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Original Research Article

A Clinical Comparative Evaluation of the Effectiveness of Dry Needling and Steroid Injection in Treating Plantar Fasciitis

Sunil Kumar[1], Anil Kumar[2]

[1]Senior Resident, Department of PMR, ANMMCH, Gaya, Bihar, India

[2]Associate professor and HOD, Department of PMR, ANMMCH, Gaya, Bihar, India

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Corresponding Author: Dr. Anil Kumar
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Abstract

Aim: To compare the effectiveness of dry needling and steroid injection in treating plantar fasciitis.

Material and Methods: This study was conducted in the Department of PMR, ANMMCH, Gaya Bihar. 83 patients were enrolled. Eligible patients were individuals > 18 years old, with a history of plantar heel pain of at least for three months and who were diagnosed for plantar fasciitis according to the guidelines of Orthopaedic Section of the American Physical Therapy Association.

Results: Three and six weeks and one year after treatment, mean VAS scores were significantly different between groups: 0.32 ± 0.71 steroid group and 3.47 ± 1.32 dry-needling group (P<0.001); 0.21 ± 0.67 steroid group and 2.66 ± 1.33 dry-needling group (P<0.001); 2.09 ± 1.58 steroid group and 0.69 ± 0.93 dry- needling group, (P = 0.004), respectively. There were no significant differences between groups at the other time points. Steroid injection quickly reduced pain, but after six weeks of treatment, pain increased; in the dry-needling group, pain reduced slowly, but after six weeks of treatment, pain continued to decline. And at the end of the study, average pain in the steroid group was greater than in the dry-needling group.

Conclusions: This study suggested that dry needling was superior to steroid injection in patients with plantar fasciitis at the end of one year of follow-up. Pain reduced gradually in dry-needled patients, and endpoint VAS scores were lower than in the steroid group, although rapid and short-term effects of steroid injection was also found.

Keywords: Dry Needling, Steroid Injection, Plantar Fasciitis.

Introduction

Plantar fasciitis is one of the most common causes of heel pain, affecting millions of people worldwide. It involves inflammation of the plantar fascia, a thick band of tissue that runs across the bottom of the foot and connects the heel bone to the toes. This condition typically results in sharp pain in the heel, particularly with the first steps in the morning or after periods of inactivity. The etiology of plantar fasciitis is multifactorial, including biomechanical, degenerative, and inflammatory factors. Conservative treatments for plantar fasciitis include rest, ice, physical therapy, orthotics, and nonsteroidal anti-inflammatory drugs (NSAIDs). When these measures fail, more invasive treatments such as dry needling and steroid injections are often considered. Both modalities aim to reduce pain and inflammation, but they employ different mechanisms and have varying degrees of efficacy and safety profiles. [1-7] Dry needling is a technique used by physical therapists and other healthcare providers that involves inserting a thin, solid needle into trigger points, tendons, ligaments, or near nerves to stimulate a healing response. The exact mechanism by which dry needling alleviates pain is not entirely understood, but it is believed to disrupt the dysfunctional motor end plates and reduce the spontaneous electrical activity in muscles, leading to pain relief and improved function . Studies have shown that dry needling can be effective in reducing pain and improving function in patients with plantar fasciitis. For instance, a randomized controlled trial by Cotchett et al. demonstrated that dry needling significantly improved pain and functional outcomes compared to a sham procedure. [8-15] Corticosteroid injections are commonly used for their potent anti-inflammatory effects. The injection is typically administered directly into the plantar fascia, aiming to reduce inflammation and pain. Steroid injections can provide rapid pain relief, making them a popular choice for patients with severe symptoms or those who do not respond to conservative treatments . However, the use of steroid injections is not without risks. Repeated injections can lead to potential complications such

as plantar fascia rupture, fat pad atrophy, and infection . Despite these risks, studies have shown that steroid injections can be effective in the short-term management of plantar fasciitis. [16-21]

