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Original Article

ENDOSCOPIC PLANTAR FASCIA RELEASE IN CASES OF CHRONIC RESISTANT PLANTAR FASCIOPATHY

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Abstract

Purpose : *The intention of this study was to evaluate the efficacy of endoscopic plantar fascia release in the therapy of resistive plantar fasciopathy.* ***Material and Methods:*** *30 individuals with plantar fasciopathy who had been recalcitrant to at least two forms of conservative therapy for at least six months were selected to participate in a prospective research.. Most of our patients had already been clinically diagnosed.* ***Results:*** *At 6 months after operation, the average AOFAS total score was significantly increased from 35 (8-62) up to 85.5 (range, 71-100), (P < 0.001). The median VAS score was significantly dropped from 10 (interquartile range, 9.25-10) up to 0 (interquartile range, 0-2.75) (P < 0.0001). The percentage of patients who scored good or exceptional on the Roles and Maudsley scale had dramatically risen after 4 weeks, rising from 73% to 93% (28/30). There were no serious adverse events.* ***Conclusion:*** *Endoscopic plantar fascia release is an efficient medication for people with relentless resistant plantar fasciopathy.*

Keywords: *Endoscopic release, Plantar fascia, Plantar fasciopathy.*

1. Introduction

One of the most prominent root causes of heel discomfort is plantar fasciopathy, which may substantially hinder everyday activities [1]. A variety of terms are used when talking about heel unease, including plantar fasciitis, jogger's heel, tennis heel, police officer's heel, and others [2]. Even though plantar fasciitis is more common, the most accurate term is plantar fasciopathy because cells associated with inflammation seldom appear in the substrate cytology [3]. The illness's origination is a mystery. Irritation from overstretching the fascia may culminate in pathological deformations such mucoid degeneration, reparative inflammatory processes, and ultimately calcification [4]. A frequent symptom of plantar fasciopathy involves significant pain that worsens after getting out of bed or while beginning an activity and goes away as the individual warms up. In more serious circumstances, pain frequently becomes worse over the day [5]. In most cases, plantar fasciopathy will heal on its own. Unfortunately, the average resolution time is between 6-18 months, which can be frustrating for both patients and doctors [6]. There is a reported 85% success rate with non-surgical treatment of plantar fasciopathy, but it may take months to resolve [7]. Platelet-rich plasma (PRP), which is separated from the patient's own blood, contains a substantial quantity of growth factors that are crucial for tissue healing.

PRP therapy is a unique and growing therapy option for plantar fasciopathy [8]. Numerous surgical methods, with varied degrees of success, have been proposed. Excision of the spur, calcaneal neurolysis, Heel awkwardness can be handled surgically by calcaneal drilling, isolated plantar fascia release at the calcaneus, and calcaneal rotational osteotomy [9]. Endoscopic plantar fascia release has been shown to be a successful remedy for plantar fasciopathy in place of conventional surgical procedures. The overwhelming majority of patients were happy with what happened. Endoscopic plantar fascia release has a low risk of harm to tissue that will last for an entire life [10].

2. Patients and Methods

In a prospective case series research conducted at the orthopaedic department of the Faculty of Medicine, Sohag Uni., thirty individuals with recalcitrant heel pain for at least a year each were included. Patients had to be at least 18 years old and have suffered heel discomfort for at least a year in order to qualify, and had tried and been unsuccessful with two or more of the following conservative treatments: NSAIDs (nonsteroidal anti-inflammatory medicines), glucocorticoid injections, physical therapy, a workout routine (including stretches for the plantar fascia and the Achilles tendon), and orthotics are some of the curative choices.

