



Early-Term Functional Results for Combined Technique of Calcaneal Spur Removal, Calcaneal Drilling, and Plantar Fascia Release in Painful Heel Syndrome

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Abstract

Introduction: Painful heel syndrome is characterized by pain and sensitivity in the inferomedial aspect of the calcaneal tuberosity. In cases resistant to conservative treatment, various surgical procedures may be used. The purpose of this study was to report the functional outcomes for a combined technique of calcaneal spur excision, drilling, and plantar fascia release for the treatment of resistant heel pain.

Methods: Patient results of preoperative and postoperative American Orthopaedic Foot and Ankle Score (AOFAS), Visual Analogue Scale (VAS), and Short Form 12 Physical Composite Score (SF-12 PCS) were evaluated. Calcaneal spur recurrence was investigated radiologically.

Results: The median preoperative scores were AOFAS: 50.6, VAS: 7.4, and SF-12 PCS: 42.9. The median postoperative scores were AOFAS: 90.4, VAS: 1.6, and SF-12 PCS: 57.1.

Discussion and Conclusion: Percutaneous calcaneal drilling, spur excision, and minimally invasive plantar fascia release provided good early results in the treatment of resistant heel pain

Keywords: Calcaneal decompression, calcaneal spur, heel pain, plantar fascia release.

Painful heel syndrome is characterized by pain and sensitivity in the inferomedial aspect of the calcaneal tuberosity. The incidence is approximately 15% in the adult population [1]. Although its etiology has not yet been completely clarified, plantar fasciitis is thought to be the most important cause of painful heel syndrome [2]. Other etiological factors may include thickened plantar fascia, calcaneal periostitis, a calcaneal spur, entrapment of the

first branch of the lateral plantar nerve, abnormal mechanics of the foot, and systemic disease [3-7].

In most patients, complaints can be relieved with a modification made to shoes, physiotherapy, extracorporeal shock therapy, or steroid injections [8,9]. Cases of painful heel syndrome that resist conservative treatment (>6 months) can be treated surgically. The surgical technique is usually selected according to the etiological factors believed to be

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Submitted Date (Başvuru Tarihi): 10.10.2017 **Accepted Date (Kabul Tarihi):** 12.12.2017

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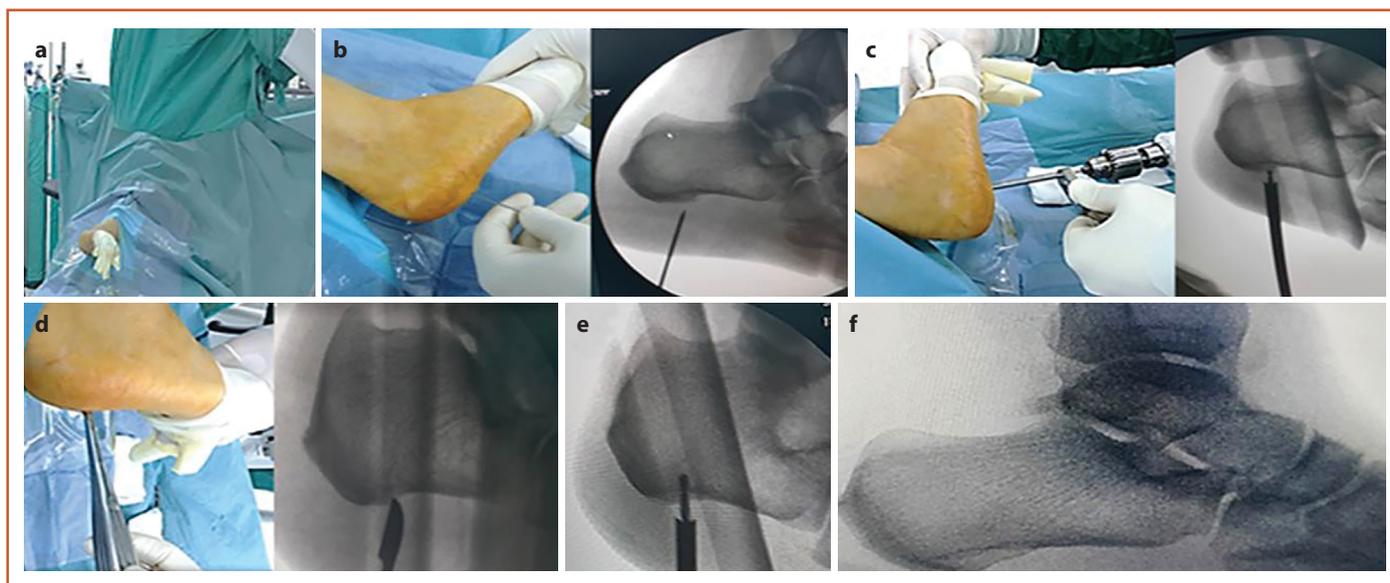


