

Efficacy of Corticosteroid versus Steroid plus percutaneous Needle Release of Plantar Fascia in Fasciitis Heel Pain (A Comparative Study)

Abstract

Background: The aim of this study was to compare corticosteroid injection and corticosteroid injection with needle release (Pie-crusting) method in the treatment of plantar fasciitis in patients with heel pain.

Methods: The present study is a randomized clinical trial. The study population included patients with heel pain who had referred to a teaching center with plantar fasciitis for treatment during the years 2020-2019. The patients were randomly divided into two groups: corticosteroid injection and corticosteroid injection plus Pie-crusting method. The patients were visited again in the third (T1), sixth (T2), twelfth (T3) and twenty-fourth (T4) weeks post treatment, and the severity of pain and ankle and foot score (AOFAS) were determined at each visit. The data of this study were analyzed with SPSSv.24 software.

Results: 89 patients (46 in steroid injection group and 43 in "pie-crusting" group) were examined. Patients in the two groups were similar in terms of age, sex and body mass index. The two groups showed a significant difference in terms of VAS of pain only in the T4. The AOFAS in the T2 ($p=0.039$), in the T3 ($p>0.001$), in the T4 ($p>0.001$) statistically significant differences were reported. Comparing the angle of inclination of the calcaneus, there was no statistically significant difference between the two groups in the T4.

Conclusion: The results of this research showed good results in use of combination of corticosteroid therapy and "pie-crusting surgery" for plantar fasciitis.

Keywords: Plantar Fasciitis, Pain, Heel, Surgery

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Introduction

Painful heel syndrome is a common orthopaedic condition encountered in daily practice; this could severely restrict the patient's activity and cause serious morbidity. Some have neurological origin for heel pain. On the other hand, inflammation of plantar fascia (PHP) is the most frequent etiology of this disease that affects 10% of adults and 25% of athletes⁽¹⁾.

Heel pain syndrome includes a set of three different diseases including plantar fascia inflammation, calcaneal periostitis, and calcaneal spur. Various treatments have been recommended for these conditions, such as the use of appropriate, physiotherapy and stretching of the plantar fascia, local injection of corticosteroids, protein-rich plasma, shock wave therapy and surgery⁽²⁾.

The clinicians should rule out important differential diagnoses such as rheumatoid arthritis, ankylosing spondylitis, Reiter's syndrome, and osteoarthritis. Studies have shown that plantar pain with disability causes weight gain, anxiety, and depression. After ruling out other differential diagnoses, various surgical and non-surgical treatments are recommended. Although corticosteroid injection is a common treatment method for clinicians, it can be associated with side effects such as damage to muscles and nerves, rupture of the plantar fascia, and infection. In the surgical technique, the plantar fascia is partially released, which may be done through open surgery or endoscopically. Stretching of the plantar fascia is one of the most common treatments for heel spurs. The pie-crusting technique is to make multiple holes in the tendon using a needle and then

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stretching the tendon^(3, 4). In total knee arthroplasty in cases where the knee is in varus with pie crusting technique by stretching and increasing the length of the fascia, varus can be corrected and ligament balance can be established. This technique may be performed without a surgical incision^(5,8). The study of Jain et al., (2018) was conducted on 80 patients diagnosed with plantar fasciitis; Patients were randomly divided into two groups, local injection of corticosteroids and injection of platelet-rich plasma (PRP). Before the injection, first month, third month, and sixth month after the injection, all the patients were assessed according to the visual pain scale (VAS), Modified Roles and Maudsley score, Functional outcome score by AOFAS (American Orthopaedic Foot & Ankle Society) scale. According to that study, the effectiveness of the two methods of steroid injection and PRP was the same⁽⁹⁾.

