

Outcome Evaluation of Endoscopic Plantar Fascia Release for Plantar Fasciitis in Vietnam

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ABSTRACT: Plantar fasciitis is one of the major causes of heel pain, with or without consequences of calcaneal spurs. Most patients respond to conservative therapy, but the remaining 5 to 10% fail and convert into surgical treatment. Endoscopic orthopedic surgery is gaining popularity; however, we have first performed endoscopic plantar fascia release (EPFR) in Vietnam and described the outcome results of EPFR in the medical setting of Vietnam in order to evaluate its short-term outcome. A prospective study was conducted from October 2017 to December 2019 at the Orthopedic Trauma Institute, Vietnam-Germany University Hospital in patients diagnosed with plantar fasciitis, who underwent over 6 months of conservative treatment showing no improvement. The American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale was used for evaluation. 20 patients undergoing EPFR were included. EPFR provides a new approach in surgical treatment of plantar fasciitis, from our initial results, enabling the surgeons to obtain good visualization and widen the surgery space while limiting complication risks, showing potential outcomes to perform widely in the medical setting of Vietnam. There is a need for larger sample size research, longer follow-up period and more high-quality level clinical trials with validated outcome measures in the nearby futures.

KEYWORDS

Endoscopic plantar fascia release; Plantar fasciitis; Short-term outcome; Outcome evaluation.

INTRODUCTION

Plantar fasciitis is the inflammatory condition of the plantar fascia, and it is one of the major causes of heel pain [1]. Over 90% of cases respond to conservative treatment, including no steroidal anti-inflammatory drugs, stretching, night splint use, foot orthosis use, physical therapy and extracorporeal shockwave therapy [2]. However, the remaining 5% to 10% of patients do not improve with conservative treatment and may be candidates for surgical treatment [3]. Previously, it was thought that calcaneal spurs were the major cause of heel pain; therefore, calcaneal spur removal surgery was common and still exists today in some medical settings. However, clinical evidence suggests that only 40% of patients with plantar fasciitis have calcaneal spurs as a consequence, not the cause of heel pain [4]. The plantar fascia release by open surgery was very common in the treatment of plantar fasciitis, but there are still some problems such as prolonged postoperative period, persistent postoperative pain, and possible neurological damage [5]. Recently, with the development of medicine in general and surgery in particular, minimal invasive surgery has become more common. EPFR in treatment of plantar fasciitis was first described by Barrett and Day in 1991 [6]. From then onwards, EPFR has been continuously improved on methods and techniques, yielded satisfactory results which creates a new direction in the orthopedic surgery of the foot and the ankle.

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To our knowledge, although it is known to be more widely performed, there have not yet been any prospective cohort studies published to date studying outcome evaluation of EPFR for plantar fasciitis in Vietnamese patients.

Therefore, our primary aim was to evaluate short-term outcome of EPFR in the treatment of plantar fasciitis indicated to surgery.

MATERIALS AND METHODS

A prospective study was conducted from October 2017 to December 2019 at the Orthopedic Trauma Institute, Vietnam-Germany University Hospital, in 20 patients diagnosed with plantar fasciitis, who underwent EPFR after a more-than-6-month course of conservative treatment without showing any improvement.

Plantar fasciitis was diagnosed by history, physical examination, and study images. The inclusion criteria were as follows: (1) Heel pain that was most intense upon the first steps after getting out of bed or after prolonged periods of sitting; (2) Plantar fascia thickness exceeds 4.5 mm in ultra-sonographic measurements, and/or signs of plantar fasciitis on MRI scans; (3) Patients who underwent more than 6 months of conservative treatment without showing any improvement.

Surgical procedures and postoperative management

Preoperatively, all the patients included were assessed by age, length of conservative therapy, clinical examination and imaging modalities, demonstrated by presence of calcaneal spurs, AOFAS scores, plantar fascia thickness measured on ultrasound and MRI.

The patient was prepared and draped in the aseptic manner, placed in the supine position with the operative foot elevated by approximately 15cm using a leg holder. Either regional or general anesthesia was used. Our endoscopic system (Figure 1) included a slotted obturator, a hook blade, an elevator. A tourniquet was applied to improve exposure. The incision placement (Figure 2) was described by Ferkel *et al*, located over a reference point determining by palpation [7]. A 5-mm vertical incision was planned at the glabrous junction along the medial aspect of the foot, 2 to 3 fingerbreadths from the medial calcaneal tubercle with a no.15 blade, followed by a small blunt dissecting scissor to separate the subcutaneous fat and create a portal.



