Research Article

Treatment of plantar fasciitis with dexamethasone with lidocaine hydrochloride

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Abstract

Background: Plantar heel pain is a commonly occurring foot complaint. Various electrotherapy modalities are frequently utilized as a treatment.

Objective: To determine the effects of a combination of dexamethasone with lidocaine hydrochloride for the treatment of patients with plantar fasciitis (PF).

Materials and Methods: A total of 40 patients suffering from PF were divided into two groups; Group A received iontophoresis with distilled water along with 4 mg/mL dexamethasone and 2 cm^3 of lidocaine hydrochloride (4% lidocaine hydrochloride), and Group B received iontophoresis with distilled water. Both groups received stretching of plantar fascia and calf muscles, followed by ultrasound for 5 min. Treatment for each patient was for a period of 2 weeks with 3 sessions per week.

Result: Group A showed significant decrease in symptoms of PF posttreatment.

Conclusion: Iontophoresis with lidocaine hydrochloride showed better results in decreasing symptoms of PF as compared to iontophoresis with distilled water only.

KEY WORDS: plantar heel pain, iontophoresis, lidocaine hydrochloride

Introduction

Plantar heel pain is one of the most commonly occurring foot complaints treated by health-care professionals. Plantar fasciitis (PF), the most common cause of heel pain, accounts for approximately 11%–15% of foot symptoms presenting to physicians. The term "plantar fasciitis" implies an inflammatory condition by the suffix "itis." However, various lines of evidence indicate that this disorder is better classified as "fasciosis" or "fasciopathy," as heel pain is associated with degenerative changes in the fascia and atrophy of the abductor minimi muscle.[1,2]

Road racing and race walking, basketball, and track and sports played on unyielding surfaces are examples of activities that predispose athletes to this injury. Usually, pain is present in the plantar-medial aspect of the calcaneus and maybe bilateral or unilateral. The pain and stiffness when bearing weight is related to muscle spasm and splinting of the fascia secondary to the inflammation. When this occurs, a normal muscle length is not attained easily, thus additional irritation and pain result. Management of PF is accomplished by addressing six specific areas: (1) prevention, including stretching, warm-up, and proper shoe selection; (2) use of therapeutic modalities; (3) strengthening exercises; (4) adhesive taping; (5) orthotics; and (6) NSAIDs and cortisone injections.[3]

Night splints can also be used in the treatment of PF. Ryan recommends use of posterior night splints as an alternative when conservative treatment is not working but before invasive treatment is undertaken. When conservative treatment fails, treatment often progress to corticosteroid injection and if no relief is afforded, surgical release. Iontophoresis of corticosteroids has been discussed as an additional treatment modality for PF. Iontophoresis is a process in which ions in solution are transferred through intact skin via electrical potential using bipolar electrodes. Positive ions are carried through the skin at the positive electrode and negative ions are carried through negative electrodes. Ionizable material

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in solution such as dexamethasone sodium phosphate will migrate toward the poles of opposite charge superimposed on this migration. A direct current enhances and intensifies the movement of ions.[4,5]

Harris reported that 75% of 50 patients treated with iontophoresis for various musculoskeletal inflammatory conditions had excellent to good outcomes based on restored Range Of Motion (ROM), improved function, and decreased pain.[6] Additional support for clinical effectiveness of iontophoretically administered dexamethasone comes from the case report, one described s successful treatment of patient with anterior disk dislocation of TMJ joint.[7] The other reported on a patient with Rheumatoid Arthritis (RA) of knees.[8]

Iontophoresis has several advantages as a treatment technique in that it is a painless, sterile, noninvasive technique for introducing ions into the tissue, which has been demonstrated to have positive effect on the healing process.[9,10]

Objectives

No known study has investigated in detail the effects of this therapy in recreational patients with PF. Therefore, the purpose of this study was to determine the effects of a combination of dexamethasone with lidocaine hydrochloride for the treatment of patients with PF.

Materials and Methods

The study was conducted for a period of 6 months. Treatment for each patient was for a period of 2 weeks with three sessions per week.

Inclusion Criteria

1. Male patients with age 30–40 years
2. Subjects with normal BMI
3. Diagnosed case of PF
4. Willing to participate

Exclusion Criteria

1. Neurological deficit or decreased skin sensations
2. Calcaneal spur
3. Any other cause of pain around heel or foot
4. Diabetic
5. Peripheral vascular disease
6. Decreased skin sensations
7. Known allergy to dexamethasone, lidocaine
8. Local or generalized arthritis
9. The affected foot had been operated
10. Had received any conservative treatment for the management of PF in the 4 weeks before entering the study

A total of 40 patients were allocated to two groups by sequential allocation. For example, the first patient with PF was assigned to the iontophoresis group (IG), the second patient with PF to the placebo iontophoresis group (PIG), and so on. Both the groups will receive stretching of plantar fascia and calf muscles, followed by ultrasound for 5 min.

The subjects of Group A underwent iontophoresis. Iontophoresis comprises electric impulses from a low-voltage galvanic current stimulation unit to drive ions into soft tissue structures. Solution for iontophoresis is made by distilled water along with 4 mg/mL dexamethasone and 2 cm^3 of lidocaine hydrochloride (4% lidocaine hydrochloride). Then the solution is poured into a water bath. Electrodes are fixed, red positive electrode is placed under the metatarsal heads and the black negative electrode is placed under the calcaneal bone. Current is applied using Neuromuscular electrical nerve stimulation (NMES). A current up to 4 mA for 10 min and a total dose of 40 mA is delivered over a period of time determined by the patient's sensitivity.[9,11,12] The subjects of Group B received iontophoresis with distilled water.