Material and Methods

This study was conducted in the Department of PMR, ANMMCH, Gaya Bihar, India for one year. 83 patients were enrolled. Eligible patients were individuals > 18 years old, with a history of plantar heel pain of at least for three months and who were diagnosed for plantar fasciitis according to the guidelines of Orthopaedic Section of the American Physical Therapy Association.[6] Exclusion criteria consisted of history of diabetes mellitus, rheumatoid arthritis, flat foot, radiculopathies and foot malignancies, infections, calcaneal spurs and fractures. Patients had previously received conservative treatment only and were randomly assigned to one of two groups: dry-needling and steroid groups, the latter receiving injection of Depo-Medrol (methylprednisolone acetate).

Methodology

Following standard sterilisation of the skin in the plan- tar region, local needling was performed into the plantar fascia at the painful point only with a 0.3-mm (30- gauge) needle.[4] Participants were randomly assigned by the research's statistical consultant who was blinded to the treatment of each group. In the first (steroid) group, 1 ml of methylprednisolone acetate containing 40 mg/ml was injected into the intended site using a 2-ml syringe. The needle was withdrawn immediately after completion of injection. In the dry-needling group, patients received dry needling of intended sites using a 0.30-mm needle that was gradually withdrawn and advances for 30 seconds in the same location as in the steroid group. Patient tolerance and pain were monitored for possible complications. We identified myofascial trigger points (MTrP) of plantar foot muscles according to points of tenderness on physical examination and patient complaints. Medial aspect of the heel pad were respected in all cases. Patients were followed up before treatment and at three weeks, six weeks, three months, six months and one year after baseline treatment. Data, including basic patient demographic information and pain intensity, were collected at office appointments. Participants were asked to evaluate their overall perception of plantar pain intensity on the visual analogue scale (VAS) (0 no pain; 10 maximum pain experienced) before treatment and at each follow-up.[22] The primary outcome was pain intensity in the plantar fascia evaluated by one study investigator. There was no secondary outcome in this study. A study coordinator uninvolved in treatment or patient care assigned eligible patients a number from 0 to 70 in order of their admission to the clinic. Each number was randomly assigned to one group (steroid or dry needling) before study initiation. Computer software (Excel 2010; Microsoft, Redmond, WA, USA) was used for this blocked randomisation. This study was a single-blind, randomised clinical trial in which all patients (if possible) and persons who recorded measurements and statistics were blinded.

Statistical Analysis

Nonprobability sampling (convenience method) was used to select patients with unilateral plantar fasciitis admitted the clinic of orthopedics. According to previous similar studies and statistical calculations, the sample size was calculated by using two means comparison formulas for the 35 patients in each group. All patients were treated by the same orthopaedic professionals.

Results

Eighty-three patients with plantar fasciitis were assessed for inclusion criteria, and 66 patients became eligible; nine patients did not meet inclusion criteria, four declined to participate. In addition to those thirteen patients, another four were excluded during the course of study (one from the steroid group and three from the dry-needling group). Ultimately, there were 32 patients in the dry-needling group and 34 in the steroid group. There were 28 men (42.4%) and 38 women (57.6%), with no statistically significant gender difference between groups (P = 0.5) (Table 1). Mean age was 39.84 ± 7.96 in the dry-needling group and 42.03 ± 10.30 in the steroid group, with no statistically significant difference (P = 0.34) (Table 1). At the end of sampling, seven patients (10.6%) were younger than 30 years, 27 (40.9%) between 30 and 40, 20 (30.3%) between 40 and 50 and 12 (18.2%) ≥ 50. the frequency of plantar fasciitis among our study population according to age and sex. In all age groups, the disease was more common among women, and in two age ranges (<29 years and >50 years), the number of female patients was almost twice as many as male patients.

