ORIGINAL ARTICLE

Effects Of Low Dye Taping with And Without Dry Needling on Pain and Functional Disability in Athletes with Plantar Fasciitis

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ABSTRACT

Background: A gradual degenerative condition of the plantar fascia of the foot is called plantar fasciitis. This pain is frequently relieved with resting, elevation, and deep tissue massage. Anti-inflammatory drugs have been a mainstay in the management of plantar fasciitis. Low-Dye taping is a popular conservative therapy for plantar fasciitis. A dry needle is used to stimulate the myofascial trigger points in the plantar fasciitis.

Objective To determine the effects of low dye taping with and without dry needling on pain and functional disability in athletes with plantar fasciitis.

Method: It was a 6-month randomized clinical trial conducted at the Pakistan Sports board, Lahore and Sports complex, Jhang. A total of twenty athletes were sampled by use a convenient sampling technique and then randomly assigned to one of two groups: group A provided with Low dye taping and conventional treatment plan along with needling, and group B provided Low dye taping and conventional treatment plan. Data was gathered at baseline and after six weeks, by using Numeric pain rating scale and functional foot index questionnaires.

Results: Results were analyzed using SPSS version 25 software and after checking normality by Shapiro wilk test, parametric tests were applied. Results shows significant decrease in functional disability and pain on that group who were on group A.

Conclusion: Low-Dye tape along with dry needling and conventional physiotherapy was effective in alleviating the painful symptoms of plantar fasciitis as well as decrease functional disability of foot in athletes.

Key words: Functional foot index, Dry needling, low dye taping, Plantar Fasciitis.

Introduction

Plantar fasciitis is a gradual degenerative condition of the foot's plantar fascia. It has been linked to impairment, low quality of life, falls, heel pain, and incapacity. People with plantar fasciitis specifically describe challenges with walking and, to a lesser extent, running-related activities[1]. The inferior heel region is where people with plantar fasciitis typically experience discomfort, which is worst in the morning or after prolonged periods of inactivity. According to research, two and eighty-four million dollars was spent on plantar fasciitis medical treatments in the United States in 2007[2].

Most epidemiological studies on plantar fasciitis in the United States have focused on very small clinical population samples or niche demographics like older athletes, industrial workers, or active-duty military personnel. Considering the variations in survey design and research demographics, the high diversity in plantar fasciitis prevalence reported in this research is not surprising (three percent - eighteen percent). There is only one population-based analysis of plantar fasciitis in the United States that we are familiar with[3].

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Researchers discovered that only one million visits annually (or less than one percent of all visits) were connected to a diagnosis of plantar fasciitis out of the estimated eight-fifty-five million patient visits to medical clinics made annually in the U.S. using statistics from 1995–2000 National Ambulatory Medical Care Survey (NAMCS). This proportion is comparable to the nineteen-hundredths of medical encounters connected with the care of plantar fasciitis seen in regional monitoring of clinical visits in southern Australia[4].

Research conducted in the United States that considered the occurrence of plantar fasciitis across demographic groups discovered links between the condition and growing older, getting a higher BMI, and being a woman. Other significant demographic factors, such as educational level, possession of medical insurance, and geographic region of the nation, were not researched. Only two studies in the United States focused on the degree of pain brought on by plantar fasciitis; none, however, on page four of four hundred and thirty-five, looked at other aspects, such as the frequency of discomfort or interruption brought on by pain[5].

The few studies that looked at medications for plantar fasciitis looked at NSAIDS (thirty-nine percent to fifty-six percent of individuals with plantar fasciitis). No study examined indicators of medication use. Identifying patients at risk for contracting plantar fasciitis will be easier with a deeper understanding of the epidemiology of the condition[6].
The plantar fascia is a robust, fibrous aponeurosis that spreads into three bands and inserts further into the base of the proximal phalanges. It begins at the plantar tuberosity of the calcaneus.

The lateral and medial bands are subordinate to the central band physically and physiologically. The thick plantar fat pad covers and protects the source and insertion, and when the plantar fascia is tensed, the mid substance can be felt subcutaneously. The windlass mechanism is activated by dorsiflexion of the toes, particularly the hallux, which raises the medial longitudinal arch and gradually stretches the plantar fascia[7].

Proximal plantar aponeurosis degradation and localized inflammation are both characteristics of plantar fasciitis. The medial tuberosity of the calcaneus, which is close to the origins, is where engagement most frequently occurs. Pathological observations have shown degenerative alterations in the plantar fascia with fibroblastic proliferation and minimal inflammatory tissue, similar to chronic tendon diseases. The research supports a mechanism where mechanical loading and severe tension cause micro-tears inside the fascia and ultimately trigger an inflammatory reaction. The normal healing process may be hampered or prevented by frequent heel strikes, which can lead to chronic inflammation and subsequent degradation[8].