Mulherin and Price (2009) conducted a study on 42 patients with heel pain. They were randomly assigned to three groups: corticosteroid injection, tibial nerve block, and combined treatment of both methods. VAS and heel tenderness index (HTI) were used in this study. All groups reported a reduction in pain intensity one week, six weeks, and 26 weeks later. In this study, after the injection of corticosteroids, a tibial nerve block was suggested to minimize the patient's pain and discomfort⁽¹⁰⁾.

Although the stretching of the plantar fascia is one of the usual treatments of heel spurs, pie-crusting as one of the effective methods for stretching the tendons has not been used in the treatment of heel spurs. Therefore, it was decided to conduct this study to see its effect as a safe alternative to open surgery.

Methods

The current study is a randomized clinical trial, single-blinded, with the ethical code of IR.KMU.AH.REC.1398.061. After obtaining informed consent, the patients entered the study. To determine the sample size, the study of Crawford et al., (1999) was used⁽¹¹⁾. Taking into account, the probability of the first type error of 0.05, the test power of 0.8

sample size was determined using G Power software and considering the alpha error of at least 41 people in each group.

This study was done in Bamonar Hospital in Kerman, a teaching center on patients coming for treatment during the years 2018-2019.

The inclusion criteria for this study included the age range of 15-65 and plantar fascia pain as diagnosed by a physician and have not answer to medical and PT treatment. The patients with a history of medical allergy, especially to lidocaine and corticosteroid, history of systemic diseases such as diabetes, local skin infections, patients who have previously had injections in the heel in the past year, any deformity in the lower limbs associated with the biomechanical change of the limb, and pregnancy were excluded from this study.

The patients were randomly assigned to two groups of: corticosteroid injection (control group) and corticosteroid injection along with a pie-crusting method (intervention group) by simple randomization method using R statistical software. The data analyst was blinded and was not aware of the code of the intervention groups.

Firstly, to confirm the diagnosis and rule out other causes of heel pain, a standing radiograph of the heel profile was taken. Then, the demographic information of the patients was recorded in a form and the inclination angle of the calcaneus was determined on the radiograph (Figure 1). Pain intensity was determined and recorded based on the VAS. The ankle score was determined and recorded based on the AOFAS ankle scale. In the control group, 40 mg of Methylprednisolone Acetate along with 0.5 ml of 2% lidocaine were injected, and in the intervention group, in addition to corticosteroid and lidocaine injections, the plantar fascia tendon pie-crusting technique with same injection needle was also performed. In this study, both groups of patients received Naproxen capsules of 250 mg twice a day for 5 days, and in the third (T1), sixth (T2), Twelfth (T3), and Twenty-four weeks (T4), they had follow-up visits, and in each visit, the pain level was measured based

on VAS. Ankle scores were determined and Scale. In the sixth month, a standing radiograph of the ankle was performed again and the calcaneus inclination angle was measured.

Data analysis was done with SPSS.V24 software. In order to describe the quantitative variables, statistical indicators of mean and standard deviation were used, and frequency

recorded based on the AOFAS Ankle-hind foot and percentage were used for qualitative variables. To compare the quantitative variables, normality was first calculated, and if it was normal, the Independent T-Test was used, and if it was not normal, its non-parametric equivalent, Mann Whitney U test was used. The significance level of this study is 0.05.

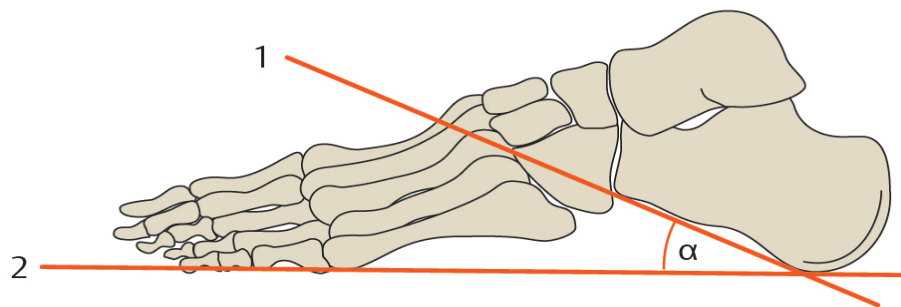


Figure 1: Inclination angle

Results

From the original 97 eligible patients 8 were excluded from the study due to lack of cooperation in follow-up visits. Corticosteroid

injection was performed for 46 patients and simultaneous injection and pie-crusting for 43 cases (Table 1).

