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Research Article

Use of local corticosteroid injection in the treatment of plantar fasciitis

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ABSTRACT

Background and Objectives: Plantar fasciitis is a common pathological condition that affects the hind foot. Management of plantar fasciitis employs use of various non-surgical and surgical treatment methods. The aim of this study was to evaluate the efficacy of steroid injection in the treatment of plantar fasciitis in adults.

Materials and Methods: From January 2016 to June 2017, fifty patients aged >18 years with plantar fasciitis symptomatic for three months or more were injected with a single dose of methylprednisolone acetate with 2% lignocaine. Assessment was done using visual analogue scale (VAS) and foot function index (pain sub-scale). Patients were followed-up for a period of 6 months.

Results:There was significant reduction in VAS score and improvement in foot function index at 1 and 3 month follow-up ($p<0.001$) as compared to pre-injection score but this VAS reduction or improvement in foot function index was not significant at 6 month follow-up ($p=0.057$ and 0.729 respectively). There were no major adverse effects of the steroid injection.

Conclusion: A single dose of corticosteroid injection provides only a short term benefit in plantar fasciitis.

Key words: Injection, Plantar fasciitis, Steroid

INTRODUCTION

Plantar fasciitis is a common pathological condition that affects the hind foot. It is the most commonly reported cause of inferior heel pain [1, 2]. It is characterized by pain at the calcaneal origin of the plantar fascia and weight bearing after prolonged periods of rest exacerbates the pain [1].

The exact etiology of plantar fasciitis remains obscure [2, 3]. The inflammation at the origin of the plantar fascia and surrounding perifascial structures is supposed to be an overuse injury.

Histologically there are degenerative changes in the plantar fascia, and there can be fibroelastic proliferation and chronic

inflammatory changes [1]. Many factors may cause plantar fasciitis like obesity, excessive period of weight bearing activity and decreased range of motion [4].

There are many treatment methods available for the management for plantar fasciitis. Nonoperative methods are use of orthoses, plantar stretching exercises, taping, nonsteroidal anti-inflammatory drugs, shockwave therapy and steroid injections. Fasciotomy may be done for the patients with intractable plantar fasciitis [5]. Usually a combination of these treatment modalities are required rather than a single treatment method [6].

As with other musculoskeletal conditions, corticosteroid injection is commonly used for treatment of plantar fasciitis. A survey of American podiatrists and orthopedic surgeons reported that about 75% of respondents have used or recommended this method [7]. A corticosteroid injection near the origin of plantar fascia may provide pain relief when other methods fail [6, 8]. Also various techniques for the corticosteroid injections have been used: palpation-guided, ultrasound-guided and scintigraphy-guided techniques [9, 10, 11].

Plantar fasciitis is a complaint with which many patients visit to orthopedic out-patient departments (OPD). Though we do not have our own statistics, we see many active adults in economically productive age group being affected. Corticosteroid injection is an easy procedure that can be carried out in OPD and might prove to be effective and safe with lesser side effects for our patients.

Some clinical trials support the use of corticosteroid injection for short term management of plantar fasciitis [1, 12], while a recent systematic review showed that the effectiveness of steroid injection has not been sufficiently established [13]. The purpose of this study was to evaluate the effectiveness of single dose of corticosteroid injection in the management of plantar fasciitis in our context.

MATERIALS AND METHODS

This prospective interventional study was conducted at Janaki Medical College Teaching Hospital from January 2016 to June 2017. Fifty patients were enrolled for this study. All patients aged > 18 years with inferior heel pain for three months or more and having tenderness on medial calcaneal tubercle or plantar fascia were included. Exclusion criteria were local infection, previous local surgery, systemic inflammatory disease, diabetes mellitus, pregnancy, patients on anticoagulants, allergy to drugs, or previous corticosteroid injection for plantar fasciitis within last six months.

Approval for the study was taken from Institutional Review Committee of Janaki Medical College on 22 December 2015. All the participants were explained about the procedure and possible side effects and informed written consent was taken.