2.1. *Criteria for exclusion*

***)** Patients under the age of 18. ***)** Patients with a history of tarsal tunnel syndrome, seronegative arthropathy, widespread polyarthritis, or diabetes. ***)** Congenital birth defects that may impact a patient comprise pesplanus, pescavus, limb length discrepancy, in-toeing, and neuromuscular issues. ***)** Patients who have cancers, vascular ano-malies, or neurological disorders on either side of their body. ***)** Fractures, deform-ities, or recent injuries to the foot, ankle, or both. ***)** Disorders of bleeding or active anticoagulant therapy. ***)** Individuals who have had a corticosteroid injection in the past four weeks are included. Age, gender, employment, afflicted side, length of symptoms, and prior steroid injections were noted for each patient. **1)** Look over, palpate, execute a neurological examination, and do specialised clinical tests on the afflicted side, contrasting the outcomes to those on the unaffected side. **2)** Physical examination to rule out underlying con-ditions. The diagnosis relied heavily on patient history and physical exam. All patients, however, had a calcaneus x-ray taken before surgery to prove that they had a heel spur. The following three scores were used to evaluate all patients before and after surgery: **1)** a 0-100 visual analogue pain scale used to gauge morning agony. **2)** AOFAS, or American Orthopaedic Foot and Ankle-Hindfoot Scale It scores suffering which is worth 40 points, performance, which is worth 50 points, and posture, which is worth 10. **3)** a self-evaluation by the patient was taken using the Roles and Maudsley [11]. Rec-eived evaluations for relief from pain and functional improvement at 2, 4, 3, and 6 months postoperatively.

2.2. *Operative technique*

Prophylactic 2g of ceftriaxone vial was given I hour before the operation. The patient was in a supine posture with their foot hanging off the surgical table while under spinal anaesthesia, and a pneumatic tourniquet was continuously applied to their thigh. A medial portal was made by cutting a vertical line across the medial malleolus's posterior border while holding the foot in a neutral position, fig. (1). A 5 mm cannula trocar with a blunt tip was used to make a transverse incision in the subcutaneous tissue just under the plantar fascia. To access the cannula, a lateral portal was created, fig. (2). Then, a gauze tape was repeatedly slipped between the medial and lateral openings to form a subcutane-

ous tunnel, fig. (3). The plantar fascia served as the tunnel's ceiling. After creating a lateral incision, the cannula was inserted. The sheath was then put over the trocar through the lateral portal after the blunt trocar had been repositioned from the medial to the lateral portal. Then, a line was installed to bring in irrigation fluid at a pressure of 50-60 mmHg. The cannula was used to insert an endoscope. The subcutaneous tissue was debrided using a motorized shaver blade until the plantar fascia's lustrous fibers were clearly seen, fig. (4). As shown in fig. (5). The plantar fascia's centre was where by by vertically puncturing the heel's skin with a needle. Full thickness loosening finishes when abductor hallucis muscle fibres are visible, fig. (6), It necessitate precisely depicting the medial side of the plantar fascia and incorporating a shaver via the medial portal to split it into two leaflets. After exposing the bony plantar fascia attachment. With a motorised incisor blade, the entire posterior leaflet was debrided, fig. (7). After that, we irrigated the tube and used one 3-0 proline suture to close up each portal. The patient was subsequently given a dressing and a crepe bandage.

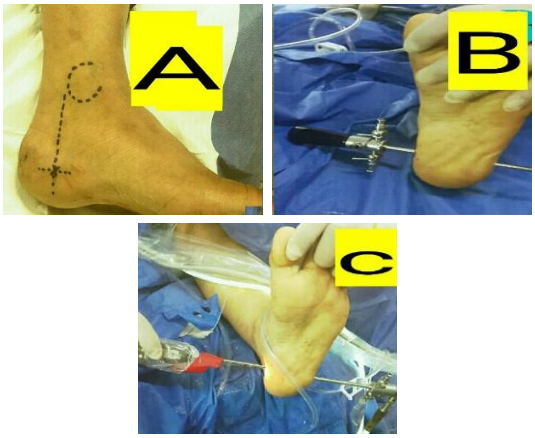

Figure (1) **a.** an intraoperative photo exhibiting the medial portal the markers. The 5mm cannula and blunt trocar are apparent transfixing the heel and exiting from the lateral portal in, **b.** an intraoperative photograph, **c.** an intraoperative image illustrating the relocation of the trocar from medial to lateral and insertion of the sheath through the lateral portal on the highest point of the trocar.