Table 1: Comparison of gender, age and BMI between groups

		Control Group (n=47)	Intervention Group (n=43)	P value
Gender	Female	31 (67/39%)	27 (%62/8)	0.75
	Male	15 (32/6%)	16 (%37/2)	
Age	Mean ± SD	42.28 ± 11.98	41.63 ± 9.99	0.78
	[Range]	[21-65]	[25-64]	
Body mass index (BMI)	Mean ± SD	26.93 ± 3.3	26.18 ± 2.2	0.21
	[Range]	[21/3-33/4]	[20/5-31/4]	

In both groups, the intensity of the pain (VAS score) decreased significantly during the investigated time periods ($P < 0.001$). According to the results, it was observed that there was a significant difference between the

two groups only in the T4 (24 weeks after the injection) (p -value=0.05), and in the T1, T2, and T3 no significant difference was observed (Table 2).

Table 2: Comparison of VAS score between groups

	Control Group (n=47)	Intervention Group (n=43)	P value
VAS	Mean ± SD	Mean ± SD	
Before injection	5/87 ± 1/15	6/12 ± 1/14	0.32
T1*	2/28 ± %93	2/31 ± 1	0.92
T2**	2/72 ± %9	3/53 ± %98	0.62
T3***	2/26 ± %94	2/42 ± %66	0.49
T4****	2/04 ± 1/07	1/98 ± %71	0/05

* T1= Third week

*** T3= Twelfth week

** T2= Sixth week

**** T4= Twenty-four week

In both groups, the results of AOFAS increased significantly during the investigated times ($P < 0.001$). There is a significant difference

between the two study groups in the T2, T3 and the T4 ($p < 0.001$) (Table 3).

Table 3: Comparison of AOFAS Score between Groups

	Control Group (n=47)	Intervention Group (n=43)	P value
AOFAS	Mean ± SD	Mean ± SD	
Before injection	56/55 ± 6/79	55/77 ± 5/57	0/65
T1	60/55 ± 5/6	61/55 ± 6/01	0/44
T2	71/02 ± 5/69	73/79 ± 6/56	0/039
T3	76/72 ± 5/3	81/35 ± 6/03	<0/001
T4	79/91 ± 5/46	85/35 ± 5/32	<0/001

The size of the calcaneus' inclination angle in T4 did not differ significantly between the two groups. Additionally, there is no significant

different in this regard between the two groups receiving corticosteroid injection or corticosteroid with pie-crusting (Table 4).

Table 4: Comparison of the size of angle of inclination of the calcaneus score between groups

	Control Group (n=47)	Intervention Group (n=43)	P Value
Angle of inclination	Mean ± SD	Mean ± SD	
Before injection	18/94 ± 2/17	19/33 ± 2/03	0/4
T4	19/36 ± 2/47	18/79 ± 1/88	0/23

Discussion

In terms of support, balance, mobility, and sensation, the heel is crucial. Heel pain can have an impact on how the body works because it is the first part of the foot to contact the ground when walking⁽¹²⁾. Since

there is no one recognised cause of heel pain, many potential causes, including enteropathy and the deterioration of fatty tissue in the heel pad, have been put forth as possible causes. However, it is often not possible to

identify the underlying reason, thus treatments including surgery and conservative measures are utilised instead⁽¹³⁾.

The present study showed no significant difference between the corticosteroid group and in the corticosteroid + pie-crusting group in terms of age, sex, and BMI, which made it possible to examine the effect of the interventions in detail.

However, the highest frequency of heel pain in the findings of Thomas et al., (2019) was reported in middle age, females, while response to treatment has no gender performance⁽¹⁴⁾.