Injection was performed by the same investigator. The injection method was as follows. With the patient in prone position, the site of maximum tenderness was palpated on medial tubercle of calcaneus. Skin was cleaned with povidone-iodine (Betadine) followed by alcohol wipe. A 1.5 inch 21-gauge needle was introduced from the medial aspect of the foot and directed posterolaterally to reach the tender spot. At this stage 1 ml of methylprednisolone acetate (40mg/ml) with 1 ml of 2% lignocaine was injected.

Patients were advised to rest for 24 hours after the procedure and to avoid running or other sports activities for 1 week. Analgesics were prescribed as necessary. Patients were asked to keep a record of pain experienced, analgesic consumption and morning first step pain.

Following outcome measurements were done. Visual analogue scale (VAS) score on a 10 cm scale [14]: 0 = no pain, 10 = worst pain. Another outcome measure was the pain subscale of the Foot Function Index (FFI): the questions were scored from 0 = no pain to 10 = worst pain imaginable giving 1 total score from 0 to 90 (Table 1) [15].

Table 1: Questions for the Pain sub-scale of the Foot Function Index

Questions	
How severe is your foot pain	
1. At its worst?	No pain/ worst pain imaginable
2. After you get up in the morning with the first few steps?	
3. When you walk barefoot?	No pain/ worst pain imaginable
4. When you stand barefoot?	No pain/ worst pain imaginable
5. When you walk wearing shoes?	No pain/ worst pain imaginable
6. When you stand wearing shoes?	No pain/ worst pain imaginable
7. When walking with orthotics?	No pain/ worst pain imaginable
8. When standing with orthotics?	No pain/ worst pain imaginable
9. At the end of the day?	No pain/ worst pain imaginable
	No pain/ worst pain imaginable

Follow-up measurements were performed at 2 weeks and 1, 3 and 6 months. Patients were called in the OPD for follow-ups and interviewed for the pain score and the Foot Function Score pain subscale.

Final outcome was rated as excellent, fair or poor: excellent- VAS 0-2, minimal to no first step pain, and minimal to no effect on activities; fair- VAS 3-5, occasional first step pain, and occasional effect on activities; poor- VAS ≥5, constant first step pain, and constant effect on activities.

Statistical data analysis was done using the SPSS (Statistical Package for Social Sciences) version 20.0. Analysis was done using frequencies, descriptive option for mean and standard deviation and paired sample t-test. Values of $p < 0.05$ were taken to indicate significance with confidence interval of 95%.

RESULTS

There were 20 men and 30 women in our study with age ranging from 20 to 56 years (mean 37.42 years). Mean duration of symptoms was 7.44 months (Table 2).

Table 2: Baseline characteristics of patients

Variable	
Male/ Female, n	20/ 30
Mean (SD) age, years	37.42 (10.88)
Mean (SD) duration of symptoms, months	7.44 (2.44)
Affected foot (right/ left/ bilateral)	25/ 20/ 5

The mean visual analogue score pre-procedure was 8.12 with a standard deviation

of 1.51. It significantly decreased to 3.24 at 1 month, and then increased to 5.02 and 7.88 at 3 months and 6 months respectively (Figure 1).