Plantar fasciitis often appears with an increased incidence of "start-up pain." When getting out of bed every morning or getting up from the couch after reclining, this intense, stabbing pain localized to the plantar medial part of the heel develops. Once weight-bearing begins, start-up soreness quickly goes away. A severe, persistent aching or throbbing ache that might extend further into the arch or the heel usually appears by evening [9].

This pain is frequently relieved with resting, elevation, and deep tissue massage. Eventually, this discomfort lessens, and when the patient wakes up, their foot is stiff but pain-free until they take their first step out of bed. Upon palpating the plantar fascia at its source on the plantar medial tubercle of the calcaneal tuberosity, the plantar fascia exhibits localized discomfort, according to a medical assessment. A constriction of the gastrocnemius fascia or Achilles tendon may be seen in the range of motion assessment as limited dorsiflexion of the foot[10].

A comprehensive neurovascular assessment should be part of a thorough evaluation to look for paresthesia, a Tinel sign, and motor dysfunction. Examining the heel pad for signs of atrophy, injury, or open sores may reveal or rule out additional illnesses. The patient must undergo further testing to rule out a calcaneus stress fracture if manually compressing the tuberosity causes pain[11].

Though mechanical stress is usually cited as a contributing factor, plantar fasciitis is believed to have multiple causes. Both intrinsic and extrinsic factors, including poor footwear, the category and severity of daily activity, and the occurrence of confined or monotonous trauma, have been presented as risk factors in the development of plantar fasciitis. Intrinsic risk factors include older age, unusual foot posture, elevated Body Mass Index, and rigid Achilles tendons[12].

Nevertheless, numerous investigations have not consistently found a single component. Achilles tendon tension and plantar fascia load have been related in static and dynamic cadaver studies, and the clinical significance of this association continues to research attention. Researchers analyzed three characteristics typically believed in risking a person to plantar fasciitis through a retrospective case study analysis (Level II-1 prognostic evidence)[13].

High-level data has been lacking in earlier clinical research examining the effectiveness of nonsurgical therapy. Current research has become of higher quality to evaluate the effectiveness of particular treatment alternatives, and statistics from rising, randomized, controlled clinical trials are now available. Although some studies evaluate one treatment as a sham or placebo control, some studies evaluate two or more different types of therapies. Considered to hasten healing, treatment should be started during the first six weeks of symptoms, but this is still disputed. Despite these developments, much disagreement exists on treating plantar fasciitis[14].

Although stretching exercises are widely used as a quick and affordable therapy for plantar fasciitis, consensus on the best frequency and duration of these exercises has not been reached. Several innovative stretching methods and procedures have been examined for their effectiveness in easing plantar fasciitis symptoms To enhance results [15].

Several progressive, randomized studies have examined ankle dorsiflexion splints' efficiency. The foot and ankle can stay in a plantarflexed position as you sleep by resting supine or prone. As a result, these devices are used at night to maintain ankle neutrality and avoid contraction of the gastrocnemius-soleus complex and plantar fascia. A direct benefit of night-time splinting is the lack of plantar heel pain while getting out of bed in the morning [14].

Plantar fasciitis has been treated with various prefabricated and bespoke orthoses, such as heel cups, arch stabilizers, and foot orthoses. Numerous research examining how orthotics affect plantar fasciitis have contrasted various orthotic models[16].

Anti-inflammatory drugs have been a mainstay in managing plantar fasciitis, whether taken orally, applied topically, or injected. Injecting corticosteroids into the plantar fascia origin results in an invasive but precise administration of anti-inflammatory medication. Injections should not be administered repeatedly or right away due to the possibility of a fascial rupture or fat pad atrophy. A safer alternative would be a topically applied steroid that is electrically charged and then driven into the tissues (iontophoresis)[17].

Low-Dye taping is a popular conservative therapy for plantar fasciitis, especially in the interim, while patients await the production of their foot orthoses. The structural function of the foot is changed by foot taping, like low-Dye tape, which reduces strain on the plantar fascia and alleviates symptoms. The mechanical effects of the tape on the lower limb have been the focus of most studies to date. Low-Dye taping's ability to reduce symptoms has only been examined in one study with limited sample size and no control group. Therefore, larger studies that use a control condition for contrast are required. Thus, this study aimed to assess the effectiveness of low-Dye taping in the short term for treating plantar fasciitis[18].

