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Endoscopic Release of Chronic Resistant Plantar Fasciopathy

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Abstract

Plantar fasciopathy is the most common cause of plantar heel pain. No enough evidence in literature strongly supports the effectiveness of any specific treatment for such conditions. To assess the efficacy and safety of a modified surgical technique for endoscopic release of plantar fascia. A total of 40 feet in 40 patients with plantar fasciopathy for at least one year and resistant for at least two modalities of conservative treatment for six months were involved in this prospective study. All patients had been diagnosed clinically.The mean AOFAS preoperative score had improved from 51.36 to 89.44 after six months follow-up. While The VAS score dropped from 9 preoperative to 1. Eighty four (84%) of patients had satisfactory outcomes according to Roles and Madsuley criteria. No major complications were recorded. Endoscopic plantar fascia release could be a viable alternative for management of chronic resistant plantar fasciopathy.

Keywords: Plantar fascia, Plantar fasciopathy, Endoscopic release, Heel pain .

1.Introduction

Plantar fasciopathy is considered one of the most common causes of heel pain, often with severe limitation of activity [1]. Variety of names are used to describe heel pain; plantar fasciitis, jogger's heel, tennis heel, police officer's heel, etc…[2]. Although the term plantar fasciitis is commonly used; plantar fasciopathy terminology is a better reflection of the underlying histology, which rarely includes inflammatory cells [3].

The etiology of the disease is not clear. It can be the result of irritation because of the overstrain of the fascia (chronic micro injuries), which induces pathological deformations such as mucoid degeneration, reparative inflammation, then calcification [4].

The classic sign of plantar fasciopathy is that the worst pain occurs with the first few steps in the morning or at the beginning of the activity that lessens as they warm up. In more severe cases, pain will also worsen toward the end of the day [5].

In general, plantar fasciopathy is self-limiting disease. Unfortunately, the time until resolution is often 6–18 months, which can lead to frustration for patients and physicians [6].

Non-surgical treatment of plantar fasciopathy has reported success rate about 85% but it may require months to resolve [7].

Platelets rich plasma (PRP) is derived from autologous blood and contains high concentration of growth factors necessary for tissue healing. The use of PRP in the treatment of plantar fasciopathy is a fairly recent and evolving concept [8].

Many surgical approaches have been proposed, with varying degree of success. Surgical procedures include calcaneal drilling, calcaneal rotational osteotomy, isolated plantar fascia release from its insertion at the calcaneus, excision of the spur, medial calcaneal nerve or Baxter nerve neurolysis, and medial calcaneal nerve neurectomy [9].

Endoscopic plantar fascia release has been reported as a viable, and possibly superior, alternative to established open procedures for the treatment of plantar fasciopathy. The majority of patients reported satisfaction with the endoscopic plantar fascia release and no long-term surgical complication [12].

2.Subjects and methods

40 patients who had chronic resistant heel pain for at least one year were enrolled in a prospective case series study conducted at the department of orthopedics, Benha university Hospital, Faculty of Medicine, Benha University,and El sheikh zayed specialzed hospital. The range of patient's age was between 25 and 59 years old.

Inclusion criteria

Patients included in the study are adults more than 18 years old presented by a single site heel pain with local pressure at the origin of plantar fascia on the medial calcaneal tuberosity for one year, with: Failure of at least two lines of conservative treatment included: nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, physical therapy, exercise program (Achilles tendon and plantar fascia stretching exercises) and orthotic devices (heel cup, molded shoe insert, or night splint) for at least 3 months.

Exclusion criteria

patients with pesplanus, pescavus, limb length discrepancy, in-toeing, neuro-muscular disorders, history of generalized polyarthritis, or prior heel surgery were not included in the study.

2.1 Method protocol

All patients were subjected to the following:

- **History**

Detailed history from each patient had been taken regarding age, gender, occupation, side involved, duration of symptoms, and number of steroid injections.

- **Examination**

1- Local examination for the involved side by inspection, palpation, neurological examination and special clinical tests and comparison with the other side.

2- General examination to detect other causes of heel pain.

• **Investigations**

The diagnosis was based mainly on history and clinical examination. However, preoperative x-ray of the calcaneus was obtained for all patients to document the presence of heel spur.