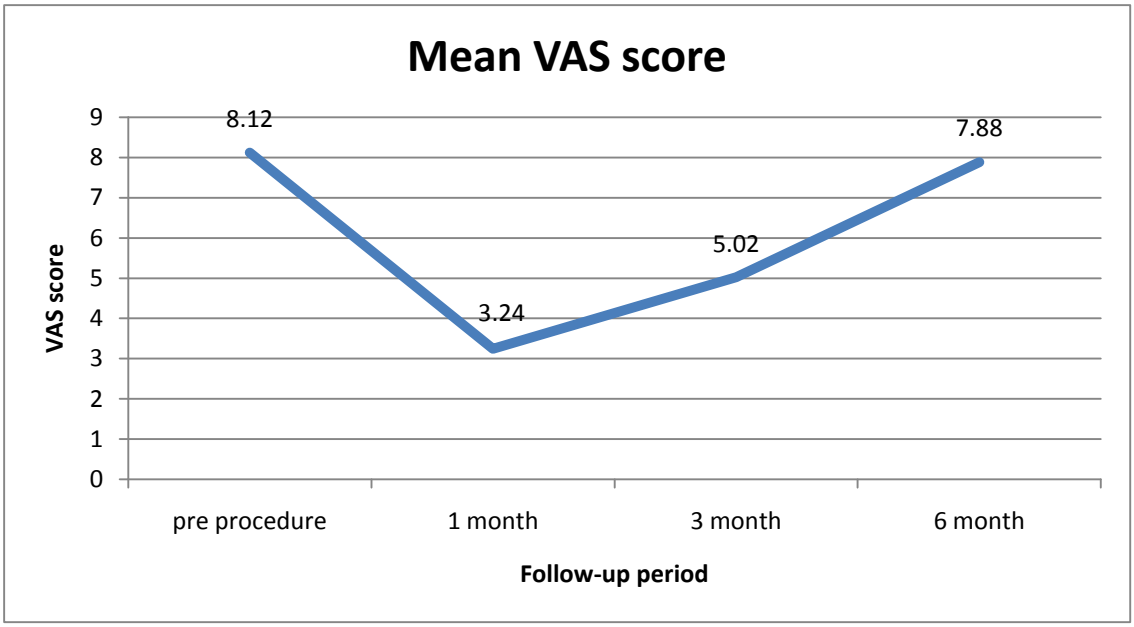

Figure 1: Mean VAS score at different times of follow-up

Table 3 : VAS comparison at different stages of follow-up compared to the baseline

VAS score	Mean ±SD	p value*
Pre procedure	8.12 ± 1.51	<0.001
1 month follow up	3.24 ± 1.49	
Pre procedure	8.12 ± 1.51	<0.001
3 months follow up	5.02 ± 1.90	
Pre procedure	8.12 ± 1.51	0.057
6 months follow up	7.88 ± 1.83	

**Paired-samples t-test*

The VAS comparison at different times of follow-up is shown in Table 3. There was significant reduction in mean VAS pain score at 1 month follow-up (p<0.001). At 3 month follow-up though the mean VAS score increased from 3.24 to 5.02, this was still statistically significantly lower when compared to pre injection VAS score (p<0.001). However at 6 month follow-up the pain reduction was not significant when compared to before the procedure (p=0.057). The mean foot function index pre-procedure was 80.09. At 1 month follow-up it decreased

to 32.63. However at subsequent follow-ups at 3 and 6 months it increased to 50.20 and 79.51 respectively (Figure 2)

