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Athletes with Runner's Heel Pain: Dry Needling's Effects and Conventional Treatment vs Conventional Treatment

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Abstract –

Title: Athletes with Runner's Heel Pain: Dry Needling's Effects and Conventional Treatment vs Conventional Treatment.

Objective: The study is aimed to ascertain the effectiveness of dry needling and conventional treatment vs conventional treatment on pain and functions in athletes with runner's heel pain.

Study design: Trial controlled by randomization was adopted for the study.

Subjects: 50 athletes between the 18 to 40 year old age range having significant amount of heel pain were selected as per the inclusionand exclusion criteria.

Procedure: Random sampling method was used, the 50 subjects separated into two groups. equal groups with 25 subjects in each group. Along with conventional treatment the group A for the experiment was also using dry needling to treat of gastrocnemius and soleus muscle and Conventional group B was only treated with conventional treatment. The pretest values of VAS , FFI, ROM, LEFS were taken of both the groups. Group A was given treatment of four weeks of once-weekly dry needling whereas Group B was given a total of 10 sessions of ultrasound in the span of 4 weeks along with taping and conventional exercises once a week. As a result of 4 weeks the post test values were statistically interpreted.

Results: VAS score for experimental group showed the mean difference of 4.24 while the mean difference in control group was only 2.84. The FFI for experimental group showed the mean difference of 40.56 whereas for the control group the mean difference was only 28.44. similarly LEFS score for experimental group showed the mean difference of 24.52 whereas for control group it was 19.84. However there was not a major significant difference in the ROMof both the groups.

Conclusion: The study showed that conventional treatment with dry needling ofgastrocnemius amd soleus muscle was more effective than only conventional treatment in athletes with runner's heel pain.

Keywords - Dry needling, VAS, FFI,ROM

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INTRODUCTION

RUNNER'S HEEL ache is a condition characterised by pain in around the heel and arch of the foot after a running for a prolonged period of time in Athletes. It is mostlyfound in long distance runners.

There is a difference in the running action of sprinters and Long distance Runners. While long distance runners have a lower limb carriage and greater heel grounding, sprinters have a more dynamic quadriceps-hamstrings motion and tend to run on the ball of the foot. The long distance runner is frequently disabled by Plantarfascitis and Achilles Tendon.[1]

The bad pain in the heel is known as Plantar fascitis, also known as RUNNERS HEEL. The plantar fascia is a tissue that looks like a series of fat rubber bands and extends from the heel toward the toes, along the arch of the foot. It's made of collagen, a rigid protein that's less

stretchy . The stress of excessive use, excessive pronation, or excessively worn shoes can shred small tears in the plantar fascia tissue, resulting in inflammation and heel pain.

It's the most frequent reason for heel discomfort and is the source of 11 to 15% of all foot issues. It is most frequently observed in younger runners and individuals between the ages of 40 and 60[2].

Running-related foot and ankle injuries are thought to account for 31% of all injuries. Achilles tendinopathy, plantar fasciopathy, and ankle sprains are three of the five most frequent running injuries, according to a systematic review of running injuries conducted by Lopes 2 in 2012.

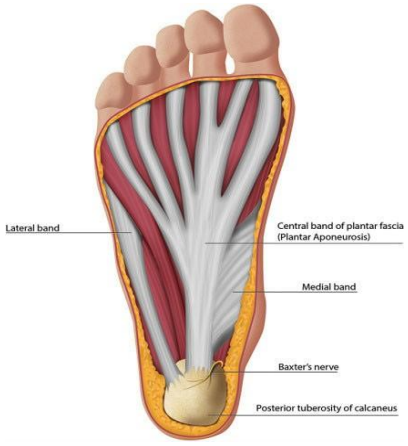


Figure no 1

Plantar fasciitis is defined as an plantar fascia swelling which is a bow string like tissue that stretches from the heel bone to the base of the toes[2]. Plantar fasciitis is an inflammation of the plantar fascia and the perifascial structures. According to Kwong et al., the syndrome is brought on by recurrent damage to the plantar fascia at its insertion point on the medial tubercle of the calcaneus.

