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Clinical Evaluation of Injection of Corticosteroid and Prolotherapy in the Treatment of Plantar Fasciitis

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Abstract

Objective: Plantar fasciitis is one of the primary causes of heel pain. Several treatment methods are substantial. This study was aimed to evaluate the clinical results of corticosteroids and prolotherapy injection therapies.

Methods: The gender, age, time of symptoms, BMI (body mass index) were specified in 60 patients with symptomatic chronic plantar fasciitis disorder between 2019 and 2020. The patients were randomly divided into two groups as prolotherapy and corticosteroid groups. Foot pain and disability were evaluated via a visual analog scale (VAS) and foot function index (FFI) that interpreted the clinical scores measured at baseline and three months after the injections.

Results: The distribution of age, gender, BMI, and duration were similar between groups. The mean VAS scores and FFI scores of all the groups were not significantly different in the baseline time ($p > 0.05$). A significant improvement was observed in the FFI and VAS scores of the patients in both injection groups ($p < 0.05$). The post-treatment VAS scores decreased from 8.03 to 4.93 (p=.003) and 7.76 to 4.23 (p=.002), respectively, in the prolotherapy and corticosteroid groups. The post-treatment FFI scores decreased from 176.1 to 126.9 (p=.004) and 181.5 to 121.1 (p=.002), respectively, in the prolotherapy and corticosteroid groups. The percentile decreases in VAS and FFI scores between groups were higher in favor of the corticosteroid group.

Conclusion: Prolotherapy and corticosteroid injection treatments provide significant functional outcomes in short-term follow-up of the treatment of plantar fasciitis. Corticosteroid injection results in superior clinical healing than prolotherapy.

Keywords: Plantar fasciitis, Corticosteroid, Prolotherapy

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INTRODUCTION

Plantar fasciitis is a primary cause of inferior heel pain. 11 to 15 percent of adults with foot symptoms are thought to have been examined by a physician (1). It is at a peak level in adults over 40 years of age and young athletes compared to the general population (2). Characteristic complaints are morning pain, standing pain after periods of immobility (3). Numerous treatments methods such as rest, stretching exercises, weight loss, heel cups, night splints with medical treatment have been described, and approximately 90% of patients respond to conservative treatment (4). Although, in the remaining 10% of patients, less invasive ways such as injection therapy, extracorporeal shockwave therapy, and aggressive procedures such as surgical releasing of the plantar fascia, if not responding to less invasive treatment, can be performed (5). There are different injectable ingredients such as corticosteroid, prolotherapy, platelet-rich plasma, lidocaine needling. The superiority and effectiveness of injection treatments are controversial and limited (6-8).

Corticosteroid injection therapy is the most widely used method of plantar fasciitis. However, corticosteroid injection has a risk of fat pad atrophy and plantar fascia rupture (9, 10).

Prolotherapy is known as regenerative injection treatment based on the injection of generating materials via high-density dextrose into ligaments and tendons (11-13). Dextrose solution provides fibroblast proliferation and collagen synthesis in response to the departure of various growth factors (14). All of these stimuli improve functional outcomes by reducing chronic musculoskeletal pain (15).

Although prolotherapy and steroid injection treatments are studied in the treatment of plantar fasciitis separately, to the best of our knowledge, there is a limited study comparing only these two injection methods in the literature (16). Considering the complications of corticosteroid injection, we hypothesized that prolotherapy was as effective as a steroid in the treatment of plantar fasciitis. We aimed to compare the clinical results of corticosteroid and prolotherapy injection therapies.

METHODS

Patients, Study Design and Evaluation

The local ethics committee at Amasya University approved this retrospective study (2021/134). Informed consent was obtained from all patients included in the current study. Patients admitted to Amasya University outpatient clinic between 2019 and 2020 for heel pain and clinically and radiographically diagnosed as plantar fasciitis were recruited in the study. Plain radiography was taken in all patients to exclude unsuitable patients. Patients undergoing previous heel injections or surgery, foot bone tumors and bone fractures, chronic systemic diseases (cardiovascular, renal, or hepatic disease), vascular insufficiency, peripheral neuropathy, diabetes, high unknown infection markers levels were excluded from the study. The vaid participants were clarified about all injection procedures. Institutional Review Board approval and informed consent were obtained for a total of 60 patients who met the conditions of participation. The patients were re-evaluated three months after the injections.