All Patients were assessed preoperatively by the following three scores:

1- **Morning Pain**: a visual analogue scale ranging from 0 (no pain) to 100 (maximal pain) .

2- **American Orthopedic Foot and Ankle-Hindfoot Scale (AOFAS)** [13]. It includes: pain (40 points), function (50 points) and alignment assessment (10 points) (table -1).

3- **Patient subjective assessment:** patients assessed their overall condition according to the criteria of Roles and Maudsley [14] as follows:

4- **Excellent**: no pain, full movement, full activity;

5- **Good**: occasional discomfort, full movement, full activity;

6- **Acceptable**: some discomfort after prolonged activities; and

7- **Poor**: pain-limiting activity.

Success is defined as an excellent or good score based on Roles and Maudsley.

follow up: The first follow up was after two weeks for removal of stitches and starting weight bearing.

The patients then assessed for pain and function improvement after 4 weeks, 3months and 6months postoperative based on the following:

1- **Morning Pain**: a visual analogue scale ranging from 0 (no pain) to 100 (maximal pain) .

2- **American Orthopedic Foot and Ankle-Hindfoot Scale (AOFAS)** [13]. It includes: pain (40 points), function (50 points) and alignment assessment (10 points).

3- **Patient subjective assessment:** patients assessed their overall condition compared to before treatment, according to the criteria of Roles and Maudsley [14] .

N.B : Regarding the bilateral cases only one side was done.

2.1.Statistical analysis

Data were statistically described in terms of mean ± standard deviation (± SD), and range, or frequencies (number of cases) and percentiles when appropriate. Comparison of numerical variables between the different time periods was done using Freidman's test with posthoc multiple pairwise comparison tests. p values less than 0.01 was considered statistically significant.

3.Results

fourty patients who had chronic resistant heel pain for at least one year were enrolled in this prospective case series study. The background information are shown in the following tables and figures.

Demographic Study of the Patients

Patients age , BMI, duration of symptoms (yr.) and the number of steroid injections.

Table (1) Patients age , BMI, duration of symptoms (yr.) and number of steroid injections.

	No. of cases	Minimum	Maximum	Mean	Standard deviation
Age	40	25	59	41.12	8.126
BMI	40	22.8	41.1	31.328	4.8279
Symptom of duration (yr.)	40	1	6	2.13	1.537
Number of steroids inj	40	0	7	2.16	1.818

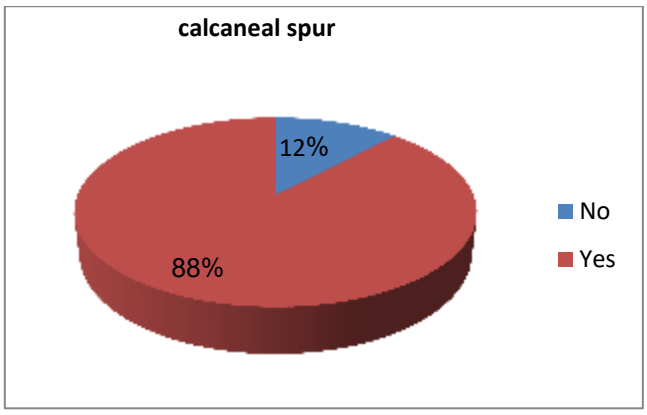

Fig (1) pie chart showing the percentage of each side involved.

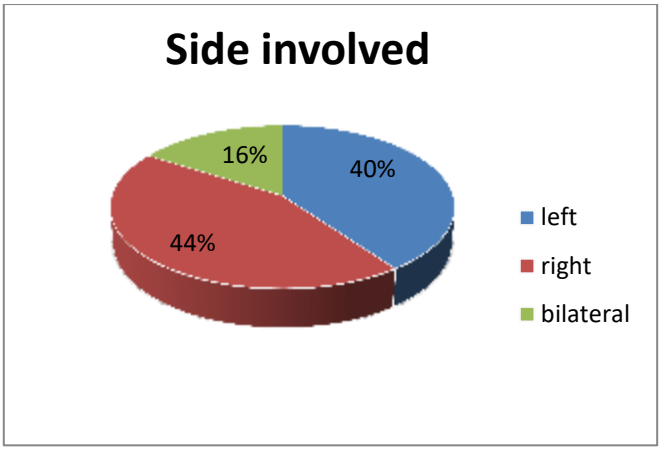

Fig (2) pie chart showing the percentage of calcaneal spur.