The investing fascia of the sole of the foot, also known as the plantar aponeurosis, creates a sturdy mechanical connection between the calcaneus and the toes. It mostly develops from the medial tubercle of the calcaneus and attaches distally to the forefoot's plantar side by a number of slips. The medial, lateral, and central fascia bands can be distinguished anatomically. Plantar fasciitis is most likely to affect the middle band since it is the thickest and strongest part of the structure3. Similar to a windlass device, the plantar fascia maintains tension and supports the arch. In the foot, it serves as a tension bridge, offering static support and dynamic shock absorption.

HICKS first put forth a hypothesis, the "windlass model," which has become the most well accepted explanation regarding how the plantar fascia, toe dorsiflexion, and medial arch kinematics are related. A tie rod made of plantar fascia connects the calcaneus to the phalanges. The body's weight exerts vertical stresses that descend through the tibia and tend to flatten the medial longitudinal arch. Additionally, because the ground reaction forces fall both posteriorly and anteriorly to the tibia, they travel upward on the calcaneus and metatarsal heads, which may lessen the flattening of the arch even more. Due to its anatomical orientation and tensile strength, it inhibits foot collapse during the running gait cycle and gives the foot passive rigidity.[10]

Figure no 2

The foot's primary functions include propulsion through the environment, terrain adaptability, shock absorption, and support of human weight. In both static and dynamic weight-bearing positions, the foot carries the weight of the body.

Running's first point of contact is the heel, which necessitates a neutral ankle dorsiflexion. This action is made possible by the tibia posture, which transfers the most body weight to the stance leg. Due to the plantarflexed position, ankle dorsiflexion is at its peak during the stance phase, and absorption time is at its lowest (Pronation). The maximum amount of ankle dorsiflexion and plantarflexion depends on the athlete's speed.[4,5]

The Running gait cycle begins with the foot in a supinated position at heel strike. While going from heel strike to weight acceptance the subtalar joint immediately pronates. This pronation results in increased foot mobility which is needed to absorb ground reaction forces and adapt to uneven terrain. The foot reaches maximum pronation at the end of weight acceptance phase, and the subtalar joint supinates thefoot from mid stance to toe off. This supination transforms the foot into the rigid lever arm which is needed for propulsion. The orientation of plantar fascia helps maintain the arch throughout gait and contributes significantly to the appropriate timing of pronation and supination during the gait cycle[6]

The principal tensile strains on the plantar fascia as a function of percentile stance phase. The fascial band was increasingly loaded after initial contact and maximally loaded during mid -to-terminal stance phase (50-90% stance).The results show that running speed posed an effect on fascia strain level[7].Increased mechanical burden to the foot was believed to tighten plantar soft tissues and exacerbate foot problems (Chen, Agresta et al,2019).Tensile strains on the fascia band increased as the runner accelerated during running trials. The increments in fascial strains were most distinctin the transition from mid-to-terminal stance[7]

Various musculoskeletal dysfunctions may lead to plantar fasciitis. In patients with pes planus, over pronation abnormally lengthens the plantar fascia thus increasing the tension of the fascia and predisposing it to plantar fasciitis. On the other hand a cavusfoot, has less mobility which results in lesser absorption of ground reaction forces increasing load on plantar fascia. A tight gastrocnemius limits the dorsiflexion during the gait cycle which results in compensatory unlocking of midtarsal joints leading toincreased pronation of the foot[8].

