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MANAGEMENT OF PLANTAR FASCIITIS CONCERNING STRUCTURAL CHANGE, FUNCTIONAL IMPROVEMENT AND PAIN REDUCTION BY DIFFERENT DRUGS

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ABSTRACT

Background: Plantar fasciitis affects a large percentage of people worldwide, including in India, and primarily affects middle-aged people and sports. It is a prevalent cause of heel discomfort. Corticosteroid injections have been used to relieve symptoms in patients with plantar fasciitis; however, worries about risks have grown, prompting research into alternate treatments such dextrose injections.

Aim: The purpose of this study was to compare the safety and effectiveness of steroid injection and 25% dextrose infection for the treatment of plantar fasciitis in terms of pain relief, functional enhancement, and structural alteration.

Methods: Participants with a diagnosis of plantar fasciitis who were treated at the Institute over the specified study period were evaluated in this study. Individuals with a verified diagnosis of plantar fasciitis were split into two groups at random and administered either corticosteroids or dextrose injections. The American Foot and Ankle Score (AFAS) for functional improvement, the Visual Analogue Scale (VAS) for pain, and an ultrasound-based evaluation of plantar fascia thickness prior to and following a 12-week course of treatment were the clinical outcomes assessed.

Results: The study's findings demonstrated that both groups' functional outcomes had significantly improved and their pain levels had decreased. While individuals in the dextrose group experienced long-term advantages, those in the steroid group experienced acute pain alleviation. Plantar fascia thickness decreased to a comparable level in both groups at the 12-week assessment, with no statistically significant difference between the two groups.

Conclusion: The current study comes to the conclusion that injections of steroids and dextrose were both effective in treating plantar fasciitis. Although steroids relieve symptoms more quickly, dextrose exhibits less side effects and long-term advantages, making it a viable option for long-term care.

Keywords: Dextrose 25% injection, plantar fascia, plantar fasciitis, steroid injection

INTRODUCTION

Nearly 10% of people will experience plantar fasciitis at some point in their lives, which is a prevalent cause of heel discomfort, especially in middle-aged people and runners. Plantar fasciitis is characterized by the degeneration and inflammation of the plantar fascia, which impairs daily activities and lowers quality of life. Biomechanical abnormalities such flat feet or high arches, inappropriate footwear, extended standing, and/or obesity are risk factors for plantar fasciitis.[1]

NSAIDs, physical therapy, and rest are conservative treatments for plantar fasciitis. Persistent cases are usually given corticosteroid injections that lead to short-term relief in the pain, however, is associated with risks and complications as fat pad atrophy and rupture of the fascia.

As an alternative, hypertonic injections of dextrose stimulate healing through a moderate inflammatory response that may strengthen the fascia. According to available research, dextrose injections provide longer-term, superior functional improvement and management as compared to steroids. However, further long-term research is required to verify this.2,3 Comorbidities, the intensity and duration of symptoms, and other subject-specific factors must be taken into consideration while choosing a course of treatment. The goal of the current study was to compare the safety and effectiveness of 25% dextrose infection and steroid injection for the management of plantar fasciitis with regard to structural change, functional improvement, and pain reduction. This comparison is essential to optimizing the treatment of plantar fasciitis.

MATERIALS AND METHODS

The goal of the current comparative observational study was to evaluate the safety and effectiveness of steroid injection and 25% dextrose infection for the treatment of plantar fasciitis in terms of pain relief, functional enhancement, and structural alteration. The Institute's Department of Orthopedics provided the study subjects. Before each participant participated in the study, their parents or guardians gave their verbal and written informed consent. According to the International Statistical Classification of Diseases and Related Health Problems (ICD) criteria, which include pain brought on by increased weight-bearing activities, pain that worsened after inactivity and with prolonged weight-bearing, and pain in the plantar medial heel region upon palpation, study participants had to be at least eighteen years old and diagnosed with plantar fasciitis.

The exclusion criteria for the study were pregnant and lactating females, individuals on local or systemic steroids in the past 3 months, subjects on dextrose injection in past 3 months, subjects with foot pain from fractures, previous heel surgeries, neurological conditions, trauma, or arthritis, subjects with connective tissue or rheumatic diseases, endocrine disorders, infections, or Achilles tendinopathy, and subjects with any deformity or flat feet.

