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Plantar fasciitis treatment: What is better, oral nonsteroidal anti-inflammatory agents or locally injectable steroid?

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Abstract

Plantar fasciitis is the one of the most common causes of painful heel in adults. It is assumed to be caused by inflammation and is typically precipitated by biomechanical stress. Conservative management is the mainstream treatment option for plantar fasciitis like non steroidal anti-inflammatory drugs (NSAIDs), steroid injections, PRP injection, stretching exercises. There is no consensus on the efficacy of any particular conservative treatment regimen. This study was taken with objective to compare the efficacy of NSAID and local steroid injection in treating plantar fasciitis. **Method:** Sixty patients were randomized into 2 groups, group I patients were treat with oral NSAIDs and group II patients were treated with local steroid injection. Patients of both groups are given common supportive measures such as soft heel and advised same stretching exercises. The patients were evaluated using VAS score for pain assessment at pre-treatment stage, 1 week, 2 weeks, 4 weeks, 2 months and 3 months. **Results:** 60 patients were randomized into 2 groups, both groups had similar demographics. The VAS scores at pre treatment level in group I was 6.60 ± 1.14 and in group II was 6.46 ± 1.05 . The VAS score reduced to 3.10 ± 1.18 in group II after injection and in group I reduced to 4.9 ± 1.33 after a starting oral NSAIDs. The VAS scores consistently reduced in both the groups till 4 weeks of follow up but group II VAS scores were always lower than group I (p -value < 0.001). After 4 weeks, a trend towards increase in VAS scores was noted in both groups, patients had complaints of relapse of pain or increase in intensity of it. **Conclusion :** With this study we concluded that as compared to NSAIDs the use of local injection of steroid gives better and more sustained pain relief with fewer complications and lesser recurrences of heel pain in cases of plantar fasciitis.

Keywords: plantar fasciitis, local steroid injection, NSAID, heel pain, corticosteroid.

1. Introduction

In 1922, Stiell stated, “painful heel appears to be a condition which is seldom efficiently treated, for the simple reason that the causation is not exactly diagnosed.” Lapidus and Guidotti stated, “the name of *painful heel* is used deliberately in preference to any other more precise etiologic diagnosis, since the cause of this definite clinical entity still remains unknown”. The differential diagnosis of plantar heel pain should include heel pad atrophy, plantar fasciitis (plantar fasciopathy), entrapment of the first branch of lateral plantar nerve, calcaneal stress fracture, and tarsal tunnel syndrome. ^[1]

Plantar fasciitis is the one of the most common causes of painful heel in adults. It is assumed to be caused by inflammation and is typically precipitated by biomechanical stress. ^[2] Tong and Furia reported that more than 2 million patients are treated for plantar fasciitis every year in the United States and estimated the cost of treatment in 2007 as ranging from \$192 to \$376 million. The plantar fascia is perhaps more correctly called the plantar aponeurosis, and lies superficial to the muscles of the plantar surface of the foot. The plantar fascia has a thick and strong central part which covers the central muscle of the 1st layer, flexor digitorum brevis and is immediately deep to the superficial fascia of the plantar surface. It is attached proximally to the calcaneus at the anterior calcaneal tubercle, the site of the muscle attachments, while distally it blends with the skin at the creases of the base of the digits, and also sends five slips, one to each toe. This anatomical arrangement is integral to the pathogenesis of plantar fasciitis. ^[3]

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The plantar fascia is the most important arch stabilising structure. It elongates with increasing loads, and stores this elastic energy, acting as a shock absorber and its dynamic role, particularly its ability to assist in the propulsive phase of gait, is critical to normal foot function.

Plantar fasciitis has been associated with obesity, middle age, and biomechanical abnormalities in the foot, such as tight Achilles tendon, pes cavus, and pes planus. It is considered to be most often the result of a degenerative process at the origin of the plantar fascia at the calcaneus. However, neurogenic and other causes of subcalcaneal pain are frequently cited. A combination of causative factors may be present, or the true cause may remain obscure. [4]

Conservative management is the mainstream treatment option for plantar fasciitis. Various options such as Orthoses, night splints, specific plantar fascia stretching regimen, oral nonsteroidal anti-inflammatory agents, local injections, extracorporeal shockwave therapy, and low-level laser therapy all have been reported to be successful. More commonly, corticosteroid injections have been used successfully, but other injections such as PRP and whole blood also have relieved symptoms. Although there is no consensus on the efficacy of any particular conservative treatment regimen, there is agreement that nonsurgical treatment is ultimately effective in approximately 90% of patients. Rarely does a patient with a painful heel require surgery to relieve the symptoms.