Foot pain and disability were evaluated via visual analog scale (VAS) and foot function index (FFI) that interpreted the clinical scores evaluated at baseline and three months after the first treatment by an author

who was blinded to the injection type. Heel pain intensity was evaluated using a visual analog scale (VAS) scale from 0 to 10. On this scale, while 0 was described as “no pain at all,” 10 was described, “my pain is as bad as it could be.” A Foot Function Index (FFI), which inclusion 23 self-reported items, has measured the effects of foot disturbance on function in terms of pain, disability, and activity restriction (17).

The demographics of each group, including age, height, weight, body mass index (BMI), and the period of foot pain, were received (Table 1).

Preparation And Application of Injections

The injections were applied to all patients who included unilateral foot symptoms and didn't respond to conservative treatment for at least six months. Medial calcaneal tuberosity and the origin of the plantar fascia, which was the most painful point before injection, were marked with palpation. The area to be injected was cleaned with an antiseptic povidone-iodine solution. A total of 60 patients were separated into two groups, including thirty patients each. In the prolotherapy group, 2 ml 15% dextrose and 2 ml 2% prilocaine were mixed and administered to the patients. Patients received the second dose on the 15th day after the first prolotherapy injection. In the corticosteroid group, patients were treated with a single dose injection using 2 mL 2% prilocaine and 2 mL 40 mg methylprednisolone. The patients in both groups were given a six-week exercise program, including stretching exercises for the gastrocnemius and soleus muscles and plantar fascia. None of the patients used oral medication after injections.

Statistical Analysis

All statistical analyses were evaluated using SPSS software (version 21.0). Descriptive data that were shown in number with or without mean ± standard deviation (SD) was tested for normality using the Kolmogorov–Smirnov and Shapiro-Wilk tests. While an independent samples t-test was used for between-group comparisons in the normal distribution, the Mann–Whitney U test was performed if the distribution was not normal. Intra-group analyses were exerted using a paired t-test. The P-value was 0.05 or less were considered significant differences.

RESULTS

The demographic characteristics of the patients participating in our study are shown in table 1. The distribution of age, gender, BMI, and duration were similar between groups (Table 1).

The mean VAS scores and FFI scores of all the groups were not significantly different in the baseline time ($p > 0.05$). A significant improvement was observed in the FFI and VAS scores of the patients in both injection groups ($p < 0.05$). The post-treatment VAS scores decreased from 8.03 to 4.93 (p=.003) and 7.76 to 4.23 (p=.002), respectively, in the prolotherapy and corticosteroid groups (Table 2). The post-treatment FFI scores decreased from 176.1 to 126.9 (p=.004) and 181.5 to 121.1 (p=.002), respectively, in the prolotherapy and corticosteroid groups (Table 3). The percentile decreases in VAS and FFI scores between groups were higher in favor of the corticosteroid group.

Table 1. The demographic characteristics of the patients

Characteristic	Group		P values
	prolotherapy (n = 30)	**corticosteroid (n = 30)**	
Gender. M/F	12/18	14/16	.610
	prolotherapy (mean ± SD)	**corticosteroid (mean ± SD)**	
Age (years)	54.13 ± 9.38	47.46 ±6.74	.170
Height (cm)	166.23 ± 6.51	164.73 ± 8.61	.450
Weight (kg)	86.93 ± 10.84	86.36 ± 10.54	.838
Time of symptoms (years)	2.4 ± 1.40	1.8 ±0.80	.121
BMI (kg / m^2)	31.57 ± 4.58	32.02 ± 4.89	.714

*P<0.05 values were considered statistically significant

Table 2 VAS score results on the affected foot before and after treatment

Group	No.	VAS score (mean ± SD)		P values
		Baseline	3 Months	
prolotherapy	30	8.03± 1.09	4.93± 1.11	.003
corticosteroid	30	7.76± 0.93	4.23 ± 0.62	.002

**P<0.05 values were considered statistically significant*

Table 3 FFI score results on the affected foot before and after treatment

Group	No.	FFI score (mean ± SD)		P values
		Baseline	3 Months	
prolotherapy	30	176.1±16.9	126.9±17.4	.004
corticosteroid	30	181±13.9	121.1±16.1	.002

*P<0.05 values were considered statistically significant

DISCUSSION

In the present study, we compared the results of prolotherapy and corticosteroid administration in patients with chronic plantar fasciitis. Pain, disability, and activity limitations were evaluated with VAS and FFI scores before and three months after injection. Post-treatment clinical scores in the third month were lower in both groups than pre-treatment. Also, the increase in clinical results was higher in the corticosteroid group than in the prolotherapy group.

