



MULTIPLE PUNCTURE TECHNIQUE: A NOVEL TREATMENT FOR PLANTAR FASCIITIS

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ABSTRACT Plantar fasciitis is one of the most common causes of heel pain. Earlier considered an inflammatory disorder, it is now thought to be degenerative in nature. Various treatment modalities have been tried over the years. Our study aimed to establish multiple puncture technique as a novel treatment for plantar fasciitis and compare its efficacy with intralesional corticosteroids. 121 consenting adults suffering from plantar fasciitis were randomly divided into two groups. In the corticosteroid group, 2 ml of 2% lignocaine with 2 ml of 40mg/ml Inj. Triamcinolone was infiltrated near the calcaneal insertion of plantar fascia while in the multiple puncture technique group, 2 ml of 2% lignocaine alone was infiltrated and 4-5 pricks were made at the same site. The improvement in VAS score and AOFAS score as well as the decrease in plantar fascia thickness as compared to preinjection values was significant in both the groups at 1 week, 1 month and 3 months follow-ups. However, the difference between the groups was non-significant. Our study concluded that multiple puncture technique is an effective treatment modality for plantar fasciitis and is as efficacious as Intralesional corticosteroids.

KEYWORDS :

INTRODUCTION

Plantar fasciitis is a degenerative irritation of the plantar fascia attachment at the medial calcaneal tuberosity and surrounding soft tissues. Since its first description by Wood¹ in 1812 who considered it to be caused by tuberculosis, many different pathologies have been considered to be the cause of plantar fasciitis. The current evidence shows the presence of degenerative noninflammatory pathological changes in the plantar fascia, making us wonder if it should be called "Plantar Fasciosis" instead of fasciitis as suggested by Lemont.² Prolonged weight bearing (eg.- teachers, surgeons), barefoot walking as in Indian housewives, obesity, footwear with less cushioning, and irregular walking surface are some of the risk factors. Plantar fasciitis is generally a clinical diagnosis. Characteristic history of morning first pain, pain most severe during first few steps after rest and decreasing later on, and the examination finding of tenderness at medial calcaneal tuberosity are sufficient in most cases. Most of the patients get relieved with conservative therapies and only about 1% resistant cases need surgical intervention. A stepladder approach is usually taken for treatment of plantar fasciitis. Initially nonsteroidal anti-inflammatory drugs (NSAIDs), foot orthoses, night splints and physiotherapy is advised. If pain persists, local injections (corticosteroids, prolotherapy, platelet rich plasma, botulinum toxin etc.) are considered. Other methods include multiple puncture technique, acupuncture, dry needling and extracorporeal shock wave therapy. In the resistant (<1%) cases surgical treatment including open, endoscopic or percutaneous plantar fascia release may be considered.

Corticosteroids are the most commonly used local injection for plantar fasciitis. The usual mechanism of action of corticosteroids is inhibition of synthesis of arachidonic acid from membrane phospholipids to reduce inflammation and pain. However, plantar fasciitis is considered to be a degenerative condition and not an inflammatory one. This could be the reason why the long-term efficacy of corticosteroids is doubtful as suggested by various studies. It is also not advisable in the presence of some pre-existing co-morbidities including, but not limited to Diabetes mellitus and immunosuppressed patients. These limitations of corticosteroids warrant the need for research on new methods of treatment of plantar fasciitis. Research is being conducted on various modalities like prolotherapy and platelet-rich plasma but could not be found on **multiple puncture technique**.

In **this technique**, 3-5 pricks are made in the plantar fascia using an 18G needle so as to form a pie crusting /fenestration pattern which helps in stretching the fascia. The local micro bleeding also releases growth factors (PDGF and TGF- β) which further help in healing the affected tissue. This is a novel method for the treatment of plantar fasciitis and not many studies have been done on the same. Our study

was done in order to further analyse the efficacy of this new treatment modality in plantar fasciitis and compare it with Intralesional corticosteroids, the most preferred treatment for the disease.

MATERIALS AND METHODS

The study was conducted at the Department of Orthopaedics, NSCB medical college and Hospital, Jabalpur after obtaining due approvals from the institutional human ethics committee. Patients between the age of 20-70 of either sex, suffering from plantar fasciitis who came to our OPD were included once they understood the risks and benefits of the protocol and gave informed consent.