The causes for Runners heel pain is not completely known .Plantar heel pains from skeletal problems are caused by calcaneal stress fracture, apophysitis of the calcaneus (Sever's disease), osteomyelitis, or inflammatory arthropathy. Soft tissue pathology includes fat pad atrophy (FPA) or contusion, plantar fascia rupture and plantar fasciitis (PF). Heel pain may be induced by neural causes such as entrapment or compression of the first branch of the lateral plantar nerve (Baxter's nerve), medial calcaneal branch of posterior tibial nerve, or nerve to abductor digiti quinti muscle. Other neural causes include S1 radiculopathy, tarsal tunnel syndrome, and peripheral neuropathy. Plantarfascitis is supposed to be the most common cause of plantar heelpain[9]

The diagnosis of Runner's Heel/Plantarfascitis is based on the history, risk factors and physical examination findings[3,11]:-

1. A gradual onset of pain in the inferomedial aspect of the heel that is usually worse with the first step in the morning or after a prolonged period of inactivity,
2. Pain maybe throbbing, searing or piercing
3. Walking barefoot, on toes, or up stairs may exacerbate the pain[8]
4. According to several small case-control studiesthat compared patients with and without plantar fasciitis, thicker heel aponeurosis, identified by ultrasonography, isassociated with plantar fasciitis[7]
5. stiffness of plantar heel pad ,
6. Fifty percent of patients with plantar fasciitis and up to 19 percent of persons without plantar fasciitis have heel spurs[9].
7. Limitation of ankle dorsiflexion due to tightness of the Achilles tendon may be present.

The medical management for plantar fasciitis/Runners heel includes:- anti inflammatory drugs or corticosteroids.(oral drugs, topical agents or injections). They are given to decrease inflammation and are best used for short term therapy.

Topical agents like diclofenac, sodium gel are used. Corticosteroid injections are usually reserved for the chronic or recalcitrant cases of plantar fasciitis that have failed to be treated successfully with the conservative treatment.A walking cast should be considered for patients with plantar fasciitis who have not responded to conservative measures.[11]

The physiotherapy management for Runners heel/plantar fasciitis is as follows:

MODALITY ULTRASOUND

It is High Frequency sound wave with an affinity for tendons and ligaments.It increases Tissue temperature, metabolism, circulation, chemical activity, cell membrane permeability, and alter protein synthesis rates affecting speed of repair. It heats up the tissues and causes the tissues to absorb energy. [10],[11]

IONTOPHORESIS

Iontophoresis is the use of an electrical current to induce ions of a medication into the tissues. Electrodes are placed on the skin in an ionisable solution such as a steroid(dexamethasone sodium) are carried through the skin towards the oppositely charged electrodes have been fund to be effective in providing short term relief for patients[13]When dexamethasone was given with acetic acid and low dye taping it was also found to be effective for short term relief.[14]

ORTHOTICS

They reduce strain on plantarfascia, by preventing overpronation of the foot andsupporting the medial arch.

Viscoelastic heel cup, prefabricated longitudinal arch support and custom made full length shoe inserts are amongst these orthotics.

Night splints

They help in maintaining neutral position of the the ankle joint thus preventing shortening of plantarfascia in sleeping position and preventing undue pressure overit. If the foot remains in plantar flexion over night, the first few steps are painful as the plantar fascia resumes its functional length and has to bear patient's weight creating potential for additional micro trauma at tissue site.[18]

TAPING

The main aim of taping is to support the medial arch and thus reduce strain over theplantar fascia.

Low dye taping and calcaneal taping have been found to be useful for short termeffect as compared to long term effect.[15]

EXERCISE THERAPY

Stretching of the Achilles tendon and plantar fascia

Stretching exercises relieve the stress put on plantar fascia which is shortened by a tight Achilles tendon.It has been found that stretching of Plantarfascia alongwith stretching of the Achilles tendon has been found to be more useful than achilles tendon stretching alone Sustained stretching as well as intermittent stretching protcol gets the same relief ofpain for the patients[17]

STRENGTHENING

Intrinsic muscle strengthening has been advocated for patients with plantarfascitis as weak intrinsic muscles lead to lesser dynamic arch support of the truss leading to further shortening of the plantarfascia and increasing the pain[18]

DRY NEEDLING

Dry needling is the insertion of fine soild filiform small needles without delivering drugs through them on specific points in the muscles to reduce the musculoskeletal pain experienced by the patients .It is nalso known as intramuscular stimulation.