Figure 1. Patients were placed in the lateral decubitus position (a), the calcaneal spur was marked using a K-wire under fluoroscopy (b), the spur was drilled (c), and remnants were removed with a curette (d). Drilling and decompression of the inferior calcaneal cortex (e). Fluoroscopic view following excision of the spur and drilling (f).

the cause. Several surgical techniques have been described in the literature. Generally, the basic procedure is a plantar fasciotomy, and it may then be combined with various other techniques, such as calcaneal drilling, spur excision, or lateral plantar nerve release^[10].

The aim of this study was to report early functional outcomes of patients who underwent surgery combining the calcaneal spur excision, percutaneous calcaneal drilling, and plantar fasciotomy techniques.

Materials and Methods

After receiving the written consent of the patients, we retrospectively evaluated 19 heels of 14 patients who had been treated conservatively for at least 6 months between November 2015 and October 2016. Upon persistence of

complaints, a combination of calcaneal spur excision, percutaneous calcaneal drilling, and plantar fasciotomy was performed.

The patients were called for a final control visit, and the plantar region was examined for the presence of infection or skin lesions. Heel walking tests were conducted and patients were asked about pain. The American Orthopaedic Foot and Ankle Score (AOFAS), Short Form Physical Composite Score (SF-12 PCS), and Visual Analogue Scale (VAS) for pain were administered, as well as a patient satisfaction questionnaire (Table 1). The patients were asked how many weeks it took to achieve complete healing, if there was the need to use an insole or other support device after the operation, and if there were any complications. Weight-bearing anteroposterior and lateral radiograms of the affected feet of all patients were obtained.

The presence of active plantar infection, history of systemic inflammatory or metabolic disease (rheumatoid arthritis, diabetes mellitus, etc.), ipsilateral foot or ankle surgery for another reason, surgery performed at another center, and failure to attend periodic control visits were exclusion criteria. Three patients who did not meet the inclusion criteria were excluded. Fifteen heels of 11 patients were included in the study.

The data obtained were compared with preoperative data and the differences between preoperative and postoperative AOFAS, VAS, and SF-12 PCS results were analyzed statistically. The radiograms were examined for any recurrence of calcaneal spurs.

Table 1. Preoperative and postoperative AOFAS, VAS, and SF-12 PCS results

	n	Min.	Max.	Median	SD
Preop AOFAS	15	43.00	68.00	50.66	8.42
postop AOFAS	15	76.00	100.00	90.40	7.28
preop VAS	15	6.00	9.00	7.46	1.18
postop VAS	15	0.00	4.00	1.60	1.24
Preop SF-12 PCS	15	32.10	53.70	42.91	6.65
postop SF-12 PCS	15	53.70	59.90	57.18	1.86
MHT (weeks)	15	5.00	17.00	10.00	3.60

AOFAS: American Orthopaedic Foot and Ankle Score; MHT: Mean healing time; postop: Postoperative; preop: Preoperative; SF-12 PCS: Short Form 12 Physical Composite Score; VAS: Visual Analogue Scale.

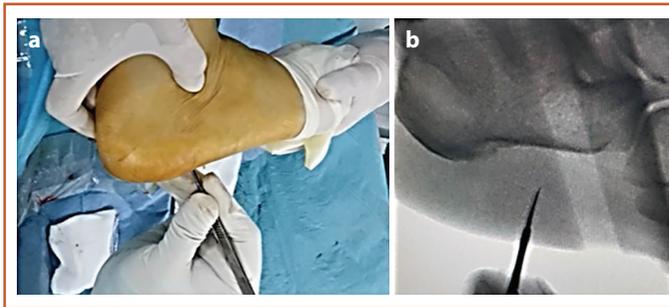


Figure 2. Release of the plantar fascia (a) and checking depth with a scalpel (b).