A lot of studies have been conducted in past few years regarding the role of PRP and autologous blood injections in treatment of plantar fasciitis and assessing their efficacy as well as comparing it with other methods specially steroid injections. But PRP injections and autologous blood injection are not as common method of treatment as NSAID and steroid injections. Upon extensive search of literature we found very few studies comparing the efficacy of the two most common methods of treatment of plantar fasciitis namely NSAID and steroid injections along with stretching exercises and orthosis. Also in our institute these two are the most common methods of treatment used for the treatment of plantar fasciitis.

The present study was taken up with the aim to compare the effectiveness of steroid injection and NSAID in conjunction with the common supportive measures in the management of plantar fasciitis.

2. Methods and Material

Place of study: R L JALAPPA hospital and research center, Tamaka. Kolar

Nature of study: randomized prospective comparative study.

After obtaining ethical clearance from the institutional ethical clearance committee and taking written informed consent, 60 adult patients were enrolled in this study as per the inclusion criteria.

Inclusion criteria

1. Unilateral plantar fasciitis.
2. No serious systemic disorders (The American Society of Anesthesiologists (ASA) grade I and II)
3. Patients willing for 8 week follow-up.

Exclusion criteria

1. History of trauma in past 3 months of the affected foot and ankle.
2. In case bilateral plantar fasciitis, only the side with more pain was included in the study.
3. Prior treatment done for plantar fasciitis.

The patients were randomized into two groups namely NSAID (group I) and STEROID INJECTION (group II) by allocating all the odd sequence number patients to group I and all even sequence patients to group II.

NSAID group patients were prescribed oral tablet diclofenac (50 mg) and paracetamol (500 mg) - one tab. twice a day along with tab. ranitidine (150 mg) - one tab. twice a day for 4 weeks. STEROID injection groups patients were given STAT dose of 40 mg (1 ml) of methylprednisolone (Depomedrol) and 2 ml of 0.5% bupivacaine, injected into the tender most point of plantar fascia and advised to avoid strenuous activity for 2 days following the procedure following which specific plantar fascia stretching exercises were started.

The steroid injection was given with patients in the lateral recumbent position with the affected side down. On the medial aspect of the foot distal to the calcaneum, the point of maximal tenderness or swelling was palpated and a 18 G needle was inserted perpendicular to the skin, which is advanced until the deep plantar fascia is engaged. The use of an 18-gauge needle allows the surgeon to easily advance the needle and perceive contact with the inflamed calcaneal apophysis or spur. Once the target was reached, 40 mg (1 ml) of methylprednisolone (Depomedrol) and 2 ml of 0.5% bupivacaine was injected slowly and evenly through the middle one third of the width of the foot while the needle was being withdrawn. Injection through the base of the foot into the fat pad was avoided.

The injection site is then covered with an adhesive coverlet, after which the patients were allowed to ambulate with full weight bearing as tolerated and were advised to start stretching exercises after 1 week of local steroid injection.

Patients of both groups are given common supportive measures such as soft heel and advised same stretching exercises and common precautions such as not walking bare foot and standing for long durations.

All patients were explained about visual analogue scale (VAS) (0-10cm) for pain; 0 equal to "no pain" and 10 equal to "worst possible pain". In both groups, pain intensity was measured before treatment, and at 1 week, 2 weeks, 4 weeks, 2 months and 3 months of follow up. The recurrence or increase in severity of heel pain and any complications, if any, occurred in any of the groups were also noted.

3. Statistical analysis

Statistical analysis was done by the graph pad prism software 4 version and also manually which was done to cross check the outcomes. Sample size was decided on consultation with the statistician: 26 was the smallest number in each group, where any results could be statistically significant (with power of 90%). Hence sample size of 30 (thirty) was selected for both the groups. Statistical measures such as "Z" test and Chi-square test were used to analyze the data. Results were reported as mean±standard deviation (SD). The results were considered to be statistically significant at the 5% critical level ($P<0.05$).

Table 1: Demographics (mean±SD)

	Group I	Group II
Number of Patients	30	30
Age In Years	39.33±9.5467	40.67±10.5647
Weight In Kgs	57.45±5.8767	60.98±5.3746
Asa Grade (I/II)	10/20	15/15
Male /Femlae	13/17	14/16

p-value:>0.05 not significant, ASA – American society of Anaesthesiologist

4. Results

A total of 60 patients were included in the study, 30 each were randomized into NSAID (group I) and STEROID INJECTION (group II).

Both the groups had similar demographic build up, group I had 13 males and 17 females whereas group II had 14 males and 16 females. The average age and weight of patient in group I were 39.33 ± 9.5467 years, 57.45 ± 5.8767 Kgs respectively. In group II the average age was 40.67 ± 10.5647 years and average weight was 60.98 ± 5.3746 Kgs, both age and weight distribution had no statistically significant difference in the two groups.