Visual analogue scale (vas)

Table (2) Showing (vas) at baseline, and 4weeks, 3months, 6months post operative.

vas	No.of cases	Minimum	Maximum	Mean	Standard deviation
base line	40	7	9	8	7.130
4 weeks	40	1	9	5	18.927
3 months	40	0	5	2.5	16.109
6 months	40	0	4	2	11.431

* Significantly different from the precedent time period (P<0.0001).

American Orthopedic Foot and Ankle-Hindfoot Scale (AOFAS).

Table (3) (AOFAS) at base line,and 4 weeks, 3months,6 months post operative.

	American Orthopedic Foot and Ankle-Hindfoot Scale (AOFAS).					
pain		**No.of cases**	**Minimum**	**Maximum**	**Mean**	**Standard deviation**
	base line	40	0	20	8.00	10.000
	4wk.	40	0	30	25.20*	7.141
	3 m.	40	20	40	29.60*	5.385
	6m.	40	20	40	32.00*	5.000
Activity limitation	base line	40	0	4	2.56	1.960
	4wk.	40	4	7	5.56*	1.530
	3m.	40	4	10	7.96*	2.071
	6m.	40	4	10	8.92*	1.706
Maximum walking	base line	40	2	5	3.48	1.085
distance	4wk.	40	2	5	4.32*	0.852
	3m.	40	4	5	4.80*	0.408
	6m.	40	4	5	4.88	0.332
Walking surfaces	base line	40	0	3	2.04	1.428
	4wk.	40	0	5	3.28*	1.061
	3m.	40	0	5	3.76*	1.268
	6m.	40	3	5	4.12	1.013
Gait abnormalities	base line	40	0	8	3.52	2.104
	4wk.	40	0	8	5.76*	2.332
	3m.	40	4	8	6.88*	1.833
	6m.	40	4	8	7.52	1.327

Table (3) Continue

Sagital motion	base line	40	8	8	8.00	0.000
	4 weeks	40	8	8	8.00	0.000
	3 months	40	8	8	8.00	0.000
	6months	40	8	8	8.00	0.000
Hind foot motion	base line	40	3	6	5.76	0.831
	4wk.	40	3	6	5.76	0.831
	3m.	40	6	6	6.00	0.000
	6m.	40	6	6	6.00	0.000
Ankle- Hind foot stability	base line	40	8	8	8.00	0.000
	4 weeks	40	8	8	8.00	0.000
	3 months	40	8	8	8.00	0.000
	6 months	40	8	8	8.00	0.000
Alignment	base line	40	10	10	10.00	0.000
	4 weeks	40	10	10	10.00	0.000
	3 months	40	10	10	10.00	0.000
	6 months	40	10	10	10.00	0.000
AOFAS total score	base line	40	33	72	51.36	14.373
	4wk.	40	41	87	75.88*	10.576
	3m.	40	64	100	85.00*	8.765
	6m.	40	67	100	89.44*	7.741

* Significantly different from the precedent time period.

Multivariate statistical analysis indicated that age, sex, BMI, occupation, side involved, number of steroids injections, duration of symptoms and presence of calcaneal spur has no statistically significant effect on the mean final AOFAS score.

Criteria of Roles and Maudsley

(1) At base line : All patients had poor criteria.

(2) Four weeks post operative.

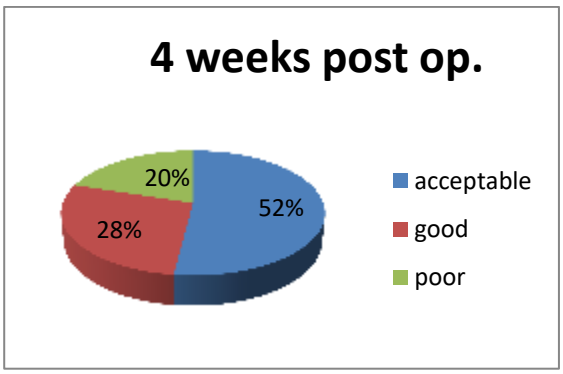

Fig (3) pie chart showing the percentage of patients regarding Criteria of Roles and Maudsley at 4 weeks post operative.