Surgical Technique and Postoperative Patient Care

All of the patients signed informed consent forms before the operation. The surgeries were realized under spinal or general anesthesia based on the decision of anesthesiologist and the patient. All surgeries were performed by the same surgeon in the same hospital. The patients were placed in the lateral decubitus position. All of the patients underwent a combined technique of calcaneal spur excision, percutaneous calcaneal drilling, and plantar fasciotomy. The calcaneal spur was marked on the lateral plane under fluoroscopy using a K-wire. The insertion point of the K-wire was enlarged with a scalpel, and a 3.5-mm guidewire was added over the K-wire to engage the calcaneal spur and the calcaneus. The spur was debrided completely using a 2.7-mm cannulated drill, and remnants of the calcaneal spur were removed with a fine curette. Through the same incision, a total of between 3 and 6 drill holes were made on the inferior cortex, and calcaneal drilling was performed (Fig. 1).

For the release of the plantar fascia, the big toe was dorsiflexed to stretch the plantar fascia, which was palpated under the skin. A transverse 1-cm incision was made on the midline of the medial plantar region where the plantar fascia was felt. The medial edge was exposed with delicate dissection. One-third of the medial edge of the plantar fascia was dissected away from whole of the fascia, and all of the toes were dorsiflexed to stretch the plantar fascia. The already detached third of the fascia was cut with a scalpel to relieve the tension, and the plantar release procedure was completed (Fig. 2).

The patients were permitted to walk on their heels 3 weeks after the operation. After the postoperative third week, walking with complete weight bearing and using insoles that provide arch support was recommended. Foot and ankle rehabilitation and plantar fascia stretching exercises were demonstrated to the patients before their discharge from the hospital, and they were advised to do these exercises regularly. The patients were called for follow-up visits at the first, second, fourth, and eighth week, and then every 2 months after discharge.

Table 2. Preoperative and postoperative AOFAS, VAS, and SF-12

	n	Min.	Max.	Mean	SD
Age (years)	15	38.00	54.00	46.06	5.57
Follow-up period (months)	15	12.00	22.00	14.86	2.97
BMI (kg/m ²)	15	19.30	30.20	24.78	3.81

BMI: Body mass index.

Statistical Analysis

The differences in parameters measured preoperatively and at the last control visit were analyzed using the Wilcoxon signed-rank test and dependent t- test. P<0.05 was accepted as the level of significance.

Results

A total of 15 heels were included in the study: 2 heels of 2 men and 13 heels of 9 women. The left heel of 8 and right heel of 7 patients was operated on. The mean age of the patients was 46 years (range: 38-54 years). The mean body mass index (BMI) of the patients was 24.7 kg/m² (range: 19.3-30.2kg/m²). The mean follow-up period was 14.8 months (range: 12-22 months) (Table 2).

The median preoperative values were AOFAS: 50.6 (min: 43, max: 68), VAS: 7.4 (min: 6, max: 9), and SF-12 PCS: 42.9 (min: 32.1, max: 53.7). The median postoperative scores were AOFAS: 90.4 (min: 76, max: 100), VAS: 1.6 (min: 0, max: 4), and SF-12 PCS: 57.1 (min: 53.7, max: 59.9). The increases in the patients' AOFAS and SF-12 PCS scores, and the decrease in VAS pain scores were statistically significant (p<0.01) (Fig. 3).

BMI did not have a statistically significant effect on the study results. The responses to patient satisfaction surveys administered postoperatively indicated that 46.6% of the patients reported their level of satisfaction to be excellent, 40% replied with very good, 6.6% said somewhat dissatis-

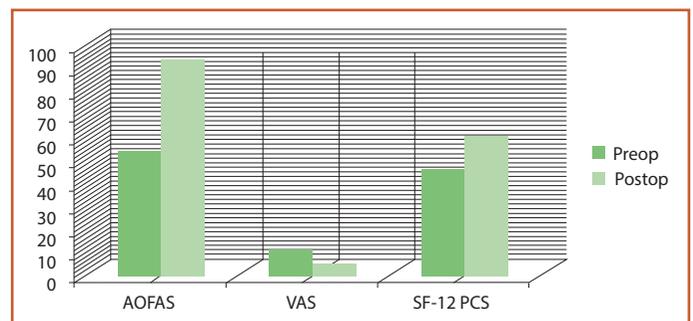


Figure 3. Preoperative and postoperative AOFAS, VAS, and SF-12 PCS values

AOFAS: American Orthopaedic Foot and Ankle Score; SF-12 PCS: Short Form 12 Physical Composite Score; VAS: Visual Analogue Scale.

fied, and 6.6% expressed complete dissatisfaction.