Patients with a history of fractures of the foot, calcaneum osteomyelitis, deformed foot, or any operative intervention for plantar fasciitis were excluded from the study. Pregnant females, immunosuppressed patients, and patients allergic to local anaesthetics were also excluded from the study. Furthermore, patients with a history of any other disease capable of inducing pain or sensitivity to the foot like Diabetes Mellitus, Seronegative arthritis, fibromyalgia, Vitamin D deficiency, Vitamin B12 deficiency, Hypo- or Hyperthyroidism etc. were not included. All such patients were advised physician check-up and treatment of these comorbidities.

All the patients were evaluated clinically for the presence of tenderness near the medial calcaneal tuberosity or at the proximal plantar fascia. The subjects were assigned to multiple puncture and corticosteroid group on alternating basis. Patients with bilateral plantar fasciitis were assigned to both groups with one foot receiving multiple puncture treatment and the other corticosteroid injection.

A plain radiograph of bilateral heel (lateral view) was obtained for detecting the presence of calcaneal spur or any other pre-existing foot lesions.

Plantar fascia thickness was measured at presentation using ultrasonography. VAS and AOFAS scores were calculated before the procedure.

In the corticosteroid group, 2 ml of 2% lignocaine with 2 ml of 40mg/ml Inj. Triamcinolone was infiltrated in the plantar fascia near the medial calcaneal tuberosity using a 23 G needle while in the multiple puncture technique group, 2 ml of 2% lignocaine alone was infiltrated and 4-5 pricks were made ~3-5mm apart in the plantar fascia near the medial calcaneal tuberosity with 18G needle. Injections were given under aseptic conditions as an outpatient procedure.

After the injection, patients were sent home with instructions to restrict

weight bearing for 24 hours. Analgesics (paracetamol and ibuprofen) were given to all patients for 3 days. All the patients were advised to use soft sole footwear and to do daily physiotherapy (plantar fascia stretching exercises, iced calf roll, and calf stretching exercises). Adverse effects like pain, swelling, redness, and infections were watched for and recorded at each follow-up.

Improvements in VAS and AOFAS scores were analyzed at 1 week, 1 month, and 3 months and were expressed in terms of the mean and the standard deviation of the mean. To assess the differences in the mean of the two groups, a student's T-test was performed. The decrease in plantar fascia thickness was measured at 1 month and was analyzed similarly.

RESULTS

Out of 121 subjects, 80 (66.1%) were females and 41 (33.9%) were males. Based on occupation, 49 (40.5%) were housewives, 24 (19.8%) were labourers and 13 (10.7%) were farmers. 94 patients (77.7%) showed bony spur on lateral radiograph of calcaneum

The study subjects were divided into two groups - multiple puncture group (63 patients) and corticosteroid group (58 patients)

The mean VAS score in multiple puncture and corticosteroid groups was 5.11 and 5.05 preinjection which decreased to 3.22 and 3.17 at 1 week, 2.16 and 1.88 at 1 month and 2.02 and 1.76 at 3 months follow up. Similarly, the mean AOFAS score was 79.08 and 79.66 preinjection which increased to 85.37 and 86.14 at 1 week, 91.03 and 92.29 at 1 month and 92.51 and 94.79 at 3 months follow up. The mean plantar fascia thickness in multiple puncture and corticosteroid groups was 4.81 and 4.90 preinjection which decreased to 3.74 and 3.38 at 1 month.

In both the groups, the decrease in mean VAS score and the increase in mean AOFAS score in comparison with the preinjection scores in the same group was significant at 1 week ($p < 0.01$), 1 month ($p < 0.01$) and 3 months ($p < 0.01$) follow up. The plantar fascia thickness also decreased significantly at 1 month ($p < 0.01$) follow up

Upon comparing the two groups, mean difference in VAS scores was 0.0498 at 1 week ($p > 0.05$), 0.2794 at 1 month ($p > 0.05$) and 0.2573 at 3 months ($p > 0.05$). The mean difference in AOFAS scores was -0.7729 at 1 week ($p > 0.05$), -1.2614 at 1 month ($p > 0.05$) and -2.2852 at 3 months ($p > 0.05$). The mean difference in Plantar Fascia Thickness was 0.3589 at 1 month ($p > 0.05$).

Comparing the two groups showed statistically insignificant results signifying that multiple puncture technique is not less effective in comparison with Intralesional corticosteroids.