The subjects were split into two equal groups at random (n = 50). Group II subjects received a steroid injection consisting of 40 mg of triamcinolone acetonide mixed with 1 ml of normal saline at the intersection of the extension of the posterior border of the medial malleolus and the palpable inferior border of the calcaneus and at the maximum tenderness site in the plantar fascia. Group I subjects received a dextrose injection consisting of 2 ml of 25% dextrose injection at the intersection of the posterior border of the medial malleolus and the palpable inferior border of the plantar fascia. The American foot and ankle score (AFAS) was used to gauge functional results, and the safety profile was assessed using plantar fascia rupture, heel pad atrophy, or infection as adverse events.

Measuring discomfort on the first step in the morning and after continuous walking, as well as the maximum walking distance, using the Visual Analog Scale (VAS), which goes from 0 (no pain) to 10 (worst possible pain). Ultrasonography was used to determine the thickness of the plantar fascia at baseline and 12 weeks later as secondary criteria. All parameters were assessed before injection, and the two groups were similar at the beginning of the study. Group I received an aseptic injection of 25% of 2 milliliters of dextrose at the areas of maximal soreness using a 27-gauge needle once the study patients were finally included. Group II was given 40 mg/1 ml of triamcinolone acetonide along with 1 ml of ordinary saline at comparable intervals.

Following the injection, patients received cold packs to minimize swelling, paracetamol to manage pain, and a 48-hour reduction in weight bearing activities. After therapy, follow-ups were conducted at 2 weeks, 4, 6, 8, 10, and 12 weeks in order to evaluate the patient's development and give a follow-up questionnaire.

Demographic information, medical history, functional condition, and first pain status were recorded at baseline. Maximum walking distance (meters), functional outcomes (AFAS), and VAS (visual analogue scale) for pain levels were measured at follow-up. Adverse events were assessed throughout the trial, and plantar fascia thickness was measured by ultrasonography at baseline and 12 weeks.

The chi-square test, Fisher's exact test, Mann Whitney U test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) were used to statistically analyze the data gateherd employing ANOVA, chi-square test, and student's t-test. A p-value of less than 0.05 was used as the significance criterion.

RESULTS

The goal of the current comparative observational study was to evaluate the safety and effectiveness of steroid injection

and 25% dextrose infection for the treatment of plantar fasciitis in terms of pain relief, functional enhancement, and structural alteration. 36% of the 100 individuals were men and 64% were women. Females were more likely to have plantar fasciitis. In the steroid group, there were 60% (n=30) females and 40% (n=20) males, while in the dextrose group, there were 68% (n=34) females and 32% (n=16) males. There was no significant difference (p=0.534). The study participants' mean age was 44.34±8.6 years in the dextrose group and 42.74±12.1 years in the steroid group; this difference was not statistically significant (p=0.598). In the dextrose group, injections were administered to the left and right sides in 48% (n = 24) and 52% (n = 26) of the subjects, respectively.

In the steroid group, 44% (n=22) and 56% (n=28) of the participants received injections on their left and right sides, respectively, with p=0.69. Plantar fascia thickness 1 cm distal to insertion showed a non-significant difference between the steroid and dextrose groups when research parameters were assessed at baseline for each injection type and side (p=0.582). With p=0.579, 0.33, and 0.944, respectively, there was a similar non-significant difference between the two groups in terms of maximum walking distance, VAS for pain on walking distance, and pain on first step in the morning. However, the steroid group's AFAS values were significantly greater than those of the dextrose group (p=0.03) (Table 1).

Concerning VAS score for pain on first step in morning in two groups of study subjectsAt baseline (0 weeks), there was a non-significant difference between the two groups (p=0.594). However, the dextrose group had a considerably higher VAS than the steroid group at 2, 4, 6, 8, 10, and 12 weeks (p=0.000, 0.000, 0.000, 0.000, 0.003, and 0.000, respectively) (Table 2).

According to the study's findings, there was a non-significant difference in the two groups' VAS scores for pain during continuous walking at 0 weeks (p=0.162). However, at 2, 4, 6, 8, and 10, the dextrose group had significantly higher mean VAS scores than the steroid group (p=0.000), and at 12 weeks, both groups had VAS values of 0 (Table 3).

There was a non-significant difference at 0 weeks between the two groups of research participants when measuring the minimum walking distance in meters (p=0.05). At 2, 4, 6, 8, and 10 weeks, the steroid group had a considerably greater walking distance than the dextrose group (p=0.000). However, at 12 weeks, the steroid group had a substantially greater walking distance (100.00±0.00 m) than the dextrose group (97.38±4.33 m, p=0.03) (Table 4).