Figure 1. Our endoscopic system to perform EPFR.

This procedure was assisted by palpation as limited space through such a small incision made comprehensive visualization impossible. The fascial elevator was introduced into the incision, then the elevator was advanced across the interior aspect of the fascia to create a channel for the obturator/ cannula. The fascial elevator was removed by applying gentle dorsal pressure. The fascial elevator would “drop-off” the medial investment of the fascia when exiting the medial portal. This would confirm that the fascial elevator is inferior to the fascia. We introduced the obturator/cannula assembly in a similar manner.

Once the tip of the obturator was palpated on the lateral aspect, a small vertical incision was made over the tip so the obturator could pass through the soft tissue. The obturator was removed (Figure 3). A 4.0mm, 30-degree arthroscope was introduced through the medial portal and the hook blade was introduced through the lateral portal, allowing the surgeon a 180-degree perspective. The hook blade was advanced medially across the fascia engaging the medial band edge.



Figure 2. Incision placement measured from a non-weight-bearing projection.

The double banded cannula marking would help locate where the medial fascia release began and the single marking would help locate where this process should be stopped. The hook blade was withdrawn laterally, and by that the medial one third of the plantar fascia was transected. Any remaining fascia fibers would be released. Visualization of the intrinsic muscle belly beneath the fascia would confirm a complete release. Only the medial one third of the plantar fascia was released (Figure 4). Skin closure was done with simple interrupted 5-0 nylon or prolene. 3cc of Marcaine Plain Multidose 0.5% and 1cc of dexamethasone phosphate were applied to the surgical site. The operative foot was wrapped in a small compressive gauze dressing and placed in a surgical shoe.



Figure 3. The obturator/cannula system was advanced laterally, superficial to the plantar fascia.

Operational results would be evaluated before discharge with incision recovery, operating time, hospital stay. Clothes changing and shower were allowed from the first day after the surgery. Sutures were removed 10-14 days after the surgery. Patients were advised to apply a bandage and wear a comfortable regular shoe. If the patient could not tolerate the regular shoe, a surgical shoe was recommended. Patients were advised not to be on their feet in regular shoes more than 5 minutes per hour during the first 4-6 weeks. If it was necessary for the patients to be on their feet more frequently, they were recommended to wear cast boots. Patients were encouraged to begin gently stretching and slightly walking from the first

day after the surgery, rather than being sedentary. Patients were also advised to avoid going up on stairs or climbing on ladders and other stressful activity for 8 weeks after surgery. Running and other intensive activities were also advised to be avoided for 8-12 weeks, based on clinical recovery.

At 6 months, 12 months and 2 years postoperative follow-up, AOFAS Ankle-Hindfoot Score was used to evaluate their short-term recovery.

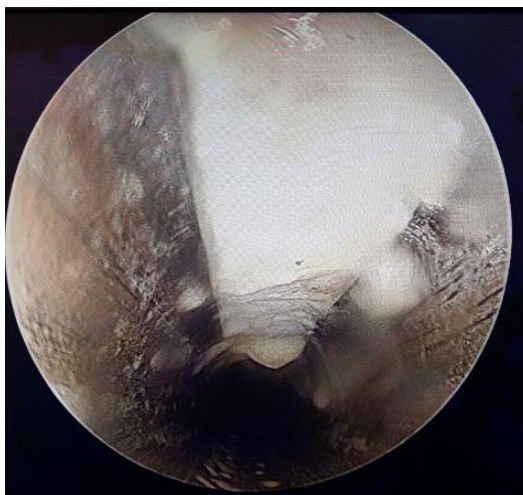


Figure 4. Medial plantar fascia release.

RESULTS AND DISCUSSION

A total of 20 patients underwent EPFR in our study, followed up within 2 years after surgery. Of the 20 patients, 3 were males (15%) and 17 were females (85%), mostly middle-aged. The mean age was 53.2 ± 12.5 (range 31 to 70) years. The mean duration of conservative treatment with NSAIDs was 20.2 ± 7.5 months before being indicated to surgery.