Local injections relieve heel pain by reducing inflammation (18, 19). It is reported that injection-based invasive methods can be used in patients with plantar fasciitis if symptoms are present for more than six months (2, 10, 20). Similarly, we included patients with symptoms lasting longer than six months in our study. Prolotherapy is an injection procedure in which a solution of proliferant is administered to the ligament and muscle injuries (14, 21). There are no formal practice guidelines about the procedure of the prolotherapy method, the density of the solution, the frequency, and the number of sessions in the clinical practice. Usually, prolotherapy injection can often be administered through a few injections' sessions every two or more weeks (22). We performed two doses (at 0-, 2- week intervals) with two-week intervals. Although there is no known side effect of the high dose dextrose solution, the most widely used

concentration of prolotherapy in clinical administration dextrose was varying between 12.5% to 25% (23). We used a solution containing 15% dextrose density, as described by Kim and Lee (24).

The superiority of sonographically-guided injections compared to palpation-guided injections is still controversial. In the meta-analysis study that was conducted in 2014 about this topic, even though ultrasound-guided injections were advocated to be more effective, further studies are required to attain this outcome (25). However, Kane et al concluded that there was no significant difference between the two-application guide technique (26). We administered the injections with the palpation-guided method in both groups.

Ersen et al. (27) found that prolotherapy application significantly improved in VAS and FFI scores at three months in the treatment of plantar fasciitis. Kim and Lee conducted a randomized controlled study, and they compared the effectiveness of autologous PRP versus dextrose prolotherapy treatments. Each treatment resulted in better initial clinical improvement via Foot Functional Index measurement at two- and six-month follow-ups (24). Ryan et al. argued that prolotherapy injection is superior to corticosteroid injection because it provides tissue healing and regeneration like Platelet-Rich Plasma (PRP). They recorded VAS at baseline and the final at the end of an 11-month follow-up treatment consultation and concluded that prolotherapy injections indicated an excellent clinical response with chronic plantar fasciitis (3). Besides, the complication rate of prolotherapy is lower and more cost-effective than corticosteroid (28). Many studies have shown that the effectiveness of corticosteroids in the treatment of plantar fasciitis, relieves pain, especially in the three months after injection. (29-31). Fat pad atrophy, calcaneal osteomyelitis, rupture of the plantar fascia are long-term complications of corticosteroid injection (32-34). In a placebo-controlled corticosteroid injection trial, the authors found that there was a significant difference in VAS scores between the groups at 6 and 12 weeks after injections (35). Crawford et al. reported a significant reduction in heel pain at one month in the steroid injection independent of affected by anesthesia of the heel (36). Mahindra et al. reported that the mean VAS score in the corticosteroid groups decreased from 7.72 preinjection to 3.64 at the final follow-up in three months ended (37). In a study conducted by Shetty et al., a total of 60 patients who injected PRP and corticosteroids found a significant improvement in VAS scores in the 3rd month (38). Ball EM et al. reported that steroid injection presented a clear advantage over the placebo at 12 weeks. Also, according to VAS scores, there was no significant difference following steroid injection between the ultrasound-guided and palpation groups (35). Compared to all these studies, we found significant improvement in VAS scores in the 3rd month in corticosteroid injections with the palpation guide method.

In a study by Raissi et al., ultrasound-guided prolotherapy and corticosteroid injection therapy used in the treatment of plantar fasciitis were compared. Compared with dextrose prolotherapy, corticosteroid injection was found to be superior at 2 weeks after injection, but results were similar outcomes at 12 weeks post-injection (16). In the

current study, the corticosteroid injection was superior to the prolotherapy injection in the 12th week.

To the best of our knowledge, there are not enough articles comparing prolotherapy and corticosteroid injections for the treatment of plantar fasciitis (16). The current study has some limitations. The main limitations of this study were the small sample size and the short duration of follow-up. Also, there was no placebo control group in the present study. Therefore, further, large-scale studies are required to compare the effect of prolotherapy and corticosteroid injections on the treatment of plantar fasciitis.

CONCLUSION

Prolotherapy and corticosteroid injection treatments provide significant functional outcomes in short-term follow-up of the treatment of plantar fasciitis. Contrary to our study hypothesis, corticosteroid injection results in superior clinical healing than prolotherapy.

Ethics Committee Approval: This retrospective study was approved by the local Ethics Committee (Amasya University, 2021/134, Amasya, Turkey).

Peer-review: Externally peer-reviewed.

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