No severe side effects were noted in any patient in both the groups. The most common complaint was increased pain immediately after procedure which lasted 1-2 days for which analgesics (Ibuprofen + paracetamol) were continued for 3 days post injection.

DISCUSSION

The term 'Plantar Fasciitis' is synonymous with inflammation of the plantar fascia. Earlier plantar fasciitis was considered to be caused due to inflammatory processes at the insertion of plantar fascia. Histological studies and Electron microscopy has now shown that there are no inflammatory changes in plantar fasciitis. Instead, we've now found out that in plantar fasciitis there is presence of degenerative noninflammatory pathologic changes in the fascia near its insertion at the medial calcaneal tuberosity. This change in understanding of the etiopathogenesis has led to a change in the treatment modalities being considered for plantar fasciitis. Intralesional corticosteroids which act by reducing inflammation was the most sought after treatment earlier.

Many studies have shown that prolotherapy and platelet rich plasma are also effective modalities. Multiple different forms of treatment are now under research for treatment of plantar fasciitis including, but not limited to botulinum toxin, extracorporeal shock wave therapy, dry needling etc. Our study was done to establish multiple puncture technique as a novel treatment for plantar fasciitis and compare its therapeutic effect with Intralesional corticosteroids, the age old treatment.

The multiple puncture technique is a novel method for treatment of plantar fasciitis, which acts by creating 4-5 fenestrations in the plantar

fascia using an 18 G needle. These fenestrations allow the fascia to stretch like a pie-crusting pattern and hence reduce the pain perceived when plantar fascia is stretched during activities like walking. These fenestrations also create new channels in the degenerative tissue where localised micro-bleeding helps in healing by releasing various growth factors like TGF- β and PDGF.

Previous studies done for various methods of treatment show good results with corticosteroid injection upto 3 months. Mahindra et al³ compared PRP and corticosteroids and found that mean VAS score decreased from 7.44 and 7.72 preinjection to 2.52 and 3.64 respectively at 3 months follow-up. They also measured AOFAS score which improved from 51.56 and 55.72 preinjection to 88.24 and 81.32 at 3 months follow-up in PRP and corticosteroid groups.

Kiter et al⁴ divided 44 patients into 3 groups- peppering technique, corticosteroids and autologous blood injection and they found significant improvement in VAS and AOFAS scores at 6 months follow up in all three groups

Jain et al⁵ compared corticosteroids with PRP injection in 60 patients and found significant improvement in AOFAS scores in both groups at 3 months.

Porter et al⁶ studied 132 patients with plantar fasciitis and concluded that extracorporeal shock wave therapy was less effective as compared to corticosteroids at 3 months. However, they were equally effective at 12 months and were significantly better than controls.

Rastegar et al⁷ studied 66 patients and found that the mean VAS score before treatment was 6.96 ± 0.87 for the steroid group and 6.41 ± 0.83 for the dry-needling group. In the steroid injection group, VAS scores reduced rapidly for three weeks in comparison with dry needling (0.32 ± 0.71 and 3.47 ± 1.32 , respectively; P value < 0.001). However, patients who were underwent dry needling reported lower VAS scores at 12 months follow-up compared with the steroid group (0.69 ± 0.93 and 2.09 ± 1.58 , respectively; P value = 0.004)

All these studies found corticosteroids to be effective upto 3 months of follow ups with some showing efficacy upto 12 months.

Our study found both corticosteroids and multiple puncture technique to be effective upto 3 months with significant decrease in VAS score and significant increase in AOFAS score. The plantar fascia thickness was also found to be decreased in both the groups. However, on comparing the scores between the groups, no significant difference was found at any follow up.

Although many such research need to be conducted to further fine tune its use, multiple puncture technique can be used in treatment of plantar fasciitis, particularly in cases where corticosteroids pose a risk/ are not advisable like Diabetes mellitus, Hypothyroidism, Endocrine disorders, Immunocompromised patients and in refractory cases.

Limitations

The duration of follow up and the sample size were small in the present study and long-term effects of both the modalities could not be assessed. Further studies must be done, preferably with a larger sample size and longer duration of follow-up to confirm the results.

CONCLUSION

Our study establishes "Multiple Puncture Technique" using 18G needle by making 4-5 fenestrations (3-5 mm apart) at the insertion of plantar fascia as a safe and effective modality for treatment of plantar fasciitis and its efficacy is comparable with Intralesional corticosteroids for as long as 3 months.

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