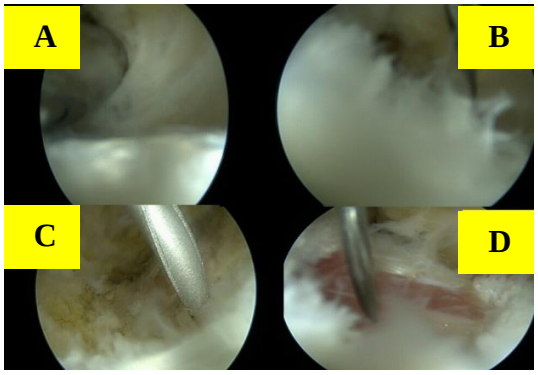

Figure (2) **a.** an endoscopic image highlighting the plantar fascia's gleaming fibres, **b.** an endoscopic image depicting the insertion of meniscectomy sheaver through the medial portal and a needle transfixing the tunnel that serves as an identifier for the centre of the plantar fascia, **c.** endoscopic image displaying the medial half of the plantar fascia split into two leaflets in its entirety, **c.** endoscopic image with the posterior leaflet debrided and the fibres of the abductor hallucis exposed.

2.3. *Post-operative follow up*

***)** After surgery, patients received analgesics, rest, limb elevation, and cold compression. ***)** Patients who were given oral antibiotics, analgesics, and anti-edematous medications and were released the same day or the first post-operative day. ***)** After two weeks of not bearing any weight, toe touch weight bearing is followed by full weight bearing, if tolerated. *) Utilising sterile dressing and regular saline every three days. *) The detachment of sutures at the outpatient clinic 10-14 days following operation; ***)** No special workout plan was offered for patients. The first checkup was scheduled for the removal of sutures and for the start of weight bearing after two weeks. After two weeks, the patients will be checked for pain and functional improvement, based on the following after 4 weeks, 3 months, and 6 months following surgery: **1)** Morning pain ratings using visual analogues. **2)** AOFAS, or the American Orthopaedic Foot and Ankle-Hindfoot Scale. It consists of an alignment evaluation (10 points), function (50 points), and annoyance (40 points). **3)** Subjective patient assessment: Utilising Roles and Maudsley's criteria, patients appraised their general health in contrast with before medical treatment.

2.4. *Statistical analysis*

In order to statistically characterise the data, mean SD, range, or frequencies (number of cases), and percentiles were utilised. To compare numerical variables over time, Freidman's test with posthoc multiple pairwise comparison tests was employed. At the 0.01 level or lower, statistical significance was deemed as being present.

3. Results

A total of 30 participants with persistent heel pain lasting more than a year participated in this prospective case series investigation. The following tables and graphs display the supplementary data.

3.1. *Patients' demographics*

Patients' ages, body mass index, years of symptom duration, and steroid injection counts. In contrast with baseline, VAS decreased substantially at 4 weeks, 8 weeks, 3 months, and 6 months (P value below 0.001). Pain-feeling (AOFAS) and activity limitations (AOFAS) were significantly improved after 4 weeks, 8 weeks, 3 months and 6 months contrasted to baseline (P value below 0.001). Gait abnormality, sagittal motion and hind foot motion were significantly improved after 4 weeks, 8 weeks, 3 months and 6 months contrasted to baseline (P value below0.001). Alignment (AOFAS) was significantly improved after 4 weeks, 8 weeks, 3 months and 6 months juxtaposed to baseline (P value below 0.001).

Table (1) Demographic data of the studied patients

		Frequency	**Percent**
Patients occupation & gender	***House waives (females)***	20	66.67
	Workers (males)	10	33.33
	Total	30	100 %
			N=30
		Mean ± SD	***Range***
Age (years)		45.4 ± 8.52	28 - 60
BMI (kg/m^2)		25.9 ± 2.85	22 - 34
Symptoms of duration (years)		2.1 ± 0.6	0.5 - 3
Number of steroid injections		1.5 ± 0.73	0 - 3
Calcaneal Spurs		***Present***	***No***
		25 (83.33%)	5 (16.67%)
The involved side		***Right***	11 (36.67%)
		Left	19 (63.33%)

Table (1) Pain assessment by VAS scale of the studied patients

	Pre-operative	**Post-operative**			
		4 weeks	**8 weeks**	**3 months**	**6 months**
Median	10	4	2	1	0
IQR	9.25 - 10	2 - 5.5	2 - 4.75	1 - 3.75	0 - 2.75
P value		**<0.001***	**<0.001***	**<0.001***	**<0.001***

In contrast with baseline, VAS decreased substantially at 4 weeks, 8 weeks, 3 months, and 6 months (P value below 0.001).