In this study, pain induced by plantar fasciitis was investigated in six stages (pre-treatment, 3 weeks, 6 weeks, 3 months, 6 months and 1 year after treatment). We consider the first three stages as a short-term period for pain relief and all six stages as long-term assessment. Table 2 presents results of repeated- measures tests. In the short term, time had a significant effect on pain, and 93.1% of changes in pain was due to passing time, regardless of treatment method (P<0.001). Treatment itself had a significant effect on pain, with 56.7% of changes being due to treatment method regardless of passing time (P<0.001). For first three stages of assessment (over time), treatment method had a significant impact on pain; over the long term, the same test shows the significant effect of both passing time and treatment

method separately and together. In this sense, 82.3% of changes in pain was due to passing time and 17.6% due to treatment method, regardless of treatment method and passing time (P <0.001).

Table 3 shows means ± standard deviation (SD) of VAS scores before treatment and at each follow-up. Three and six weeks and one year after treatment, mean VAS scores were significantly different between groups: 0.32 ± 0.71 steroid group and 3.47 ± 1.32 dry-needling group (P<0.001); 0.21 ± 0.67 steroid group and 2.66 ± 1.33 dry-needling group (P<0.001); 2.09 ± 1.58 steroid group and 0.69 ± 0.93 dry- needling group, (P = 0.004), respectively. There were no significant differences between groups at the other time points.

pain relief over time between groups. Steroid injection quickly reduced pain, but after six weeks of treatment, pain increased; in the dry-needling group, pain reduced slowly, but after six weeks of treatment, pain continued to decline. And at the end of the study, average pain in the steroid group was greater than in the dry-needling group.

Table 1 Patient demographic data

Variables	Dry-needling group	Steroid group	P value*
Gender			
Male	14 (21.21%)	14 (21.21%)	0.143
Female	18 (27.28%)	20 (30.30%)	
Age (year)[1]	39.84 ± 7.96	42.03 ± 10.30	0.097

Data are presented as mean ± standard deviation
* P value < 0.05 is significant; chi-square and independent t tests

Table 2 Effects of time and treatment method on pain relief: repeated-measures test

	Degree of freedom	F	*P* value	Amount of pain variation [b]
Short term				
Time	1.44	846.25	< 0.001	93.1%
Treatment method	1	83.86	< 0.001	56.7%
Time a	1.44	99.19	< 0.001	
Treatment method				
Long term				
Time	3.72	296.78	< 0.001	82.3%
Treatment method	1	13.63	< 0.001	17.6%
Time a	3.72	53.48	< 0.001	
Treatment method				

a Interaction between the variables
b Pain reduction considering each factor

Table 3 Visual analogue scale (VAS)

Time	Dry-needling group	Steroid group	P value*
Before treatment	6.41 ± 0.83	6.96 ± 0.87	0.54
3 weeks after treatment	3.47 ± 1.32	0.32 ± 0.71	< 0.001
6 weeks after treatment	2.66 ± 1.33	0.21 ± 0.67	< 0.001
3 months after treatment	1.59 ± 1.24	0.56 ± 1.33	0.44
6 months after treatment	1.28 ± 1.46	1.79 ± 1.55	0.65
1 year after treatment	0.69 ± 0.93	2.09 ± 1.58	0.004

Data are presented as mean ± standard deviation
* P < 0.05 is significant; independent t test

Discussion

This study compared the effectiveness of corticosteroid injection and dry needling in pain relief for patients with plantar fasciitis. We followed up our patients for one year and investigated pain relief in the short term (until 6 weeks after beginning treatment) and long term (until 12 months after beginning treatment). Participants who received corticosteroid injection presented a rapid and significant improvement in pain relief three weeks after baseline, although patients who were dry needled had pain relief during this period, as well. The effects of steroid injection on plantar fasciitis