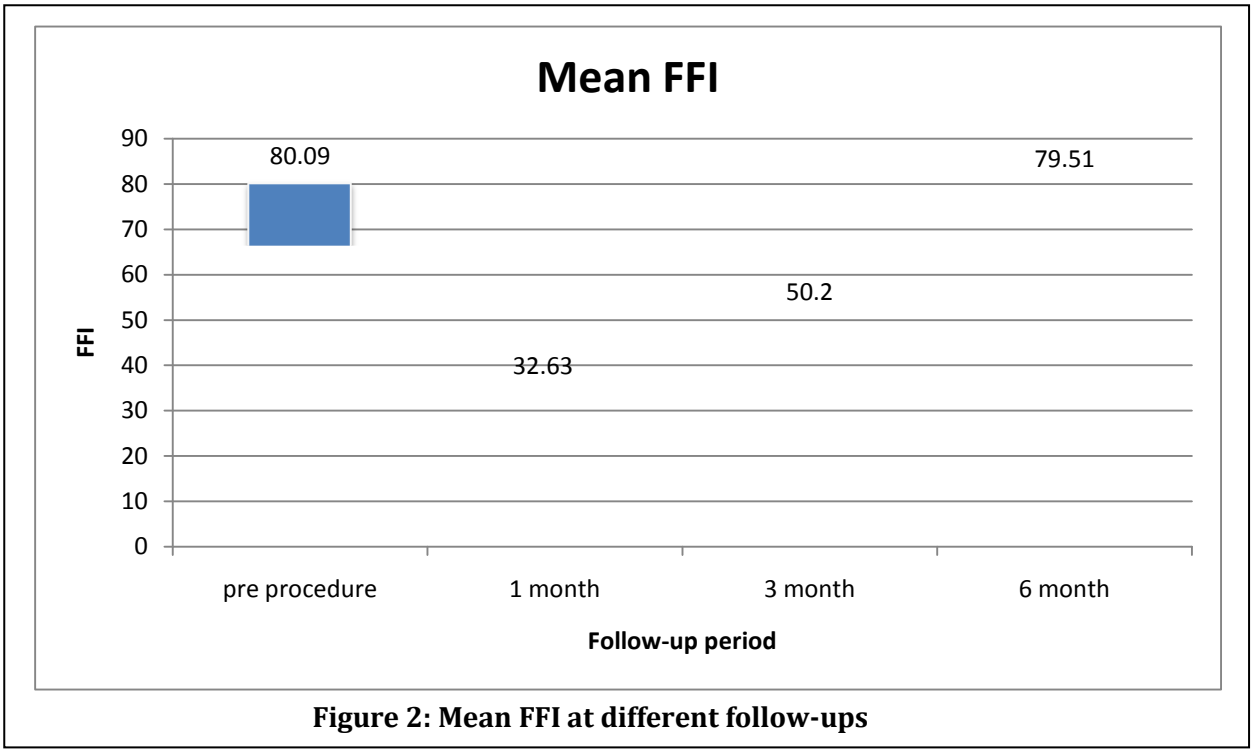

Figure 2: Mean FFI at different follow-ups

Table 4 shows the Foot Function Index at different periods of follow-up. There was significant improvement in FFI at 1 month and 3 month follow-up (p<0.001).

Table 4: FFI comparison at different periods of follow-up

Foot Function Index	Mean ±SD	p value*
Pre procedure	80.19 ± 15.08	<0.001
1 month follow up	32.63 ± 15.19	
Pre procedure	80.19 ± 15.08	<0.001
3 months follow up	50.20 ± 19.16	
Pre procedure	80.19 ± 15.08	0.729
6 months follow up	79.51 ± 18.29	

**Paired-samples t-test*

However at 6 month follow-up there was no significant improvement in FFI (p=0.729). All comparisons were with regard to the pre-procedure score.

Final treatment outcome is shown in Table 5. At 1 month follow-up 92 % had fair to excellent results. However at last follow-up at 6 months 90% had poor outcome.

Table 5: Final outcome

	Follow-up period		
	1 month	3 months	6 months
Excellent	19 (38%)	6 (12%)	2 (4%)
Fair	27 (54%)	21 (42%)	3 (6%)
Poor	4 (8%)	23 (46%)	45 (90%)

There were no complications like fat pad atrophy, plantar fascia rupture, infection, hematoma or hypopigmentation. Only 2 patients (4%) encountered extreme pain while injecting steroid.

DISCUSSION

Plantar fasciitis is a self-limiting condition in the majority of cases and surgery is not the treatment of choice. About 95% of patients

with plantar fasciitis will have their symptoms resolved in six to eighteen months [6, 16]. Corticosteroid injections have long been used to relieve the symptoms of plantar fasciitis when other conservative measures fail [6, 8]. This study was conducted to find out the effectiveness of corticosteroid injection in our context.

Different methods of injection of corticosteroid have been described, most commonly used are the palpation-guided and ultrasound-guided techniques. We have used palpation method in our study. Although some studies suggest ultrasound-guided injection [9, 10], Kane et al. [17] reported no significant difference in the outcome of ultrasound- and palpation-guided injection methods. Similarly satisfactory outcomes following palpation-guided steroid injection was achieved in other studies [16, 18]. Moreover, ultrasound-guided treatment will increase the cost of treatment and also may not be always readily available.

The mean age of patients in our study was 37.42 years with a standard deviation of 10.88 years which is comparable to 38.9 years in the study of Porter et al [19]. Majority of the patients in our study were in the age group of 20-40 years (58%). Other studies had a higher mean age- Crawford et al 57 years [20], Tsai et al 51.4 years [21], Kalaci et al 50.58 years [22], Aksahin et al 46.03 years [18]. Lower mean age may be because of lower life expectancy of our population. Also patients of age group 20-40 are actively involved in outdoor activities and are prone to injury.