Comparable AFAS scores were seen in the two study subject groups at 0 weeks (p=0.461). At 2, 4, 6, 8, and 10 weeks, the steroid group had significantly higher AFAS scores than the dextrose group (p=0.000, 0.000, 0.003, 0.00, and 0.01, respectively).

AFAS scores at 12 weeks, however, showed a non-significant difference between the two groups with p=0.146 (Table 5). At 0 weeks, the mean thickness of the plantar fascia (in mm) 1 cm distal to insertion in the study individuals was 6.926±1.36 mm in the steroid group and 6.511±1.28 mm in the dextrose group. This difference was not statistically significant (p=0.361). The steroid group's mean plantar fascia thickness at 12 weeks was 2.471±0.53 mm, while the non-significant difference was 2.334±0.45 mm (p=0.352) (Table 6).

DISCUSSION

Of the 100 patients evaluated in this study, 36% were men and 64% were women. Females were more likely to have plantar fasciitis. In the steroid group, there were 60% (n=30) females and 40% (n=20) males, while in the dextrose group, there were 68% (n=34) females and 32% (n=16) males. There was no significant difference (p=0.534). The study participants' mean age was 44.34±8.6 years in the dextrose group and 42.74±12.1 years in the steroid group; this difference was not statistically significant (p=0.598). In the dextrose group, 48% (n=24) and 52% (n=26) of the participants received injections to the left and right sides, respectively. 44% (n=22) and 56% (n=28) of the participants in the steroid group received injections on their left and right sides, respectively, with p=0.69.

These results were similar to those of studies conducted in 2018 by Puranik RG et al.5 and Jain SK et al.6, in which the authors evaluated participants whose demographic information was similar to that of the current study. According to the study's findings, there was a non-significant difference between the steroid and dextrose groups for plantar fascia thickness 1 cm distal to insertion (p=0.582) in the assessment of study parameters at baseline for each injection method and side in study individuals. Maximum walking distance, VAS for pain on walking distance (m), and pain on first step in the morning (VAS) all showed similar non-significant differences between the two groups (p=0.579, 0.33, and 0.944, respectively). However, the steroid group's AFAS readings were significantly greater than those of the dextrose group (p=0.03).

At baseline (0 weeks), there was a non-significant difference between the two groups of research subjects' VAS scores for pain on the first step in the morning (p=0.594). At 2, 4, 6, 8, 10, and 12 weeks, however, the dextrose group had a

substantially higher VAS than the steroid group (p=0.000, 0.000, 0.000, 0.000, 0.003, and 0.000, respectively). These results were in line with those of Ryan MB et al.7 in 2009 and Biswas C et al.8 in 2011, whose findings were similar to the current study's regarding maximum walking distance, VAS for maximum walking distance, and VAS score for pain on first step in the morning in subjects with plantar fasciitis.

At baseline (0 weeks), there was a non-significant difference between the two groups of research subjects' VAS scores for pain on the first step in the morning (p=0.594). At 2, 4, 6, 8, 10, and 12 weeks, however, the dextrose group had a substantially higher VAS than the steroid group (p=0.000, 0.000, 0.000, 0.000, 0.003, and 0.000, respectively). These results were in line with those of Ryan MB et al.7 in 2009 and Biswas C et al.8 in 2011, whose findings were similar to the current study's regarding maximum walking distance, VAS for maximum walking distance, and VAS score for pain on first step in the morning in subjects with plantar fasciitis.

At 12 weeks, however, the steroid group's walking distance was substantially greater (100.00±0.00 m) than the dextrose group's (97.38±4.33 m; p=0.03). These results were consistent with those of Damor V et al. (2019) and Varma H et al. (2022), who also reported the VAS score for pain on continuous walking and the minimum walking distance in meters in plantar fasciitis subjects following dextrose and steroids.

Comparable AFAS scores were seen in two groups of research participants at 0 weeks, with p=0.461. The steroid group had noticeably higher AFAS scores compared to dextrose group at 2, 4, 6, 8, and 10 weeks with p=0.000, 0.000, 0.003, 0.00, and 0.01 respectively. However, AFAS scores at 12 weeks showed a non-significant difference between the two groups (p=0.146). At 0 weeks, the mean thickness of plantar fascia (in mm) 1 cm distal to insertion in study participants was 6.926±1.36 mm in the steroid group and 6.511±1.28 mm in the dextrose group. This difference was not statistically significant (p=0.361). The steroid group's mean plantar fascia thickness at 12 weeks was 2.471±0.53 mm, while the non-significant difference was 2.334±0.45 mm (p=0.352). These findings were consistent with those of Akram MR et al. (2022) and Raissi G et al. (2012), who found similar AFAS scores and plantar fascia thickness (in mm) 1 cm distal to insertion.