These points are called as Trigger points.There is local twitch response after insertion of needles which leads to change in muscle fiber length and absoprtion of excessive Acetylcholine [20]

Myofascial trigger point is a hyperirritable spot in a taut band of a skeletal muscle .It is painful on compression, stretch, overload or contraction of the tissue which usually responds with a referred pain that is perceived distant from the spot.[22,26]

Trigger points are of two types, active and latent. An active trigger point exhibits spontaneous pain or pain in response to movement ,stretch or compression.A latent trigger point is a sensitive spot with pain or discomfort in response to compression only.[23]

They are located with tightened muscle area called as taut bands .These bands develop independently without involving the entire muscle group and do not havesignificantly EMG activity.

It has been found that Trigger points in the gastrocnemius muscle have been responsible for causing Plantar Heel pain.[21,22]

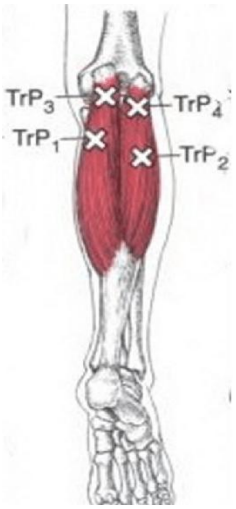


Figure no 3-Trigger points in GastroSoleus muscle

Dry needling helps in modulation of pain and Resolving the Trigger point issue by resolving the features in the following way:-

1. **Effect On Taut Band** – insertion of needle at end plate region may cause increased discharges which lead to elicitation of latent trigger responses and reduction of available acetylcholine stores and thus reduing endplate noise(Chen et al) . The latent trigger responses lead to alteration in length and tension of muscle fiber by local twitch response and causes stimulation of mechanoreceptors like Aβ fibers[21]. The restriction of ankle range of motion were corrected after release of latent TrPs in the soleus muscle(Grieve et al)

2. **Effect On Blood Flow** – sustained contractures might cause local ischemia and hypoxia in the core of MTrPs. Dry needling causes increased blood flow and oxygenation to the core of MTrPs by release of a vasoactive substance such as CGRP and Substance P (SP) which upon activation of Aδ- and C-fibers via the axon

reflex lead to vasodilatation of small vessels , thus increasing the blood flow.[25]

3. **Effect On Peripheral Sensitization** – various studies demonstrated that concentrations of (SP) and CGRP were higher in the vicinity of active MTrPs compared to latent ones. After eliciting a LTR,SP and CGRP concentrations were significantly lowered compared to their pre – LTR values. These values were compatible with the data published by Hsieh et al. which suggested a single session treatment produced a short term analgesic effect by decreasing the Spat peripheral sites, although no lasting effect were found 5 days post dry needling . Hsieh et al. have also shown that increased β-endorphin levels can suppress neurons from releasing SP and thus inhibit pain [25,29]

4. **Effect On Central Sensitization** – Dry needling may cause stimulation of both large myelinatedfibers (Aβ- and Aδ-fibers) and C-fibers indirectly via the release of inflammatory mediators. Mechanical stimulation results in Aβ- and Aδ-fibers activation and it sends signals to the dorsolateral tracts of the spinal cord and activate the supraspinal and higher centers involvedin pain processing [25,29.]

NEED FOR STUDY

There are various causes leading to Runner's heel pain condition . They include micro trauma, stress, various musculoskeletal conditions such as pesplanus, pescavus, tight plantar flexors. A variety of treatment techniques have been used in the treatment of Runner's Heelpain . However there are a few high quality, randomized control trial that support the efficacies of these therapies. Dry Needling of the Gastrocnemius Soleus muscle has been found to improve the Range of motion in various studies, there is a lack of literature determining its effectiveness on pain, dysfunction and Return to Sport Activity.

However as mentioned earlier, dry needling with its effect on peripheral and central sensitization may help in inhibiting pain . Hence this study was undertaken to study the effect of Dry needling and conventional treatment versus conventional treatment in Athleteswith Runner's Heel pain.