Table (2) Pain (AOFAS) and Activity limitations (AOFAS) of the studied patients

		Pre-operative	**Post-operative**			
Pain (AOFAS)	*Median*	0	30	30	40	40
	IQR	0 - 20	20 - 30	30 - 37.5	30 - 40	30 - 40
Activity limitations (AOFAS)	*Median*	4	7	8.5	10	10
	IQR	0 - 4	4 - 7	7 - 10	7 - 10	7 - 10
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***

Table (3) Maximum walking distance and walking surfaces of the studied patients

		Pre-operative	Post-operative			
Maximum walking distance(m)	*Mean ± SD*	1.8 ± 0.96	3.9 ± 0.51	4.5 ± 0.51	4.7 ± 0.48	4.6 ± 0.5
	Range	0 - 4	2 - 4	4 - 5	4 - 5	4 - 5
Walking surfaces	*Mean ± SD*	2 ± 1.44	3.4 ± 0.81	4.1 ± 1.01	4.5 ± 0.9	4.2 ± 1
	Range	0 - 3	3 - 5	3 - 5	3 - 5	3 - 5
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***

Maximum walking distance and walking surfaces were significantly improved after 4weeks, 8weeks, 3months and 6 months contrasted to baseline (P value below 0.001).

Table (4) Patients who were the focus of the study's American Orthopaedic Foot and Ankle-Hindfoot Scale (AOFAS)

		Pre-operative	Post-operative			
Gait abnormality	*Mean ± SD*	2.9 ± 1.8	6 ± 2.03	6.9 ± 1.8	7.2 ± 1.63	7.5 ± 1.38
	Range	0 - 4	4 - 8	4 - 8	4 - 8	4 - 8
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***
Sagittal motion	*Mean ± SD*	4.3 ± 1.8	6.3 ± 2.02	6.9 ± 1.8	6.9 ± 1.8	6.9 ± 1.8
	Range	0 - 8	4 - 8	4 - 8	4 - 8	4 - 8
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***
Hind Foot Motion	*Mean ± SD*	4.6 ± 1.89	5.6 ± 1.04	5.6 ± 1.04	5.8 ± 0.76	6 ± 0
	Range	0 - 6	3 - 6	3 - 6	3 - 6	6 - 6
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***
Ankle hind foot stability	*Mean ± SD*	8 ± 0	8 ± 0	8 ± 0	8 ± 0	8 ± 0
	Range	8 - 8	8 - 8	8 - 8	8 - 8	8 - 8

Gait abnormality, sagittal motion and hind foot motion were significantly improved after 4 weeks, 8 weeks, 3 months and 6 months contrasted to baseline (P value below0.001).

Table (5) Alignment (AOFAS) of the studied patients

		Pre-operative	Post-operative			
Alignment (AOFAS)	***Mean ± SD***	4.3 ± 1.73	7.2 ± 2.52	9 ± 2.03	9 ± 2.03	9 ± 2.03
	Range	0 - 5	5 - 10	5 - 10	5 - 10	5 - 10
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***

Alignment (AOFAS) was significantly improved after 4 weeks, 8 weeks, 3 months and 6 months juxtaposed to baseline (P value below 0.001).

Table (6) Criteria of Roles and Maudsley patient self-assessment of the studied patients

		Pre-operative	Post-operative			
Patient Self-Assessment	*Excellent*	0 (0%)	2 (6.67%)	11 (36.67%)	14 (46.67%)	16 (53.33%)
	Good	0 (0%)	20 (66.67%)	19 (63.33%)	14 (46.67%)	12 (40%)
	Acceptable	0 (0%)	8 (26.67%)	0 (0%)	2 (6.67%)	2 (6.67%)
	Poor	30 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
P value			**< 0.001***	**< 0.001***	**< 0.001***	**< 0.001***

3.2. *Complications of the study*

After 6 months of follow-up, two patients in the current trial achieved acceptable outcomes which was considered as a fail. In our research, we found no evidence of serious adverse consequences. Three patients experienced medial hind-foot paresthesia, which ultimately resolved with continued treatment and monitoring. Two patients were found to have a superficial infection, which responded well to oral medications. foot swelling after surgery treated by resting on a higher level. Two patients experienced lateral foot pain that resolved with analgesics and follow-up, but no foot deformities or significant arch abnormalities were observed after surgery.

