 80.5 |
| **Patient satisfaction with surgical results** | 82 | |
| Extremely Satisfied | 61 | 74.4 |
| Somewhat Satisfied | 4 | 4.9 |
| Satisfied | 7 | 8.5 |
| Somewhat Dissatisfied | 6 | 7.3 |
| Dissatisfied | 4 | 4.9 |
| **Recommendation of surgery to friend** | 82 | |
| Yes | 73 | 89.2 |
| Unsure | 1 | 1.2 |
| No | 8 | 9.6 |
| **Would patient have surgery again?** | 82 | |
| Yes | 72 | 89.0 |
| Unsure | 1 | 1.2 |
| No | 9 | 9.8 |
| **Orthotics AFTER surgery** | 54 | 65.9 |
| Custom | 29 | 53.7 |
| Over-the-Counter | 15 | 27.8 |
| Both | 6 | 11.1 |
| Unknown | 4 | 7.4 |

**Table 5**

## CHART REVIEW POSTOPERATIVE INFORMATION

| | NO. PLANTAR FASCIAL RELEASES | % |
|---|---|---|
| **Follow-ups** | | |
| 2-8 days | 73 | 89.0 |
| Well | 73 | 100 |
| 9-12 days | 71 | 86.6 |
| Well | 71 | 100 |
| 13-30 days | 22 | 26.8 |
| Well | 20 | 90.9 |
| Fair | 2 | 9.1 |
| 5-8 weeks | 56 | 68.3 |
| Well | 49 | 87.5 |
| Fair | 7 | 12.5 |
| Greater than 2 months | 37 | 45.1 |
| Well | 26 | 70.3 |
| Fair | 11 | 29.7 |
| **Overall Subjective** | 82 | |
| Well | 75 | 91.5 |
| Fair | 6 | 7.3 |
| Poor | 1 | 1.2 |

instability and painful neuromas.[18,29,38] In our study, we recorded any pain not associated with regular postoperative process or any pain after the 8 week time course as a complication. We had no cases of wound complications or dehiscence. There were transient pains during the post-operative course including postoperative scarring, entrapment of nerve to abductor digiti minimi, diffuse plantar fasciitis, low grade discomfort, dorsolateral discomfort, and possible stress fracture. These symptoms appeared to resolve with either a cortisone injection(s), orthotics or nonweight-bearing cast prior to the final postoperative visit.

Interestingly, we had no complications noted at the 2-8 day and 9-12 day follow-up visits but there were more reported cases with subsequent visits. This is consistent with the course of plantar fascial release because as patients begin to ambulate they are placing more pressure and weight on the ligaments and the mechanics of the foot begins to change. Murphy et al used cadaver specimens and digitized computer programs to evaluate the changes in the arch after sequential sectioning of the plantar fascia. They stated that there is an equinus rotation of the calcaneus and drop in the cubiod due to the strain of the plantar calceaneocuboid joint capsule and ligament after complete release of the plantar fascia.[37] A similar study by Crary et al used strain gauges in the plantar ligaments of 11 cadaveric feet and showed that after the plantar fascial release, the axial load increased by 52% in the spring ligament and 94% in the long plantar ligaments.[33] In 2001, Gefen et al used a computational model for stress analysis of the standing foot following surgery and concluded that tension stresses may exceed the normal stress by 200% and can lead to extensive arch deformation.[35] Another computer modeling study by Erdemir in 2004 showed an increased passive arch torques by 7.4%, increased metatarsal head contact forces by 18% and greater toe flexor activity, which may explain mechanics behind plantar fasciotomy complications.[34] Most of these studies tend to focus on the potential complications associated with a complete plantar fascial release.

According to the literature, the single factor that affects the development of lateral column pain is percent

of fascia release.[41,42] In 2002, Brugh et al performed a study to determine the amount of plantar fascia to release (25, 50, or 66%) using endoscopic or open release to treat heel pain effectively while preventing the development of lateral column symptoms. He proposed that a maximum of 50% should be released.[31] In the literature, partial release of 33 to 66% has been recommended.[41-43]

In our study, the medial and central band of the plantar fascia was released percutaneously with care to leave the lateral band or at least 25% of the total ligament intact. Perhaps, another comparison study would be beneficial to evaluate the outcome of percutaneous plantar fasciotomy with less than a 50% release of the plantar fascia. The extent of plantar fascia resected is an important contributing factor to the rate of complications and should be considered for any plantar fascial release surgery. The lateral column pain appears to be more consistent with complete fascial releases, which we avoid with this percutaneous procedure. In addition, the placement of the incision is an important factor. Distal incisions through the fat pad tend to have more complications associated with nerve entrapments.