AIMS AND OBJECTIVES

AIM:

To study the effect of Dry needling and conventional treatment versus conventional treatment on pain and function in Athletes with Runner'sHeel

OBJECTIVES

1. To study the effects of dry needling on pain and functions in Runners' Heel pain as measured by FFI, VAS,LEFS

2. To study the effect of dry needling on mobility as measured by ankle dorsiflexion range of motion

3. To analyze and compare the statistical outcomes of Experimental group treatment protocol with that of Control group treatment protocol

HYPOTHESIS

NULL HYPOTHESIS:

Dry needling and conventional treatment are equally effective.

ALTERNATIVE HYPOTHESIS:

Dry needling along with conventional treatment is more effective thanconventional treatment.

REVIEW OF LITERATURE

1. .**Luis Llurda Almuzara ,Noe Labata-Lezaun,2021 et .al** have shown evidence of moderate to low quality supporting the favourable effects of trigger point dry needling on pain intensity and pain-related impairment in both the short and long term in patients with musculoskeletal origin plantar heel pain.

2. **Afsaneh moosaei Saein ,Ziaeddin safavi –Farokhi et.al** , 2021 research found that dry needling can help women with plantar fasciitis who have trigger points in their gastrocnemius and soleus muscles feel less pain and have less thickening of their plantar fascia.

3. **Esat Uygur,Birol Aktas ,Engin Eceviz et.a,2019** they discovered that, for patients with plantar fasciopathy, dry needling performed better than corticosteroid injection at the three-week and six-month follow-up periods.

4. **Shirvan Rastegar,Sadegh Mahdavi,et al ,2018** A comparative study indicated that while steroid injections can quickly relieve heel pain, dry needling can deliver longer-lasting, more acceptable benefits for patients with plantarfascitis.

5. **Rachelle Buchbinder ,2004** indicated that 11–15% of all adult foot complaints that call

for medical attention are caused by plantar fasciitis. According to reports, 10% of all injuries related to jogging are caused by plantar fasciitis. According to reports, the prevalence is highest among runners who are younger and between the ages of 40 and 60.

6. **Dishan Singh et.al ,1997,** highlighted that dorsiflexion, which is significant during the gait cycle, will be predisposed to by a tight Achilles tendon. Limitations in dorsiflexion range cause the subtalar joint to release, which increases the foot's pronation and the tensile pressure on the plantar fascia. The foot frequently assumes the equines position while sleeping in plantar fasciitis, which causes the fascial tissue to contract. In the morning, when one bears weight, the plantar fascia is strained, causing the pain to worsen.

7. **Keith Rome et al ,2001** In their study on runners, it was discovered that heel pad stiffness may be related to plantar heel pain since the mean stiffness of the group with plantar heel pain was lower than that of the group without plantar heel discomfort. 33 of the 166 participants in the study who participated had plantar heel pain.

8. **BinaEftekharsadat (2015)** conducted a study on dry needling in patients with chronic heel pain due to plantar fasciitis. 20 patients were taken and they were randomly allocated into two groups.Group A received dry needling (1 session per week for 4 consecutive weeks) and conventional exercises (plantar muscles massage and calf stretching). Group B received only conventional exercises. The outcome measures used were VAS, FFI and ANKLE ROM. They concluded that dry needling group gave superior results as compared to other group by improving severity of pain but not the ROMDF and ROMPE

9. **Rachael Allen et.al (2000)** conducted a study to determine if a difference exists in toe flexors strength and passive extension range of motion of the first metatarsophalangeal joint between individuals with unilateral plantar fasciitis and control group. The study concluded that subjects with unilateral plantar fasciitis showed weak toe flexors as compared to the uninvolved foot of control side.

10. **Aishwarya Ranbhor , Ashish prabhakar, 2021** found that in a randomized control trial of 50 subjects ,subjects were randomly allocated to 2 groups of stretching and foam roller muscle release and found that both techniques were effective and foam roller was superior to stretching in terms of pressure pain threshold for gastrocnemius and Soleus muscles.