(3) Three months post operative .

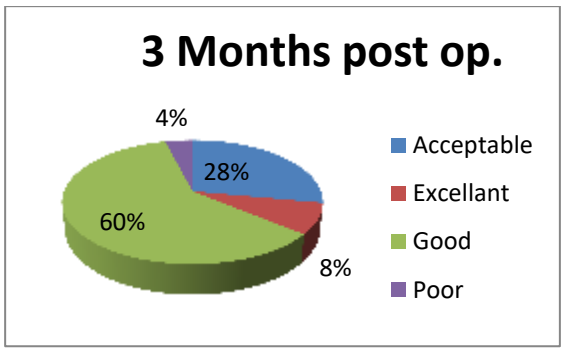

Fig (4) pie chart showing the percentage of patients regarding Criteria of Roles and Maudsley at 3 months post- operative.

(4) Six months post- operative

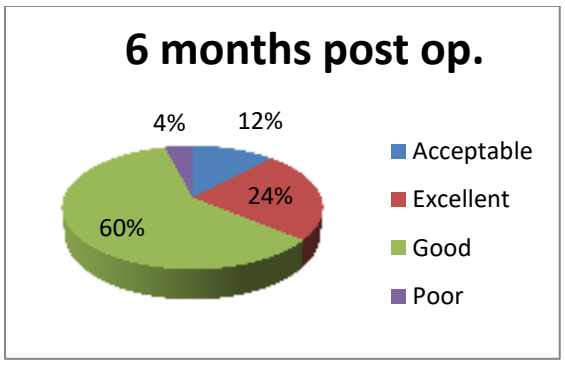

Fig (5) pie chart showing the percentage of patients regarding Criteria of Roles and Maudsley at 6 months post-operative.

Complications of the study

No major side effects were observed in our study. four patients developed parathesia along the medial aspect of hind-foot which improved later on follow up. Superficial infection was recorded with five patient and it was improved with oral antibiotics. Another four patients developed post- operative swelling that resolved with foot elevation. We noted no postoperative foot deformities or major changes in the arches of those who had surgery.

Criteria of Roles and Maudsley at baseline and 4weeks, 3months, 6months post-operative.

Table (4) Showing Criteria of Roles and Maudsley at baseline and 4weeks, 3months,6months post-operative.

		Base line	4weeks	3months	6months
	Excellent	0	0	3	10
	Good	0	11	24	24
Roles and	Acceptable	0	20	11	5
Maudsley	poor	40	9	2	1
	Total	40	40	40	40

4. Operative technique

Surgery was performed under general or spinal anesthesia, in the supine position with the foot hanging outside the edge of the table. A pneumatic tourniquet was maintained on the thigh throughout the procedure. A medial portal was developed 1 cm away from the plantar skin along a vertical line passing through the posterior border of the medial malleolus with the foot in neutral position Fig (6-1A). A 5mm canula with a blunt tip trocar was then introduced transversely in the subcutaneous tissue just inferior to the plantar fascia. A lateral portal was made in the lateral side where the cannula emerges Fig (6-1B) A gauze tape was then passed between the medial and lateral portals many times to create a subcutaneous tunnel, The roof of which was formed by the plantar fascia Fig (6-1C). The cannula was then introduced thorough the lateral portal. To facilitate this step, the blunt trocar was passed from medial to lateral then the sheath was introduced through the lateral portal over the trocar Fig (6-1D).