On the foot X-rays, 15/20 patients had attached calcaneal spurs, accounting for 75% of the total number of cases. The mean plantar fascial thickness measured on ultrasound was 5.25 ± 0.64 mm. The mean thickness of plantar fascia measured on T1-weighted MRI is 5.05 ± 0.76 mm.

The average surgery time was 15.7 ± 2.0 minutes. Complications included 2 cases, one with paresthesia resolving within 2 months, one with seroma at the incision.

The mean score on the American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale improved from 65.0 ± 12.5 before surgery to 89.4 ± 11.5 ; 91.6 ± 10.6 and 92.4 ± 9.1 at 6 months, 12 months and 2 years after surgery, respectively, as shown in Table 1 divided into 2 subgroups: with or without calcaneal spurs before surgery.

Table 1. Average AOFAS score over time

	Pre-operative	6 months post-op	12 months post-op	2 years post-op
AOFAS score	65.0 ± 12.5	89.4 ± 11.5	91.6 ± 10.6	92.4 ± 9.1
- calcaneal spur present	65.3 ± 13.0	92.3 ± 9.0	93.6 ± 8.0	93.6 ± 8.0
- calcaneal spur absent	63.8 ± 12.2	80.8 ± 15.0	85.4 ± 15.9	88.8 ± 12.2

Two complications were observed during this study. 1 patients developed symptoms of paresthesia in the lateral instep, the symptom spontaneously relieved and disappeared after 2 months. 1 patient was observed with signs and symptoms of seroma at the site of surgical incision, which was treated with fluid aspiration and antibiotics. There were no cases of venous thrombosis, residual heel pain or arch collapse.

Plantar fasciotomy is the most common surgical procedure for plantar fasciitis. It is considered as the mainstay of surgical treatment. Overall, a surgical release has a 70-90% success rate in treating chronic persistent plantar fasciitis. Plantar fascia release can be approached in a variety of techniques, including open fasciotomy, in-step plantar fasciotomy and minimally invasive fasciotomy [8]. EPFR offers the surgeon clear visualization of the anatomy at the surgical site. This technique has been continuously developed to decrease the occurrence of surgical complications, shortening the duration of the surgery, hospital stay and the duration of returning to initial activities [9].

In our study, evaluation of 6-month postoperative AOFAS score showed that the patients had significantly improved functional outcomes with an average improvement from 65.0 to 89.4 points, showing similar results compared to the other authors: O'Malley, Saxena, Zhou [10, 11, 12]. The most satisfactory result was that of Komatsu *et al*, improving from 64.2 to 92.6 at 2 years after surgery ($p < 0.0001$) [13].

In this study, we chose superficial fascial approach (SFA) over deep fascial approach (DFA) for EPFR. Barrett *et al* were the first ones to perform EPFR. However, they reported that this approach was technically difficult and caused more damage to the surrounded tissue [6]. Jerosch *et al* also conducted a study with DFA technique, and they reported clinical improvement in 13 of 17 patients [14]. In a study conducted by Komatsu *et al* using DFA, the research team reported a clinical improvement in AOFAS score from 64.2 ± 6.3 points before surgery to 92.6 ± 7.1 points at 2 years after surgery, referring that this result was equal or superior to those of past studies, due to the complete resection of the plantar fascia under good visualization through the deep fascial portal [13]. However, a comparative study conducted by Catal *et al* reported a higher AOFAS-AHS score at 3 weeks after surgery and lower VAS score at 3 weeks and 3 months after surgery in the group of SFA. Although there was no difference at the late postoperative phase and the final follow up visit, the better scores in the early postoperative period of the SFA group revealed a relatively faster recovery compared to the DFA group. According to the author, the longer recovery in the DFA group was due to damage to the plantar portion of the flexor digitorum brevis muscle during debridement for visualization [15]. In our study, SFA technique used for EPFR also showed a rapid recovery with an improvement in AOFAS score from 65.0 points before surgery to 89.4 points at 6 months after surgery. Catal *et al* reported that the mean operative time for SFA group was significantly shorter than that of the DFA group (19.05 ± 4.01 minutes compared to 35 ± 5.62 minutes) and clarified that easier endoscopic orientation through the slotted cannula was a factor for the shorter mean operative time in the group using SFA technique [15]. The mean operative time in our study was 15.7 ± 2.0 minutes, displaying the similarity to Catal.