Females were affected more in our study (30:20). There was female preponderance in most of the studies- Kalaci et al 70:30 [22], Aksahin et al 35:25 [18], Crawford et al 69:37 [20], Lee et al 57:6 [23]. Many women wear high-heeled sandals and this faulty footwear may be the cause of their foot pain. Also many pregnant women have symptoms of plantar fasciitis - they gain weight quickly making it difficult for their body to adapt to supporting more weight so fast, which puts a strain on their plantar fascia.

In this study right side (50%) was affected more than the left (40%) and 10% patients had bilateral involvement. Right side was affected more in the studies of Aksahin et al [18] and Omar et al [24]. Left side was commonly involved in Tsai et al [10]. Furey et al [25] had 15% of patients with bilateral involvement. No studies have shown why either side is affected. Injury or repeated microtrauma may damage the foot arch and the heel, thus predisposing to plantar fasciitis. Also the symptoms may develop in the uninjured foot as well which may have to absorb greater impact and force to compensate for the injured foot, for example when single-leg weight bearing is allowed during the healing period of the opposite injured limb.

The mean duration of symptoms was 7.44 ± 2.44 months (range 3-12 months). This was comparable to the study of Lee et al 7.75 months [23]. The mean pain duration was 6 months in the study by Crawford et al [20] and 8 months in the study by Kulkarni et al [26]. Many patients seek local remedies and visit to our hospital late. This may be the reason for longer duration of symptoms during presentation.

The mean VAS score before steroid injection was 8.12 ± 1.15 (range 4-10). There was significant reduction in VAS score at 1 and 3 months follow-up ($p<0.001$) but this reduction was not significant at 6 months

follow-up (p=0.057). The findings of this study were comparable to the study done by Crawford et al [20] and Landorf et al [27] which had clearly shown the short-term effectiveness of the steroid. Other studies had significant reduction in mean VAS score [18, 22, 28]

The mean foot function index had significantly improved at 1 month and 3 month follow-up ($p < 0.001$). No statistically significant improvement in foot function index could be detected at 6 month follow-up (p=0.729). The FFI (pain subscale, score 0-90) decreased from 80.19 ± 15.08 at baseline to 32.63 ± 15.19 at one month ($p < 0.001$).

Similarly, in the study of Eslamain et al [29], the mean FFI (pain and disability, score 0-170) decreased from 60.25 ± 5.90 at baseline to 38.25 ± 16.27 at 4 week and 31.50 ± 20.53 at 8 week ($p<0.001$). Their study had 36.5% and 44.7% improvement in FFI at 4 week and 8 week respectively, whereas we had a better improvement (59.3%) in FFI at one month. However this difference could be due to different subsets of FFI used to measure the outcome in their and our study.

There was 92% fair to excellent outcome at 1 month follow-up, which decreased to 54% at 3 month and 10% at 6 month. In the study of Eslamain et al [29], 30% patients believed the treatment to be good to excellent and 70% to be fair to adequate (8 week follow-up).

There were no major complications in our study. Kalaci et al [22] had no complications of hypopigmentation, hematoma formation, infection or tendon rupture but all of the patients found the injection to be painful.

In our study only 2 patients (4%) encountered extreme pain while injecting steroid. Kim et al [30] had 2.4% plantar fascia rupture following an average of 2.67 injections whereas Acevedo et al [3] reported 10% plantar fascial rupture in patients treated with multiple steroid injections. We did not encounter this complication probably because of use of single dose of steroid injection.

Our study is not without limitations. The sample is small. The duration of follow-up is relatively shorter and the long term results are yet to be evaluated.

CONCLUSION

A single dose of corticosteroid injection provides short term benefit in plantar fasciitis. Successful treatment of plantar fasciitis may require a combination of various treatment methods rather than administering only steroid injection.

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AUTHOR'S CONTRIBUTION

DNS- conception of study and design, data collection, analysis and interpretation of data, manuscript writing; **BDS-** conception of study, data analysis and manuscript writing.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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