4. Discussion

Based on some, endoscopic plantar fascia release is an effective and maybe superior option than standard open procedures for treating plantar fasciopathy. Patients who had endoscopic plantar fascia release expressed favourable outcomes, and its use was

associated with zero long-term complications [10]. Our study's key finalisation is that treating recalcitrant plantar fasciopathy with an endoscopic plantar approach is safe and exceptionally effective. In fact, more than 90% of patients were scored as good or exceptional on the AOFAS after approximately a year of follow-up, a considerable increase from baseline. We propose this method as a way to lessen the likelihood of serious problems during traditional surgery. Traditional plantar fascia release, resection, or debridement of the afflicted fascial segment produces excellent outcomes but can also be accompanied by a protracted healing period and a few issues. Lateral arch collapse, arch instability, and medial longitudinal foot discomfort are all possible outcomes of a plantar fascia tear [12]. But 10% of the time for lateral column overload, calcaneocuboid and mid-tarsal joint soreness appeared as implications. In the initial studies of endoscopic partial plantar fascia release (EPFR), it emerged that complete relaxation of the plantar fascia raised the risk of lateral column overload. El-Sayed, et al. [12] investigated the efficacy and security of a modified procedure for surgery for endoscopic release of plantar fascia. They detected a spike in the mean AOFAS preoperative score from 51.36 to 89.44 after six months of remedy. The pre-op VAS score of 85 was reduced to 12.6 after the procedure. The majority of patients (84%) had positive results as measured by the Roles and Madsuley criteria. There were no serious adverse events. The results of a prospective case series research including 32 individuals were reported by Morsy, et al. [13]. Following an average of 26 months, the mean AOFAS score grew by 5.2 points to 92.36 (P equal 0.0001). The average score before to operation procedure was equal 44.28 (5.98). 28 diseased people (78.5%) reported being happy with the endoscopic experience. Radwan, et al. [14] undertook a prospective comparative study of shock wave and endoscopic plantar fascia release on 70 patients with unilateral long-term plantar fasciopathy. There was a total of 31 people in the endoscopic release group. One year after surgery, this group's AOFAS score increased from 44 to 77. Based on the number of patients who gained appropriate or outstanding grades using the Roles and Maudsely criteria one year afterwards the operation, the overall success rate was 24/31 (76.6%). Case series data from Hogan et al. [15] on 22 patients showed a 97% satisfaction rating with this technique and a 50% reduction in pain or more for all patients following surgery. Twenty-two patients (26 feet) in a long-term retrospective analysis by Nery, C. et al. [16] exhibited a boost from a mean preoperative AOFAS score of 51 to a mean postoperative AOFAS score of 89. The functional prognosis of 48 patients (56 foot) who had endoscopic plantar fasciotomy was monitored by Bader, L. et al. [17]. After a median of 49.5 months of follow-up, 37 feet reported no discomfort, 11 feet reported a decrease, and 1 foot reported an increase. After surgery, patients had a significant increase in their AOFAS scores (from 54 to 93, $p< 0.001$). Twenty-two people with plantar fasciopathy in each of 24 feet were studied by El Shazly et al. [18]. Two years after surgery, the average VAS score dropped from 82.81 before treatment to 6.63. There was an 85% level of contentment. Retrospective study of 55 cases has been carried out, Urovitz, E. et al. [19] found that the average AOFAS score increased from 66.5 before surgery to 88.2 after a typical 18-month follow-up span. Over 80 percent of patients saw remission. In a study involving 20 patients (23 foot), Bazaz, R. et al. [11] found that after an average follow-up of 47 months, the patients' average AOFAS scores increased from 66 to 88. The method described in this research is straightforward, low-cost, technically easy, and requires no specialized equipment. In contrast to methods previously described we discovered that introduction of the endoscope through the lateral portal improved visualization [11]. Inflating the subcutaneous tube with water pressure (50-60 mmHg) allowed for clearer