Patients in both groups had similar ASA distribution, group I had 10 ASA I and 20 ASA II patients whereas group II had 15 patient each of ASA I and II, making the distribution statistically insignificant.

All the patients were assessed using VAS scores at pre treatment and follow ups. The pre treatment mean VAS scores

of group I was 6.60 ± 1.14 and in group II was 6.46 ± 1.05 . The VAS scores of both the groups improved after initiating the treatment, the improvement was more prominent in group II where VAS score reduced to 3.10 ± 1.18 , as compared to group I where although VAS score reduced but not as much. (4.9 ± 1.33). Both of these changes in VAS scores as well as the difference between the VAS core of group I and group II were statistically significant. The VAS scores consistently reduced in both the groups till 4 weeks of follow up but group II VAS scores were always lower than group I (p value < 0.001). After 4 weeks, a trend towards increase in VAS scores was noted in both groups, patients had complaints of relapse of pain or increase in intensity of it. This increase was more drastic in between 4 weeks and 1 month in group I and between 2 months and 3 months in group II, although during these follow-ups also group II patients had lower VAS scores than group I (p value < 0.001).

Table 2: VAS scores (mean \pm SD)

Groups	VAS pre treatment	VAS 1weeks	VAS 2weeks	VAS 4weeks	VAS 2months	VAS 3months
Group I	6.6 ± 1.66	5.3 ± 1.09	4.4 ± 1.14	3.7 ± 1.16	4.1 ± 1.71	4.5 ± 1.07
Group II	6.2 ± 1.31	3.1 ± 1.18	2.1 ± 1.04	1.6 ± 1.13	1.9 ± 1.09	2.4 ± 1.18
P-Value	0.29	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

The number of patients which has an increase in heel pain after 2 months of treatment in group I was significant as 17 out of the 30 patients (56%) reported an increase in VAS score. This number further increased to 21 from 2 month to 3 month follow up. In group II this number was limited to only 10% during the follow up from 4 weeks to 2 months but the number increased to 10 patients (33.3%) during 2 months to 3 months follow up. All of these increases were statistically significant (p value < 0.001).

Table 3: Recurrence of pain number (percentage)

Groups	Recurrence of pain at 2 months	Recurrence of pain at 3 months
Group I	17 (56%)	21 (70%)
Group II	3(10%)	10(33.3%)

Occurrence of complications was more in group I patients (22/30 i.e. 73.33%) as compared to group II patients (3/30 i.e. 10%). Most common complications in group I were gastritis and pruritus, whereas in group II the complications of injection site infection and erythema were seen in one case each and plantar fascia rupture in one case.

Table 4: Complication in group I and group II.

Complications	Group I	Group II
Gastritis	18	
Esophagitis	1	
Pruritus	3	
Injection site Erythema		1
Injection site Infection		1
Plantar fascia Rupture		1

5. Discussion

Plantar fasciitis is the one of the most common causes of painful heel in adults, assumed to be caused by inflammation and is precipitated by biomechanical stress. Both NSAIDs and steroid injections have been used commonly to treat this condition but very few studies have been done to compare these two modalities of treatment.

This study was undertaken to compare the efficacy of

NSAIDs and single steroid injection to treat plantar fasciitis in OPD set up.

In this study it was observed that for the treatment of plantar fasciitis, local injection of steroid with local anesthetic agent gave a better pain relief and improvement in VAS score with fewer complications than NSAIDs, all of which were statistically significant.

In a randomized control prospective study of 120 cases, Biswas *et al* [2], found out that local steroid with local anesthetic injection gives better pain relief than NSAIDs. Throughout the study period steroid group had better improvement in VAS scores and fewer complications, hence concluded that steroid injection is superior to NSAID in treatment of plantar fasciitis.

Nonsurgical methods are the mainstream methods of treatment of plantar fasciitis. Bartold S.J. [3], after studying the biomechanics of plantar fasciitis and various methods of treatment opined that although there is no agreement on one treatment of choice for plantar fasciitis but an early, aggressive, nonsurgical treatment within 12 months of the onset of symptoms offer the best chance of a good outcome.

NSAIDs are commonly used for treating plantar fasciitis associated pain and disability. Our study showed that although NSAIDs help in reduction of pain in plantar fasciitis but it is inferior to local steroid injection. Donley *et al* [5] in a study of 29 patients comparing efficacy of NSAIDs v/s placebo found that both improved the pain and disability means score with no statistical significance between the two, when both group patients received same conservative regimen. Although there was a trend noted in NSAID group in 2 to 6 months follow up towards pain relief and disability improvement which provided some evidence of NSAIDs being useful in plantar fasciitis management. Other studies also founds that NSAIDs have a limited efficacy in treatment of plantar fasciitis [6].