Barret *et al* originally support the complete resection of the plantar fascia, however, eventually, they recommended to only release the medial one-third of the plantar fascia. The reason for changing the releasing an amount of plantar fascia was to minimize the risk of arch instability and maintain normal foot biomechanics, prevent the disruption of the locking mechanism for the calcaneocuboid joint [16]. Cheung *et al* recommended the partial release of less than 40 percent of the plantar fascia [17]. Brugh *et al* found out that lateral column syndrome was more likely to occur when releasing more than 50 percent of the plantar fascia [18]. However, a prospective case series reported by De Prado *et al* found that percutaneous complete fascia release did not produce a remarkable drop in arch height on X-rays compared to partial release [19]. In our study, SFA technique was utilized advocating the partial release and showing good outcomes. After surgery, we instructed to perform exercises with gradually increasing loads, thus helping the arch to adapt with the sudden strain reduction of the plantar fascia.

Previously, it was thought that calcaneal spurs were the major cause of heel pain, thus, calcaneal spur removal surgery was common and still exists today in some medical settings. However, it is now widely accepted that calcaneal spurs can occur with plantar fasciitis, but not the cause of the heel pain [20]. Previous reports have not shown any evidence in pain reduction with removing the calcaneal spur [21]. However, Zhou *et al* reported that EPFR and calcaneal spur removal proposed good outcomes for both type A and type B spurs [12]. However, in our study we left the calcaneal spurs intact in order to avoid post-surgery complications such as calcaneal inflammation and calcaneal fistula, also to shorten operative time.

Previous studies reported that dual portal techniques have primarily attributed to higher complication risks, including nerve entrapment, arterial tears, postoperative stress fracture, recalcitrant lateral pain [18, 22]. Because the portal tract used for dual technique have been shown to be in close proximity to the posterior tibial nerves and their branches, enhancing the risk of nerve damage by introducing the endoscope deep to the plantar fascia [23]. However, O'Malley *et al* reported no nerve entrapment complications along with significant AOFAS score improvement from 62 to 80 points using dual ports [10]. In our study, we advocated to dual port technique because it offered better visualization and wider surgical space to deal with the plantar fascia without spur removal compared to uniportal approach. To increase avoidance to this nerve damage, a small incision was made along the medial side of plantar fascia. The patient with complication of lateral instep paresthesia then resolved symptoms after 2 months and returned to normal activities. 1 patient was observed with signs and symptoms of seroma at the site of surgical incision due to her foot soak in warm water within 7 days after surgery. The patient was treated with fluid aspiration and antibiotics.

Miyamoto *et al* showed that the prognosis of sedentary patients was inferior to that of patients engaged in athletic activities [24]. Therefore, in our study, all the patients were encouraged to begin gently stretching and slightly walking from the first day after the surgery, rather than being sedentary.

Gibbons *et al* reported 73% of patients experienced satisfactory relieving symptoms in a long-term follow up period within 10 years after surgery [25]. Mao *et al* showed that EPFR seemed to be effective in the treatment of recalcitrant plantar fasciitis, however, the maximal follow-up duration of studies included was 2 years and only one article with level of evidence I was found [26].

Limitations of our study include the lack of a standardized objective scoring system for EPFR procedures, a small sample size and a short-term follow-up duration. The reasons are the small number of patients with plantar fasciitis who fit the surgical criteria in clinical practice and the medical setting in Vietnam still lacking of medical infrastructure and hospital employees. To our knowledge, we have first performed EPFR in Vietnam and evaluated the short-term outcomes of this technique on Vietnamese population. Further research should be made with longer follow-up period of more than 5 years with a larger number of patients for more reliable results. Larger, prospective, randomized controlled trials would be helpful to introduce validated outcome measures and stronger evidence to make recommendations.

CONCLUSIONS

Endoscopic plantar fascia release provides a new approach in surgical treatment of plantar fasciitis, from our initial results, enabling the surgeons to obtain good visualization and widen the surgery space while limiting complication risks, showing potential outcomes to perform widely in the medical setting of Vietnam. There is a need for larger sample size research, longer follow-up period and more high-quality level trials with validated outcome measures in the nearby futures.

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