are well investigated worldwide in clinical trials. [18, 23] Similar to our work, the evidence of short-term pain reduction at one month of treatment in favour of steroid injection was provided in a double-blind study of 106 patients comparing steroid injection and an anesthetic control. [17] In a previous study, authors reported the benefits of steroid injection over placebo injection at six weeks that was maintained until 12 weeks of baseline in 65 patients with inferior heel pain. [18] It has also been reported that iontophoresis of 4% dexamethasone with traditional modalities is effective on pain reduction in the short term but not the long term in comparison with placebo. [24] Similarly, we found that dry needling was associated with better improvement in heel pain ultimately when we considered VAS scores at months 12 of follow-up. The effectiveness of dry needling is not well documented. Recently, Cotchett et al. reported significant plantar heel pain relief in patients who underwent real dry needling compared with counterparts underwent sham dry needling. Details of dry needling were consistent with standards for Reporting Interventions in Clinical Trials of Acupuncture. Two primary outcomes including VAS and three secondary outcomes including Foot Health Status Questionnaire (FHSQ) were measured to reach the goals.[21] Moreover, the effectiveness of miniscalpel-needle (MSN), a new medical instrument for managing plantar fasciitis, has recently been practiced. The procedure is considered acupuncture and a microinvasive method. The authors of that study concluded that MSN pain relief was overall higher than steroid injection, with active pain reduction being reported in the MSN group from the beginning of treatment to 12 months of follow-up; only short-term pain relief was reported in patients receiving steroid injection. [23]

Little is known about the possible mechanisms of dry needling for pain reduction, although different pathways of action have been proposed worldwide for acupuncture treatment of acute or chronic pain and is a well-known complementary therapy. Central release of opioid peptides, increased regional blood flow and anti-inflammatory effects of this therapy have been reported previously. [25] We believe similar underlying mechanisms occurred with dry needling in our patients with plantar fasciitis, although the anti-inflammatory effects of steroid injection at least in the short term are possibly greater than for the dry needling method. Nevertheless, we believe further investigation is warranted in this field. In this study, we recruited the patients with plantar fasciitis who failed common conservative therapies for at least three months, such as analgesics orally (e.g., nonsteroidal anti-inflammatory drugs), tendon or plantar fascia stretching and orthoses (in some cases). Patients underwent no prior interventions, such Botulinum toxin injection or plantar fasciotomy, before involvement in the study. The effects of such modalities have been investigated before and reported to be effective in pain relief. [26,27] Moreover, to achieve more accurate results, primary X-ray imaging was done, and patients suspected of having calcaneal spurs or evidence of fracture or malignancy were not entered in to the study: re-search is already available regarding the association of calcaneal spurs and heel pain. [28] The effect of improvement of heel pain over time should not be neglected. Plantar fasciitis is a said to be a self-limiting disability in which 90% of patients will improve with conservative therapies, and pain relief is usually achieved within one year regardless of treatment. [29] We found that over the short term, 93.1% of pain variations could be explained with passing time, regard- less of treatment method, and 56.7% of pain variations were due to therapy regardless of passing time. The separate effect of time and treatment method were 82.3% and 17.6%, respectively, over the long term. These findings are similar to those reported in the mentioned study [29] and are in agreement with the effect of time on heel-pain healing. There are some limitations to our study. We used the medial plantar region of the heel as the location for steroid injection and dry needling, where most pain had been focused on. We did not guide needles using ultrasonography or other imagery techniques. While there are no robust criteria in the literature for exact identification of painful trigger points, using imaging techniques, we could be sure of locating the needle tip in soft tissue and monitoring some complications. Fat-pad atrophy, rupture of the plantar fascia and lateral plantar nerve injury are the common reported complications of steroid injection. [30] Further investigation is warranted using an upgraded, rein-forced methodology.

Conclusions

This study suggested that dry needling was superior to steroid injection in patients with plantar fasciitis at the end of one year of follow-up. Pain reduced gradually in dry-needled patients, and endpoint VAS scores were lower than in the steroid group, although rapid and short-term effects of steroid injection was also found. Clinicians should manage patients with plantar fasciitis according to the latest recommendations considering patient clinical features and need for treatment.

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