Radiological follow-up revealed recurrent calcaneal spur formation in 2 (13.3%) patients. Tissue infection and prolonged wound healing at the incision site were observed in 1 patient. In another patient, a lack of sensitivity was seen in the heel region, and pain lateral to the midline of the plantar region was observed. Superficial tissue infection was treated using oral antibiotics and local debridement. None of the patients required reoperation.

Discussion

Painful heel syndrome is a complex disease that may have several causes. In studies, intraosseous pressure and venous congestion have been detected as basic pathogenetic steps in the development of this disease [11]. Calcaneal drilling has been used by many surgeons in the surgical treatment of painful heel syndrome [12-14]. Various methods have been described. Santini et al. [15] achieved calcaneal decompression by drilling 3 holes in the medial cortex of the calcaneal bone. Osama et al. [12] used an arthroscopic method, and created as many as 6 holes in the inferior cortex. We created between 3 and 6 holes in the inferior cortex to achieve calcaneal decompression. We used the same incision for spur debridement; no additional incision was required.

In some studies of plantar heel pain, the authors indicated that a calcaneal spur is not the cause of the painful heel syndrome; rather, it is the outcome of a pathology. In 50% of patients with a painful heel, a calcaneal spur is present, yet a calcaneal spur has also been reported in 16% of the population without painful heel syndrome [16,17]. We observed a recurrent calcaneal spur in 2 patients postoperatively. One of these patients had a painful heel, while the other patient was pain-free. Therefore, the presence of a calcaneal spur cannot be evaluated as the absolute cause of a painful heel. Although the surgical indications for spur resection in the literature are not yet clear-cut, the majority of surgeons agree that excision of the spur has favorable outcomes in pain relief and postoperative patient satisfaction [18-20]. We observed a decrease in pain level and high degrees of patient satisfaction (excellent: 46.6%, very good: 40%) in patients who underwent spur excision.

Open, mini-open, and arthroscopic plantar fasciotomy methods have been reported. The open plantar fascia release procedure is a popular method; however, it requires a large incision and significant dissection, the healing time is longer and there is the potential risk of painful scar tissue [1, 21]. Arthroscopic plantar fascia release has been evaluated as a method with a high success rate by experienced surgeons.

However, complications such as severe pain and nerve compression at the arthroscopic portals are possible [22,23]. In a study by Bazaz et al. [24], the author found much better improvement in the level of pain using open surgery, while arthroscopic release yielded a shorter recovery time and faster return to preoperative activity level. With our minimally invasive procedure, the average healing time was 10 weeks, and apart from 1 patient, wound site complications were not observed.

The amount of the plantar fascia to be cut is still debated. At first, Barret et al. [25] advocated total release; then they subsequently reported that release of one-third of the medial part of the plantar fascia would not affect the calcaneocuboid locking mechanism. According to Cheung et al. [26], less than 40% fascial release will have only a minimal effect on bone stability and normal foot biomechanics [26]. In our cases, one-third of the medial part of the plantar fascia was released. At the conclusion of follow-up, none of the patients had experienced lateral column symptoms or bone instability.

Thomas et al. [27] reported that a combined percutaneous calcaneal drilling and minimally invasive fasciotomy technique decreased the recurrence rate and increased success, especially in the treatment of painful heel syndrome caused by intraosseous hypertension. Controlled, partial plantar fascia excision can prevent potential complications and further increase patient satisfaction. In the present study, 86.6% of our patients indicated that the outcome was excellent or very good. No instance of painful scar tissue or nerve entrapment/compression was seen.

Conclusion

A combined technique to treat refractory painful heel syndrome, consisting of percutaneous calcaneal drilling, spur excision, and minimal invasive plantar fascia release, yielded very satisfactory outcomes in the early phase. The success of this combined technique, with a low complication rate and high patient satisfaction level, will be more precisely defined in additional studies performed with larger patient groups.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: K.K.; Design: K.K.; Data Collection or Processing: K.K., S.G.B., E.Y.; Analysis or Interpretation: K.K., S.G.B., E.Y.; Literature Search: K.K., S.G.B., E.Y.; Writing: K.K., S.G.B., E.Y.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study received no financial support.

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