11. **Rome K (1997)**[27] in a systemic review proposed following risk factors. Intrinsic factors proposed were age, BMI, pesplanus, pescavus, limb length discripency, reduced ankle dorsiflexion, tibial and subtalarvarum, femoral or tibial torsion. Extrinsic factors proposed included footwear, surface, activity type, activity level and trauma. Out of all the above mentioned factors, no single factor has been reliably identified across the study. Mechanical overload has been implicated as the principle factor involved.

12. **Tekin L et.al (2013)**[31] conducted a study to test the hypothesis that dry needling is more effective than sham dry needling in the treatment of myofascial pain syndrome. 39 subjects with myofascial syndrome were randomly distributed into two groups, study group and placebo group. Dry needling was applied using acupuncture needles and sham dry needling was applied in placebo group. VAS scores ,SF-36 scores were used in the study Hence this study concluded that dry needling treatment is effective in relieving the pain and in improving quality of life of patients with myofascial pain syndrome.

13. **Cummings et al (2001)**[28] conducted a systematic review of 23 RCTs of needling therapies to establish whether there is evidence for or against the efficacy of needling as a treatment approach for myofascial trigger point. They stated that direct needling of MTrPs seems to be an effective treatment. They concluded that direct MTrP needling was effective in reducing pain when compared to standardized treatment protocol

14. **Romulo et al (2011)**[29] conducted a study on effectiveness of myofascial trigger point therapy combined with a self stretching protocol for the management of plantar heel pain. The study was conducted on 60 subjects and they were randomly allocated in to two groups. One group was given only self stretching exercise while the other group was given self stretching along with myofascial trigger point release therapy. The protocol was given for 4 days per week for 4 weeks and the outcome measures were SF 36 and pressure pain threshold. They concluded that subjects with addition of myofascial trigger point release along with self stretching showed

superior short term outcomes as compared to only self stretching.

15. **Timothee Rainteau et al ,2020** in his study on field Hockey players with plantar heel pain found that there was a significantreduction in the pain levels after 1 month of using plantar foot orthoses ,measured by FFI.Thus they concluded that it can be a potent solution to complement other treatments like foot muscle strengthening.

16. **Cotchett and colleagues(2010)**investigated the effect of trigger point dry needling compared to injections on symptoms and disablement associated with plantar fasciitis.. Three quasi-experimental trials matched the inclusion criteria: two trials found areduction in pain for the use of trigger point dry needling when combined with acupuncture and the third found a reduction in pain using 1% lidocaine injections when combined with physical therapy. This systematic review found limited evidence for the effectiveness of dry needling and/or injections of MTrPs associatedwith plantar heel pain.

17. **BehnamAkhbari (2014)**[32] conducted a case report on use of dry needling and myofascial meridians in a case of plantar fasciitis. The case study was done on a 53 year old man having recurrent plantar fasciitis which was being treated since 2.5 years with conventional treatment but was not better. Initial examination of this individual revealed that multiple tender points were found along the insertion of Achilles tendon, medial gastrocnemius, biceps femoris, semimembranosus, and ischial tuberosity. Dry needling of the trigger points was applied. After 4 treatments over 2 weeks, the patient felt a 60% to 70% reduction in pain. They concluded that a global view of condition is useful and dry needling improved the symptoms of patient with recurrent plantar fasciitis.

18. **Benedict F et.al (2009)**conducted a clinical trial on specific stretching exercise in plantar fasciitis. 101 patients having plantar fasciitis for over 10 months were chosen and they were randomly allocated into two groups- non weight bearing plantar fascia stretching and weight bearing Achilles tendon stretching . FFI was done pre and post 8 week protocol.It was concluded that non weight bearing specific plantar fascia stretching was superior compared to standard weight bearing Achilles tendon .