Mickle et al., (2015), Caterson et al., (2008), Bocchier et al., (2002) have all mentioned a positive relationship between a higher BMI and the occurrence of plantar fasciitis, especially in the middle-aged females⁽¹⁵⁻¹⁷⁾. Among other demographic characteristics, body mass index is most closely related to the severity of the patient's disability, such as pain intensity and ankle function. Also, it has an effect on the response to therapeutic interventions⁽¹⁸⁾.

In current study, the comparison of average pain intensity on VAS score before the start of the treatment and until the end of the 12th week did not show a statistically significant difference between the two groups. But at the end of the 24th week after the treatment, in the corticosteroid injection group, less pain intensity was reported than in the corticosteroid injection group along with pie-crusting.

Keyhan Shokouh (2004) compared oral non-steroid drug, medical shoe and local injectable steroid drug, two weeks after treatment in patients who did not respond to treatments; corticosteroid injection was performed. Based on their results the response to medical treatment with corticosteroids in both groups was effective in reducing the patients' symptoms⁽¹⁹⁾. The findings of the systematic review-meta-analysis of Whittaker et al., (2019) showed that the injection of corticosteroids is more effective in reducing pain than the injection of PRP and the use of foot orthoses⁽²⁰⁾. Xiong et al., (2018) compared shock wave treatment and corticosteroid injection to reduce pain and

reported the same effect of the two treatment methods three months after the intervention⁽²¹⁾.

Regarding post-injection pain, the corticosteroid + pie-crusting group experienced longer pain duration than the group of corticosteroid injection alone. Ahmadzadeh Heshmati & Ilka's study reported an increase in pain after the injection of corticosteroids following the reduction of effect of lidocaine for one to two days after the injection. In the present study, the duration of pain after injection was reported to be 48 ± 4.1 hours in the group receiving corticosteroid alone.

Mahindra et al., (2016) compared three interventions of PRP injection, corticosteroid injection and placebo, significant improvement in VAS score and AOFAS score three weeks and three months later in the PRP and corticosteroid injection group compared to the placebo group⁽²²⁾. A study by Maes et al., (2022) on 22 patients, including 16 females and 4 males who did not respond to supportive treatment of plantar fasciitis, underwent subcutaneous plantar fasciotomy surgery. The results of this study 15 days, 6 weeks and three months later showed an incremental improvement in AOFAS ankle score from 42.8 to 89.9, which is consistent with the findings of our study⁽²³⁾.

In this study, the size of the calcaneus inclination angle before injection and six months after injection did not show any significant change in any of the groups, which indicates the safety and efficiency of both treatment methods. The study of De Prado et al., (2020) in 60 patients who underwent invasive plantar fasciotomy, in 25 patients no change in the angle of inclination of the calcaneus was shown. However, in 37 cases, drop in arch height were reported along with angle changes⁽²⁴⁾. A retrospective study by Seong Lee et al., (2014) between 2004-2008 on 286 patients diagnosed with plantar fasciitis showed that in 33 patients who were treated with corticosteroid injections, fascial tear and reduction of the calcaneal inclination angle was observed. The results of this study, despite the safety and efficiency of corticosteroids as a common treatment

method, pointed to cautious injection of corticosteroids⁽²⁵⁾.

Due to the lack of studies in this field and the need for long-term follow-up, it is necessary to conduct similar studies in the future in a multi-centered manner with a larger sample size and long-term follow-up. As this was a limitation of our study, so It is recommended that this study be a platform for future studies.

Conclusion

Considering the prevalence of plantar fasciitis patients and its therapeutic importance, the above study tested the safety and efficacy of two common treatment methods including corticosteroid injection and its combination with pie-crusting technique. The findings of this research confirm the use of the combined treatment of coronet injection and non-invasive pie-crusting surgery and introduce it as an up-to-date and practical technique without side effects.

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