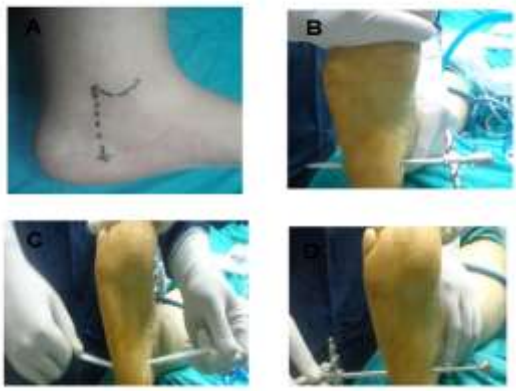

Fig (6-1) (A) Intraoperative photograph showing the landmarks of the medial portal. (**B)** Intraoperative photograph showing the 5mm canula and blunt trocar transfixing the heel and emerging from the lateral portal. (**C)** Intraoperative photography showing a gauze tape passing between the medial and lateral portals. (**D)** Intraoperative photography showing the trocar was passed from medial to lateral then the sheath was introduced through the lateral portal over the trocar .

5. Discussion

Although no enough evidence in literature strongly supports the effectiveness of any modalities of treatment for plantar fasciopathy [6]. The current study found that endoscopic plantar fascia release presents a safe and reliable option in treatment of selected cases of plantar fasciopathy.

S. Kinley et al., [10] in a prospective study compared the results of conventional open and endoscopic techniques. Those patients in whom the endoscopic fasciotomy was performed had significantly less postoperative pain, returned to regular activities 4 weeks earlier, and had fewer complications postoperatively than those patients undergoing traditional heel spur surgery. The main advantage of the endoscopic method is the quicker recovery time of the patients compared with the standard open procedure. Another retrospective study [11**]** compared endoscopic and open fasciotomy, it found that patient who underwent endoscopic plantar fasciotomy returned to work an average of 55 days earlier than those who had an open heel approach.

Most cases of plantar fasciopathy are self-limited **[6]**. However, In this study, trying to avoid the effect of time on healing, we selected patients who had symptoms for more than one year, with an average about 25 months duration of symptoms.

In the current study, diagnosis was based mainly on clinical examination which is the gold standard for diagnosis of plantar fasciopathy. The imaging techniques available are plain radiography, magnetic resonance imaging (MRI) and ultrasound (US) . Direct imaging of the plantar fascia is possible with MRI and US [12]. and [13] compared US and MRI with respect to their accuracy and validity in the detection of plantar fasciopathy. The results of current study are encouraging, it showing improvement in the morning pain according to visual analog scale (VAS). The mean preoperative VAS score was 8 (range, 7-9), dropped to 2 (range, 0-4) 6 months post operatively. This difference was statistically

Significant with a P value < 0.0001 (table 8-6).

The mean of AOFAS total score improved from 51.36 (range, 33-72) preoperatively to 89.44 (range, 67-100) six months post operatively. This difference was statistically Significant with a P value < 0.0001.

The success rates (number of patients who achieved good and excellent scores in the Roles and Maudsley criteria) were 11 (28%) at 4 weeks, increased to 27(68%) at 3 months and 34(84%) at 6 months post- operative.

Multivariate statistical analysis indicated that age, sex, BMI, occupation, side involved, number of steroids injections, and duration of symptoms and presence of calcaneal spur has no statistically significant effect on the mean final AOFAS score. This results do not agree with previous studies [14] regarding the duration of symptoms, which reported lower post- operative scores for patients with symptoms more than 2 years.

The results in the current study were comparable with those of previously published reports on endoscopic plantar fascia release.

[15] Morsy, M et a] reported their prospective case series study on 32 patients. After average 26 months follow up, the mean AOFAS score improved significantly to 92.36 ± 5.2 points (P = 0.0001). Preoperatively, the mean score was 44.28 ± 5.98 points. Twenty-eight (78.5%) patients were satisfied by the endoscopic procedure

[16] Radwan, Y et al. a prospective comparative study between shock wave and endoscopic plantar fascia release conducted on 70 patients with unilateral recalcitrant plantar fasciopathy. The endoscopic release groups were 31 patients. The AOFAS score for this group was 44 preoperative, improved to 77 one year post operatively. The success rate (number of patients who achieved good and excellent scores in the Roles and Maudsely criteria) one year post -operative was 24/31 (77.6%) and this is comparable with our results [14] reported in their study which include 20 patients (23 feet) that the mean AOFAS score was improved from 66 to 88 points with average 47 months follow up (table 9-1).

[17] reported in their case series on 22 patients that the satisfaction rate with this procedure was 97.7%, and all patients reported at least a 50% improvement in pain after surgery.