An acupuncture needle is used in the invasive practice of dry needling to stimulate the myofascial trigger points in the plantar heel. Although the precise mode of action with dry needling still is largely understood, it has been demonstrated to change the metabolic milieu around an MTrP. Additionally, it has been shown that inducing a local twitch response with dry needling reduces spontaneous electrical activity in the MTrP area of rabbit skeletal muscle[19]. However, these results are crucial for

comprehending how dry needling functions; it is also vital to know if it is efficient in a therapeutic situation. A recent meta-analysis of randomized controlled studies concluded that MTrPs were not significantly improved by dry needling or acupuncture compared to placebo[20].

Material & Methods:

Study Design: It was a Clinical Trial.
Settings: The study was conducted in Sports Rehab Lahore.
Study Duration: The duration of the study was nine months after the approval of the synopsis.
Sample Size: The sample size was 74.
The calculated sample size using Pinion as an outcome measure is 74[19].

$$n = \frac{2\sigma^2 (z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

$Z_{1-\alpha/2}$ Level of significance = 95% 19
μ_1 Expected mean change in pain in the Control Group = 1.6 43
μ_2 Expected mean change in Pain in Experimental Group = 2.0743
δ_1 Expected standard deviation in Control group = 0.24 43

Results

A sample of PF athletes who satisfied our eligibility requirements and volunteered to join our research was gathered for this randomized control trial. A convenient sampling approach was used for the study. The data show that the mean age of group A was 24.60±4.11, and the age range of group B was 21.90±2.76, with those in group A having a mean weight of 62.20±6.96 or those in group B having a mean weight of 63.40±6.00. In groups A and B, the mean height was 167.20±9.46 and 161.30±10.96, respectively. Following that, the training exercise commenced following the instructions, and data was gathered using the FFI and NPRS scales before and after six weeks of therapy. Before running the parametric test, the Shapiro-Wilk test was conducted to evaluate the normality of the data, which was determined to be normal because the the-value was greater than 0.05. After analyzing all covariates, the paired sample and independent sample t-tests were used to see if there was a substantial difference in post-effective interventions between the two groups. The pre-intervention NPRS value for group A was 9.00±.942, whereas the observed NPRS value for group B was 9.00±.942. The post-intervention outcomes in groups A and B were 2.80 ±1.03 and 7.40± 1.42, respectively, while FFI studies show that group A's pre-intervention readings were 85.20± 6.08, while group B's mean value of FFI was 3.44± 0.67. The post-intervention lessons in groups A and B were 22.70± 5.53 and 47.00± 8.23, respectively, acquiescent with a less than 0.05 p-value, displaying a difference between the two groups, and we repudiated our null hypothesis.

Very little evidence is found in the literature that shows the effectiveness of low-dye tape with and without dry needling on plantar fasciitis athletes. There is very little evidence regarding the efficacy of low-dye tape with and without dry needling on plantar fasciitis athletes; there is a reasonable requirement for proof-based guidance.

δ_2 Expected standard deviation in Experimental group = 0.91 43
$Z_{1-\beta}$ power of the study = 80%
n Expected sample size in a group = 7443
Sampling Technique: Convenient sampling technique was used
4.6 : Sample Selection:
4.6.1 : Inclusion Criteria:

- Both male and female.
- Participants had unilateral adhesive capsulitis.
- Participants with sub-acute adhesive capsulitis.
- Age of 40-60 years.

4.6.2 : Exclusion Criteria:

- Patient with cervical radiculopathy.
- Fractures of the upper limb.
- Thoracic outlet syndrome.
- Post-traumatic.

Table 1 Between Group Comparison Of NPRS

NPRS	Group A	Group B	Mean Difference	P value
Pre-treatment	9.00± .942	9.00± .942	0.00	1.00
Post Treatment	2.80± 1.03	7.40± 1.42	-4.60	.000

The above table describes the group comparisons of the numeric pain rating scale. Pre-treatment values of groups A and B were 9.00±. 942. post-treatment values were 2.80± 1.03 and 7.40± 1.42 in group A and group B respectively. Independent Sample T-test was used to analyze any significant difference across the two treatment groups in NPRS. Before the treatment, the mean difference was 0.00 with a value of 1.00, which is not statistically significant because its p-value was > 0.05, and a significant difference was observed after the treatment due to the mean difference being -4.60, which resulted in its p-value to be < 0.05.