Patients were scheduled to be seen for 3 follow-up visits postoperatively and until symptom-free however there are several patients who failed to show after their second visit. Four of the five patients who had less than 2 points decrease in the pain level on the VAS postoperatively had no follow-up after the 13 to 30 day time point. There may be an assumption that patients either continued to be pain-free and no medical treatment was necessary, non-compliant or decided to seek treatment elsewhere.

In order to further analyze the potential complications, we reviewed the chart in detail for the 4 patients who had an increased level of pain postoperatively and for all the patients who received an overall rating of fair or poor. Two of the 4 feet with an increase level of pain (from 3 to 10) were in one patient with simultaneous bilateral plantar fasciotomy. The patient had a history of severe rigid pes cavus type feet and had neuroma surgery performed on both feet at the same time. He developed postoperative scarring and received injections bilaterally with minimal relief. He refused to wear orthotics and was lost to follow-up. The third foot had an increase in pain from 5 to 7 and had a history of back pain and calcaneal periostitis status-post injury. She developed diffuse symmetrical bilateral symptoms likely associated with peripheral neuropathy and not objectively related to surgery. The last foot with worsening pain from 5 to 8 developed calcaneal periostitis, 2 months following surgery, and had a poor rating overall. He reported improvement of symptoms with Tuli's heel cups and injections but only temporary relief. His pain was of unknown etiology and he was lost to follow-up.

One patient who received an overall rating of fair developed persistent low-grade discomfort starting at 5 weeks. This patient appeared to have other contributing factors given her history of morbid obesity, hypermobility, posterior tibial tendon dysfunction, and stress fractures. The remaining patients with fair status developed postoperative scarring and nerve entrapment that eventually resolved with injection(s) and/or non-weight bearing cast for 3 weeks. There were 2 patients with lateral column pain that had complete resolution of symptoms with no treatment. Both these patients had decreased level of pain to 1 and 3, were satisfied and would have the surgery again. There was a high rate of recurrence of pain (41.5%) but this does not seem to correlate with pain level or surgery outcome. Nine of the ten patients dissatisfied with surgery had pain in the same location postoperatively. Half of these patients did improve their pain level by 10-60%. Majority of the recurring pain was related to normal postoperative course and/or pedal problems not associated with the procedure. Overall, the level of pain decreased in 93.4% or by 6.04. Also, 89% of patients opted to have the same surgery again.

There are several limitations with this study, especially since most of our assessment to determine the success of the surgery is subjectively evaluated. The phone questionnaire is based on the reliability of the subject's report and some patients were not able to accurately recall their pain level pre- and postoperatively. One patient even forgot that he had foot surgery. The clinical rating as well, fair, or poor is subject to bias since patients will often associate any foot pain to surgery. In our evaluation, we did not factor the problems that were unrelated to the surgery like onychomycosis, trauma, wounds, fractures secondary to injury, or soft tissue masses. The overall assessment is also subject to bias since we incorporated several factors and made interpretations based on the chart reviews, questionnaire, and surgeon's evaluation. Another drawback to our study is the inability to obtain more detailed patient characteristics, which may contribute to their outcome such as patient occupation, weight or BMI, activity level, and specific biomechanical abnormalities. Also, the compliance with the nonsurgical treatments and timeline can be variable and not a dependable source of information. We have no control group as patients who did not undergo surgery had complete resolution of symptoms with conservative therapies. Although one of the eleven patients who received less than 6 months of therapy continued to have postoperative complications, we can not conclude that the length of time is the source of the problem. Of the six subjects who received a fair rating overall, three were from the group who participated in at least 37 months of conservative therapy prior to surgery. There seems to be no correlation between the length of time and surgical success rate.

## CONCLUSION

A restrospective review of percutaneous plantar fasciotomy suggests that this procedure is an acceptable alternative for recalcitrant plantar fasciitis in patients who have failed conservative therapy. The study shows that this is a predictable, simple and cost-effective procedure with reproducible results. We included a large number of cases, 76 patients or 82 feet, with average 42 month follow-up and minimal complications. With resection of only the medial and central bands, there was a decreased risk of lateral column complications and medial arch instability. The evaluation of patient satisfaction through chart checks and questionnaires gave evidence that percutaneous plantar fasciotomy is a valid surgical option and provides significant relief of symptoms. Based on the questionnaire, 89.2% of patients would recommend the surgery to a friend and 89% would have the surgery again.

The advantages to percutaneous plantar fasciotomy compared to open release include shorter operation, shorter tourniquet time, immediate weight bearing, quicker recovery to work, less trauma and less risk of complications. The results of this study compare favorably with other more invasive studies. Even with an 87.8% satisfaction rate, the nonoperative course should be maintained as first line therapy for at least 6 months before consideration of surgical intervention.

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