Local steroid injections use for treatment of plantar fasciitis is also a widespread practice. In our study it was observed that local steroid injection provides better pain relief and disability improvement than NSAIDs. John Grice *et al* carried out a retrospective study on the clinical outcome of all patients who

underwent a corticosteroid injection of the foot or ankle pain management, plantar fasciitis being a common cause amongst the patients. Out of the total of 365 patients, 314 (80%) patients reported a significant improvement in symptoms, and 242 (66%) reported complete resolution of their pain, with 107 (29%) remaining asymptomatic at two year follow-up.^[7] There were no reported infections. Complications occurred in 5 patients (1.3%), including steroid flare, pain, and plantar plate ruptures. The author concluded that corticosteroid injections were a safe and effective option for treating a variety of foot and ankle conditions and reduced the need for surgery but appear ineffective in providing significant improvement in pain for longer than 3 months in conditions such as plantar fasciitis. These findings are similar to our study where steroid injections although provided good pain relief for first 2 months, with recurrence of pain only in 2 patients but at 3 month follow up the recurrence increased and 12 patients reported increase in pain. When compared with NSAID group the recurrence was less in steroid injection group at all follow up periods till 3 months, which was statistically significant at each follow up.

The effectiveness of steroid injections in treatment of plantar fasciitis has been studied in various studies. Karls *et al* did a review of published literature since 2009 with aim to find if steroid injection is more effective than other interventions such as placebo, PRP and tenoxicam in treatment of plantar fasciitis. One level 2 randomized controlled trial, 1 level 2 randomized trial, and 2 level 3 nonrandomized trials were included.^[8] Two studies compared corticosteroid injection with platelet-rich plasma injections.^[9, 11] One study compared corticosteroid injection with NSAID (tenoxicam) injection.^[10] one study compared corticosteroid injection with PRP and placebo injection.^[12] The primary outcomes that were common in the 4 studies were pain, function, and patient-reported outcomes. After the comprehensive review the author opined that that corticosteroids are more effective than placebo injections but are no more effective than tenoxicam injections and perhaps less effective than platelet-rich plasma treatment. Studies comparing the effectiveness of joint mobilization combined with stretching exercises v/s steroid injection in the treatment of plantar fasciitis^[13] demonstrated that steroid injection gives better relieve but only for a short term whereas exercises give improvement in disability longer periods. To rule out confounding effect of exercises on the results as noted in some studies^[11], in our study both the groups patients were given common supportive measures such as soft heel and advised same stretching exercises and common precautions such as not walking bare foot and standing for long durations.

NSAIDs mainly act by inhibition of prostaglandin synthesis, but they do not suppress the production of other inflammatory mediators like leukotrienes, cytokines, platelet activating factor etc. Steroids interfere at several steps in the inflammatory response, but the most important overall mechanism appears to be limitation of recruitment of inflammatory cells at the local site. So their actions are both direct and local.^[2]

Long-term use of oral NSAIDs can cause serious systemic side effects like gastritis, peptic ulcer, esophagitis, gastrointestinal (GI) bleeding, interstitial nephritis, Na⁺ and water retention, thrombocytopenia, bleeding, pruritus, central nervous system, and hepatic complications⁵, whereas in case of steroid injections chances of systemic side effects are very rare as it is injected locally, but steroid injection for plantar fasciitis is often associated with local site erythema, plantar

fascia rupture, and fat pad atrophy.^[14, 15]

In our study the group I patients had a high complication rate, 18 patients had complaints of gastritis, 3 cases had pruritis, 1 case was diagnosed with esophagitis, these complications are commonly seen in other studies with NSAIDs.

In group II, one patient had plantar fascia rupture (3.33%), and one patient each had injection site erythema and infection. The low rates of complications can be attributed to the correct technique and post procedure compliance by the patients. Kim *et al*^[16] performed retrospective study of 120 random patients diagnosed with plantar fasciitis who were treated with local corticosteroid injection and reported the incidence of plantar fascia rupture to be 2.4%, following which it was concluded that corticosteroid injection therapy is a safe and effective form of treatment for plantar fasciitis with minima 1 complications.

6. Conclusion

With this study we concluded that as compared to NSAIDs the use of local injection of steroid gives better and more sustained pain relief with fewer complications and lesser recurrences of heel pain in cases of plantar fasciitis.

7. Limitations of study

1. Larger sample size with a longer follow up would have been more statistically relevant. Although the sample size was taken after statistician advice and all findings are statistically significant.
2. In our study only VAS score for outcome assessment was used, using other tools like The Foot Function Index would have given a more comprehensive assessment.

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