Regarding the technique described in the current study, it is simple, economic, not technically demanding, and does not need special instruments. We found that visualization is better if the endoscope is introduced through the lateral portal unlike previously described techniques [14]. Proper visualization depended on the water pressure (50-60 mmHg) to inflate the subcutaneous tunnel. However, no fluid extravasation took place because of the tight nature of the heel fat pad, also the medial portal acted as an outflow port for excess fluid apart of four cases had post -operative swelling improved with foot elevation. Uniportal endoscopic plantar fasciotomy was reported in literature [18]. However, the technique required a slotted cannula and other special instruments. No complain was recorded in the current study in relation to the portals a part of five cases had superfacial infection of the medial portal which improved with oral antibiotics. Also no complain was recorded regarding the subcutaneous tunnel, although theoretically it may cause damage to the heel fat pad.

Plantar fasciotomy is done to reduce the mechanical overload in the affected area. In the current study, we did not do fascial release only like the previously described techniques [14], but we also debrided the pathological tissue at the fascial origin and the inflamed periosteum using the motorized incisor blade. This is expected to be acause in improvement the final results.

The plantar fascia plays an important role in controlling the hindfoot during gait [19]. Plantar fasciotomy provides relief of focal stresses on the origin of the plantar fascia but it creates a less rigid and more deformable arch and reduces the height of the medial longitudinal arch. These effects may be responsible for lateral hind foot and forefoot pain sometimes seen after plantar fasciotomy [7]. It was found that, regardless of the surgical technique (endoscopic or open release), lateral column symptoms were more likely to result when more than 50% of the plantar fascia was released [108,109]. This agrees with the results of the current study in which only 50% release was done and the lateral column symptoms were not recorded. We used the heel bisector as a landmark for the middle of the plantar fascia which is fairly accurate as long as the needle is inserted perpendicular on the heel skin.

In the current study, X-rays has shown the presence of heel spur in 35 foot. One study revealed a 13% incidence of heel spurs in a random sample of 1000 radiographs, of which about one-third were symptomatic [20]. Also it is well documented that excision of the spur is not part of the usual surgical treatment for plantar fasciopathy [6]. In the current study, the heel spur was not removed in any patient. Meanwhile, satisfactory results were reported. Morsy M et al. [15**]** reported in their study calcaneal spur removal in 26/32 of cases (81.25%). However, there was no statistically significant difference in the postoperative outcome between them and the other cases (P=0.05), but it has a positive psychological impact upon patients.

Regarding to the complications and side effects of current study, one patient had poor outcomes and three patients had acceptable outcomes after 6 months follow up which was considered failure, we postulated that failure to lack of treatment of the main cause of pain in the plantar fasciopathy and not to the technique itself. There are multiple causes of pain in the plantar fasciopathy such as calcaneal periostitis, the heel spur, and entrapment of the nerve to abductor digiti minimi (Baxter nerve) [21]**.** To find the main cause of pain, the surgeon should sharply localize the point of tenderness, which we did find it to be practically difficult.

No major side effects were observed in our study. Two patients developed parathesia along the medial aspect of hind-foot which improved later on follow up. Superficial infection was recorded with one patient and it was improved with oral antibiotics. Another two patients developed post -operative swelling that resolved with foot elevation. We noted no postoperative foot

deformities or major changes in the arches.

Limitation of the current study include the small sample size made statistical analysis of the data difficult, short follow up period in comparison with other studies [14] which had longer follow-up, and lack of comparison group. We did not measure the duration for return to work because most of the patients enrolled in this current study were housewives. We choose the widely used American Orthopedic Foot and Ankle-Hindfoot Scale to allow comparison of the data. However, our limitation was with the translation of AOFAS score which has not been cross-culturally adapted

6. Conclusion & recommendations

From the current study our experience with the procedure is encouraging, and could be a viable alternative for management of chronic resistant plantar fasciopathy. It is a safe, effective, simple, economic, not technically demanding, and does not need special instruments.

We recommend future research should use a standardized objective scoring system for evaluation and should focuses on carrying out randomized clinical trials that include a sufficient number of patients. Longer follow up period is recommended to find the incidence of relapse of pain.

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