visibility. Nevertheless, owing to the heel fat pad's tight shape, there was little fluid extravasation, and in all but four cases, the medial portal acted as an exit for any extra fluid. There are reports of a uniportal endoscopic plantar fasciotomy [20]. A slotted cannula and other specialized tools were needed for this method, though. While no complaints were made about the portals themselves, five patients did have a superficial infection of the medial portal that cleared up after being treated with oral antibiotics. Additionally, the subcutaneous tunnel, which may theoretically cause harm to the heel fat pad, was not mentioned in any complaints. As a means of relieving the mechanical stress on the afflicted area, plantar fasciotomy is performed [21]. In this ongoing study, we debrided the diseased tissue at the fascial origin and the irritated periosteum with a motorised incisor blade, in addition to performing fascial release as in the previously published approaches [18,19]. It is anticipated that this will lead to better outcomes. Studies have emphasised the plantar fascia's importance in guiding the rear of the foot during walking [22]. Notwithstanding being true that a plantar fasciotomy lessens the medial longitudinal arch's height and minimises localised stressors there, it also makes the arch less stiff and more malleable. Pain in the forefoot and medial heel, after plantar fasciotomy, may be caused by these side effects [7]. Risk of the lateral column is increased when more than half of the plantar fascia is freed independent of the surgical method employed (endoscopic or open release) [21]. As stated by White [23], the entire plantar fascia and intrinsic muscle are liberated from the spur without removing it. The success percentage of plantar transverse incision, which is less invasive than standard open release is 96% [24] radiofrequency microtenotomy doesn't need cutting the plantar fascia, is minimally invasive, and improves pain and functional ratings. Adjacent tissue injury may be the one and only drawback [25]. In an arbitrary number of 1000 radiographs, a single study noted a 13% incidence of heel spurs, with almost a third of them being problematic [26]. Of our patients, 25 (83.33%) had calcaneal spurs [27]. Furthermore, surgical therapy for plantar fasciopathy does not typically involve an excision of the spur [28], as has been shown in numerous studies. No patient in the current research had their heel spur surgically removed. Meanwhile, it seemed like everything was going well. The calcaneal spur was surgically removed in 26 of 32 instances (81.25%), according to research by Morsy M et al. [13]. Though it aids patients psychologically, there was no statistically significant distinction in the outcome following surgery between them and the other cases (P= 0.05) despite this. Lateral column issues were more likely to arise when the plantar fascia was relaxed by more than half [21], regardless of the surgical approach used. The outcomes were in line with those of the current study, in which just a 50% release was carried out and no lateral column issues were detected. Plantar fasciopathy is typically treated with surgery, but it is widely known that the spur is not removed [6]. In the present study, nobody had their heel spur removed via surgery. Meanwhile, it seemed like everything was going well. The current operation did not involve Baxter nerve (controlling abductor digiti minimi) decompression. Additionally, the subcutaneous tunnel, which may theoretically cause harm to the heel fat pad, was not mentioned in any complaints. In order to alleviate the mechanical stress on the afflicted area, a plantar fasciotomy may be performed. In contrast to earlier descriptions of fascial release [11,15,19, 29,30], we used a meniscectomy shaver blade to debride diseased tissue at the fascial origin and inflammatory periosteum. It is anticipated that this factor will contribute to better overall results. The back foot's mobility when walking is modulated by the plantar fascia [22,27]. Despite the fact that a plantar fasciotomy lessens the medial longitudinal arch's height and minimises localised stressors there, it also makes

the arch less stiff and more malleable. These adverse effects of plantar fasciotomy may involve pain in the forefoot and lateral portion of the foot [30,31]. There was a higher likelihood of getting lateral column difficulties when more than half of the plantar fascia was loosened [21, 32] independent of the surgical technique used to perform the release (endoscopic or open).This is consistent with the current study's findings, since merely a minor release was carried out, and no lateral column issues emerged. The heel bisector acted as a somewhat precise marker for the centre of the plantar fascia as long as the needle was held perpendicular to the heel skin. Twenty-five feet tab. (1) in the current investigation had heel spurs, as detected by X-ray. About one-third of people with heel spurs experience symptoms, according to one study of 1,000 radiographs. The spur is not routinely removed after surgery for plantar fasciopathy, as has been shown [10,33,34]. No patient in the current research had their heel spur surgically removed. Meanwhile, it was reported that the results were satisfactory. In their study, Morsy M et al. [13] observed that 26 of 32 patients (81.25%) had their calcaneal spurs resected. Though this aids patients psychologically, there was no statistically significant difference in the outcome following surgery between them and the other cases (P= 0.05) despite that.

5. Conclusion

**The sample size is too tiny. *Very brief follow-up period. *Due to the reality that the majority of the patients in this research were housewives, it was impossible to determine how long it would take for them to return to work. * Our flaw was that the AOFAS score was not cross-culturally adapted when it was translated. Our success with that technique so far in this study is promising, and it may represent a new option for treating persistent resistant plantar fasciopathy. It's a tried-and-true method for helping people with plantar fasciopathy.*

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