All patients received a verbal explanation of the trial prior to entry into the study. All patients gave signed informed consent to participate in the study. Before commencement of treatment, each subjects Visual analogue scale (VAS) and Foot Function Index (FFI) score was taken/calculated and same scores were calculated after 1 week of completion of treatment session

Results

The mean age for Group A and B was 36 ± 4 years and 35 ± 3 years, respectively.

Discussion

The results obtained from this controlled clinical trial are novel; as to date, there have been no data comparing the effectiveness of iontophoresis using dexamethasone and lidocaine hydrochloride versus placebo iontophoresis in PF

Both the groups in the present study had equal number of subjects and there was no significant difference found with respect to their gender distribution, age, and body mass index.

As per Table 1 it can be seen that iontophoresis is definitely beneficial in decreasing symptoms of PF, but iontophoresis given with dexamethasone and lidocaine hydrochloride is significantly more effective in treating PF.

Iontophoresis has attracted much interest as it is applied to common musculoskeletal conditions such as lateral elbow tendinopathy (LET). It uses continuous direct current of low amperage to introduce topically applied physiologically active ions through the body surface with the advantages of including its noninvasive nature, uniform absorption, and absence of systemic side effects such as gastrointestinal distress.[13]

Studies have shown clinically relevant improvements in PF symptoms using iontophoresis of dexamethasone[10] and acetic acid. Nonsteroidal anti-inflammatory drugs have been trialed, but did not show clinically significant effects *(Osborne and Allison 2006)*.[20]

The result of the present study is bolstered by the study of Osborne and Allison (2006) that showed the reduction in the

Table 1: Comparison of scores (unpaired t-test) of VAS and FFI between two groups

		Group A	Group B	t Value
VAS (Mean ± SD)	Before	7 ± 0.89	5.80 ± 0.84	2.2799*
	After 1 week	3.17 ± 0.75	4.40 ± 0.55	3.0425*
FFI (Mean ± SD)	Before	44.17 ± 3.66	43.40 ± 3.65	0.3467
	After 1 week	30.17 ± 4.45	37 ± 1.58	3.2452*

*t statistically significant.

symptoms of PF patients. Drooga et al., (2004) determined that iontophoresis benefits with vasodilatation due to attenuated addition of molar concentrations of NaCl to the iontophoresis solutions. Chorine is applied as NaCl solution and has a sclerolytic effect that reduces redundant scar tissue, which increases extensibility of scar tissue and connective tissue and used in contracture indications. Drooga and Sjoberga (2003) *studied* the effect of ionic strength of the vehicle on the nonspecific vasodilatation during iontophoresis of sodium chloride and deionized water. They found that anodal and cathodal iontophoresis induced a voltage over the skin that was dependent on the ionic strength of the test solution. The nonspecific vasodilatation during anodal iontophoresis was less pronounced than during cathodal iontophoresis, and was independent of the voltage over the skin. The nonspecific vasodilatation in cathodal iontophoresis was related to the voltage over the skin, and was possibly mediated by depolarization of local sensory nerves. The result of the NaCl Iontophoresis along with Taping group shows significantly greater improvements in morning pain where as such results could not be found out when seen in taping alone.[12]

It is supported that dexamethasone iontophoresis can replace local steroid injections, decrease local pain, realign the collagen fibers near to insertions in the periosteum and restore the function of the wrist extensor muscles as per the study by Kahn.[14] Moreover, the difference between other traditional physical therapy methods and iontophoresis is that it can reduce pain in a faster way and permits the patient to be functional.[15]

Iontophoresis has many advantages in comparison with local injections, without side effects. These advantages may be classified as follows: (1) permits consistent drug delivery; (2) a low systematic dose is administered; (3) the sterile barrier of the skin is not compromised, which is of particular importance when corticosteroid drugs are used; (4) the treatment is painless. Pain due to needle insertion and tissue tension caused by the subcutaneous injection of a fluid volume is not produced, and (5) the treatment is atraumatic. Tissue damage due to needle penetration and the subcutaneous injection of a bolus of fluid is avoided.[9,16,17]

The results of the present study are in line with those of the of the study by Harris,[6] in which 26 patients with lateral epicondylitis received iontophoresis and it was observed that 75% of the patients had an improvement in symptoms, 14% had significant relief of pain, and 11% had slight or no relief of pain. However, Harris[6] used dexamethasone with xylocaine, whereas in the present study a solution of lidocaine hydrochloride was used and many more subjects were treated for a prolonged period of time. Tamburini and Di Monte[18] showed that iontophoresis improved the symptoms and recovery time in football players who suffered from overuse syndromes such as tendonitis and tennosynovitis, but their study had methodological problems (neither blinded, nor placebo). Conversely, in another study, Bertolucci,[19] investigated the effects of dexamethasone iontophoresis in bicipital tendonitis, sacroiliitis, supraspinatus, infraspinatus, adhesive capsulitis of the shoulder, peroneal tendonitis, pes anserine bursitis/tendonitis, and LET. It was found that the patients had no significant pain relief using dexamethasone iontophoresis.

The present study also is in line with Stasinopoulos Dimitrios, (2015) who did a study on the Influence of dexamethasone with lidocaine hydrochloride iontophoresis in recreational tennis players suffering from LET and concluded that the solution of dexamethasone with lidocaine hydrochloride iontophoresis has positive effects in the treatment of LET in recreational tennis players.

Limitations of the study

Less number of sample was taken.

Conclusion

Iontophoresis itself is effective in treating PF, but if given with dexamethasone and lidocaine hydrochloride, it is significantly more effective in treating PF.

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