Table 2 Between Group Comparison Of NPRS

NPRS	Group A	Group B	Mean Difference	P value
Pre-treatment	85.20± 6.08	84.90± 6.17	0.30	.91
Post Treatment	22.70± 5.53	47.00± 8.23	-24.30	**.**000

The table above compares the functional foot index scale between groups. The pre-treatment values for groups A and B were 85.20± 6.08 and 84.90 ±6.17, respectively. Post-treatment results in groups A and B were 22.70 ±5.53 and 47.00 ±8.23, correspondingly. In FFI, the Independent Sample T-test was performed to determine whether there was a substantial distinction between treatment groups. Before even the therapy, the average difference was 0.91 with a value of 0.30, which was not statistically significant since the p-value was 0.05, and after the treatment, the mean difference was -24.30, which resulted in a 0.05 p-value.

Table 3 Within Group Comparison of NPRS

	Study Groups			
NPRS	**Group A**		**Group B**	
Pre-treatment	9.00±.94		9.00±.94	
Post-treatment	2.80±.32		7.00±1.42	
Within Group Change	**Mean difference**	**P value**	**Mean difference**	**P value**
Pre-treatment/ post-treatment	6.20	.000	1.60	.000

The paired t was performed to determine whether there was a difference between the two treated groups. The table above compares NPRS scores within groups on a pair-by-pair basis.

For group A, the pre-treatment means value for pain on the NPRS score was 9.00±.94, whereas the post-treatment mean was 2.80±.32. With a p-value of 0.001, the mean difference was 6.20. Likewise, group B's pre-treatment mean was 9.00.94, while the post-treatment mean was 7.00±1.42. With a p-value of 0.001, the mean difference was 1.60. The p values show that both groups' findings were statistically significant.

Table 4 Within Group Comparison of FFI:

	Study Groups			
NPRS	**Group A**		**Group B**	
Pre-treatment	85.20±6.08		84.90±6.17	
Post-treatment	22.70±5.53		47.00±8.23	
Within Group Change	**Mean difference**	**P value**	**Mean difference**	**P value**
Pre-treatment/ post-treatment	62.50	.000	37.90	.000

The paired sample t-test was performed to determine whether there was a significant difference between the two treated groups. The table above compares FFI scores within groups on a pair-by-pair basis. In group A, the overall pre-treatment mean for pain on the FFI score was 85.20±6.08, while the post-treatment mean was 22.70±5.53. With a p-value of 0.001, the mean difference was 6.25. Similarly, group B's pre-treatment mean was 84.906.17, whereas the post-treatment mean was 47.008.23. With a p-value of 0.001, the mean difference was 37.90. The p values show that both groups' findings were significant statistically.

Discussion

Our researchers focused on how six weeks of adjusted low-dye taping with and without dry needling intervention for athletes with plantar fasciitis impacted overall pain and functional disability. The results showed a significant difference in that group taking dry needling sessions once a week, According to the researchers, frictional anti-pronation taping benefits the forefoot and hindfoot by propping up the core. L.Burns et.al[21] noticed substantial alterations in ankle supination and pronation during the gait cycle following administering low dye taping with conventional physical therapy.

A.J. Sankhe et.al[22] Following putting low dye taping to the ankle, there was a significant increase in the flexion degree and range of motion of the foot and ankle joints. Within assessment of the VAS in the proposed investigation revealed that the ankle disability and pain values fell considerably, with the ankle disability value decreasing more dramatically than the pain level as per the post-test among both comparisons. Given that its survey respondents were individuals diagnosed with severe plantar fasciitis discomfort, the findings suggest that customized LD tapes could be a helpful therapy for people suffering from plantar fasciitis discomfort. In contrast to our study, the pain was significantly reduced rather than functional disability in between-group analyses.

Gautham P et.al[23] Relatively brief use of low dye taping and ultrasound was useful in relieving pain symptoms in athletes with plantar fasciitis. Those findings are compatible with our investigation. Furthermore, the previous research used low dye tape for a brief period, so no alterations in heel corrections or functioning were identified following its administration. Again, modified low-dye tape increased the fat cushion of a plantar heel, which would be a common source of pain in plantar fasciitis. Like our current Trial, that was beneficial in lowering heel discomfort as we also use other range of motion exercises in our regimen.