CONCLUSION

Within its limitations, the current study concludes that injections of steroids and dextrose were both effective in treating plantar fasciitis. Although steroids relieve symptoms more quickly, dextrose has fewer side effects and long-term advantages, making it a viable long-term treatment option.

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Parameters at week 0	Steroid		Dextrose		p-value
	Right	Left	Right	Left	
Plantar fascia thickness 1cm distal to insertion (mm)	6.32±1.06	6.94±1.51	6.82±1.42	7.03±1.36	0.582
AFAS (mean)	59.2±3.3	56.6±6.9	55.0±6.1	59±3.6	**0.03**
Maximum walking distance (m)	27.3±12.3	24.2±14.2	19.4±7.3	19.9±10.3	0.579
VAS for pain on walking distance (m)	8.1±1.1	8.5±1.1	9.0±1.1	8.6±1.0	0.33
Pain on first step in morning (VAS)	9.2±0.4	9.1±1.1	9.3±0.5	9.2±0.6	0.944

Table 1: Study parameters at baseline for each injection type and side in study subjects

Follow-up duration	Steroid group	Dextrose group	p-value
0 weeks	9.30±0.83	9.42±0.69	0.594
2 weeks	3.38±0.79	5.02±0.86	**0.000**
4 weeks	2.42±0.69	3.62±0.68	**0.000**
6 weeks	1.66±0.72	2.54±0.57	**0.000**
8 weeks	0.94±0.3	170±0.59	**0.000**
10 weeks	0.22±0.41	0.94±0.44	**0.003**
12 weeks	0.000±0.000	0.26±0.44	**0.000**

Table 2: VAS score for pain on first step in morning in two groups of study subjects

Follow-up duration	Steroid group	Dextrose group	p-value
0 weeks	8.46±1.13	8.90±1.01	0.162
2 weeks	2.26±0.59	5.06±0.84	**0.000**
4 weeks	1.54±0.3	3.34±0.61	**0.000**
6 weeks	0.54±0.56	2.14±0.53	**0.000**
8 weeks	0.26±0.43	1.50±0.49	**0.000**
10 weeks	0.00±0.00	0.18±0.38	**0.000**
12 weeks	0.00±0.00	0.00±0.00	

Table 3: VAS score for pain on continuous walking in two groups of study subjects

S. No	Follow-up duration	Steroid group	Dextrose group	p-value
1.	**0 weeks**	26.10±13.18	19.82±9.01	0.05
2.	**2 weeks**	54.38±15.00	31.58±9.84	**0.000**
3.	**4 weeks**	68.38±13.72	44.00±9.22	**0.000**
4.	**6 weeks**	83.18±10.67	60.02±9.10	**0.000**
5.	**8 weeks**	96.00±7.05	77.18±9.34	**0.000**
6.	**10 weeks**	96.00±1.36	90.78±7.00	**0.000**
7.	**12 weeks**	100.00±0.00	97.38±4.33	**0.003**

Table 4: Minimum walking distance in meters for two groups of study subjects

S. No	Follow-up duration	Steroid group	Dextrose group	p-value
1.	**0 weeks**	58.22±5.38	57.14±5.36	0.461
2.	**2 weeks**	77.02±4.52	70.00±3.90	**0.000**
3.	**4 weeks**	88.50±3.03	78.00±4.36	**0.000**
4.	**6 weeks**	88.00±2.02	85.54±3.49	**0.003**
5.	**8 weeks**	89.46±0.49	87.66±2.07	**0.000**

6.	**10 weeks**	89.86±0.1	88.82±1.91	**0.01**
7.	**12 weeks**	90.00±0.00	89.42±1.98	0.146

Table 5: AFAS scores in two groups of study subjects

S. No	Follow-up duration	Steroid group	Dextrose group	p-value
1.	**0 weeks**	6.926±1.36	6.511±1.28	0.361
2.	**12 weeks**	2.471±0.53	2.334±0.45	0.352

Table 6: Thickness of plantar fascia (in mm) 1cm distal to insertion in study subjects