As an outcome, our current research findings show that doing conservative physical therapy, low dye taping, and dry

needling for participants with plantar fasciitis resulted in higher pain relief versus combining conventional physical therapy with only low dye taping separately. Furthermore, the previous study of R. Podolsky et.al[24] within-group comparison revealed that the low dye taping group value grew considerably. The post-test and within comparison showed that the low dye-taping group value had increased more substantially than the conventional physical therapy group value. Load support and stability of a damaged side of the foot have been evaluated as low before using the altered LD taping due to pain and foot destabilization. The LD taping application significantly improved foot stability due to reducing pain, foot adjustment, and favourable load distribution. In relation, our study did not see these effects separately

Park C et.al[18] observed that after applying low dye tape, the overall elevation of the navicular tubercle increased immediately. Van Tonder et.al[25] discovered that a foot with severe pronation, which could also induce plantar fasciitis, had a significant load distributed towards the internal side. The use of low dye taping for six weeks led to a larger distribution of weight on the outer sole and improved navicular height. In contrast, our study did not include the variable of the navicular tubercle height.

A.A. Jaffer et.al[26] A elastoplastic tape assistance for use during basketball play improved the joint mobility, mechanoreceptors sensibility, and functional ability of a basketball player with functioning ankle instability. As a consequence, the results of this study suggest that using low dye taping is much more beneficial, along with conservative physical therapy alone, for lowering foot discomfort, rectifying load distribution, and enhancing stability owing to foot corrections. Physiotherapy with LD taping can have long-term consequences and provide immediate relief from the symptoms before employing a footing framework for foot realignment and pain reduction because, in our within-group comparisons of pain and function disability, we did not see a major difference.

N. Rosenberg et.al[27] examined low-Dye taping in combination with ankle orthoses; nevertheless, the impact of taping alone wasn't explored by conducting these trials. Sanzo P et.al[28] showed the only study to date that directly examined the efficacy of low-Dye taping on symptoms of plantar fasciitis. However, drawing concrete conclusions from this research are challenging due to the lack of a control group and the small sample size of eight participants. The current study employed a more systematic approach than has already been published. Our Trial was controlled using a preliminary descriptive estimate, compared with a control group, and was planned to employ important clinical positive impact. Nonetheless, whenever the values for "a fair bit better" and "slightly better" for such tape and control subjects are summed, they were 83 percent and 80 percent, correspondingly, indicating that at most, a little ensure good quality for 80 percent more than of individuals in both groups. So, this study tells us that low dye taping was individually given more significant results, whether used with orthoses or not, and these results are also somehow related to our study results.

Gulat et.al[29] We performed only one repeated measures research to assess the everyday clinical and kinematic impact of low dye taping 19 individuals with fat cushion discomfort or plantar fascia insertion tenderness did participate. Plantar pressure assessment was used to quantify plantar changes in pressure, ultrasound was used to measure fat pad depth adjustments, and VAS was used to measure pain relief before and after low dye taping. Participants who underwent LDT had a higher VAS score, which also correlated to our study.

Aishwarya et.al[30] only one longitudinal research on 20 respondents with plantar fasciitis was conducted to investigate the benefits of windlass tape on plantar fasciitis. Pre/post measurements included visual analogue scale pain levels, resting stance calcaneal angle, tibia placement, and navicular height. After using the tapes for twenty-four hours, fifteen individuals experienced reduced pain and discomfort. Windlass taping is therapeutic and has statistical significance in lowering pain.

Hortz BV et.al[22] The findings must also be considered with some constraints in consideration. Firstly, the parameters used to choose experts may have failed to identify individuals with enough clinical knowledge. The guidelines have been developed based on shared characteristics used to define professionals. While we feel the parameters were adequate for identifying professional physiotherapists, we did not establish a minimum length of time of clinical or research requisite experience for participants in the study. Although most physiotherapists had been dry needling for more than five years, 37% had been dry needling for less than five years. Furthermore, finding a substantial proportion of therapists who had also been practicing dry needling for a long time was challenging. Because dry needling was just established in the late 1970s, compiling a list of therapists with substantial expertise in dry needling would take a bit of time.

Conclusion

Low-Dye tape, conventional physiotherapy, and dry needling are relatively brief therapy for plantar fasciitis, although their efficacy must be properly tested. According to this study's findings, low-Dye tape, dry needling, and conventional physiotherapy as short-term therapy gives us extremely successful in alleviating the painful symptoms of plantar fasciitis and decreasing functional disability of the foot in athletes. To corroborate this conclusion, a comprehensive randomized controlled experiment is necessary.

Author Contributions

Conception and design: *Zunaira Manzoor*
Collection and assembly of data: *Muzna Munir*
Analysis and interpretation of the data:
Drafting of the article: *Zunaira Manzoor*
Critical revision of article for intellectual content: *Muzna Munir*
Statistical expertise: *Zunaira Manzoor*
Final approval and guarantor of the article: *Muzna Munir*
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