19. **McKeon PO et.al (2015)**[33] conducted a review on foot core system. They concluded that intrinsic foot muscle strengthening is very essential due its following function in the foot, diminished function of intrinsic muscles lead to deleterious alterations in foot posture, whereas training them enhances the foot arches. Intrinsic foot muscles are more active in dynamic activities such as walking as compared to standing. With increase in postural demands such as from double to single leg stance, activity of intrinsic muscles increases. They work together as a unit to provide dynamic arch support during propulsive phase of gait.

20. **R.T.H. Cheung, L.K.Y.Sze et al,2016,** in their study on 20 experienced runners out of which 10 runners were were suffering from bilateral plantarfascitis,foot scans were done and normalized for their Body mass and it was found that there was significant rearfoot muscle volume difference between healthy runners and Runners with Plantarfascitis .It lead to conclusiom that atrophy of intrinsic foot muscles may be related to plantarfascitis

OUTCOME MEASURES

Foot function index

It was developed to measure the impact of foot pathology in terms of pain, disability and activity limitation. It is a self administered index consisting of 23 items, divided into 3 sub categories.

Test retest reliability of FFI and total 3 subscales ranged from 0.87 to 0.69. Strong co relation between FFI scores and subscale scores and clinical measures of foot pathology supported the criterion validity ofindex12 [40.]

Lower extremity Functional Scale

The LEFS is easy to administer and score and is applicable to a wide range of disability levels and conditions and all lower-extremity sites. The LEFS can be used by clinicians as a measure of patients' initial function, ongoing progress, and outcome as well as to set functional goals. The MDC(Minimum Detectable Change) of the LEFS is ±9 scale points (90% CI).Inter class Corelation of 0.88 ,Standard Error of measurement was 4 LEFS points .Test –retes t reliability of LEFS was0.94.[41]

Visual Analogue Scale

This scale is a simple , easily administered for patients with acute to chronic pain.It is mostly used as a 10 point scale. It is often used in epidemiologic and clinical research to measure the intensity or frequency of various symptoms. It has test-retest reliability of 0.94 .[42]

MATERIAL AND METHODOLOGY

Study Design – Randomized control trial

Study Population - Athletes with Plantar heel pain **Sample size** – 50 Subjects was chosen as a sample size **Type of sampling** – Random sampling method was used.

Source of sampling – OPD centers affiliated to parent institute

Duration of study – 1 month

ELIGIBILITY CRITERIA:

Inclusion criteria –

1. Athletes older than 18 years
2. Patients with 3 or more years of running/athletic training at NonAmateur level
3. Diagnosis of plantar heel pain using the clinical guidelines linked to the International Classification of Function, Disability and Health from the Orthopedic Section of the American Physical Therapy Association
4. Experiencing pain for more than one month
5. Having a heel pain on the first step during the last week with the rate of at least 40 mm on visual analogue scale
6. Having MTPs on initial physical examination on plantar and calfmuscles

EXCLUSION CRITERIA

1. Refuse needling and routine physical therapy (e.g., cooling, stretch, massage therapy and/or footwear modifications)
2. Diagnosis of coagulopathy or taking anticoagulants except foracetylsalicylic acid
3. Dermatological disease in the area of needling previous history of dry needling or acupuncture
4. Treatment for plantar heel pain within four weeks prior to the study 5.Inability to understand the instructions or complete the questionnaires
5. Presence of peripheral arterial vascular disease, history of connectivetissue disease
6. Presence of a chronic medical condition like rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, septic arthritis, neurological abnormalities, sciatica, and/or chronic pain
7. History of plantar fascia surgery
8. History of injection therapy in the heel during the previous threemonths
9. Hypersensitivity to metals
10. Pregnancy
11. Raynaud's Disease

MATERIALS USED

1. Acupuncture needles (0.25 x 25mm -0.25 x 50mm)
2. Universal Goniometer
3. Case record form /Patient Information Sheet
4. Therapeutic Ultrasound machine
5. Low Dye tape

OUTCOME MEASURES

1. Foot function index (FFI)
2. Lower extremity Functional Scale(LEFS)
3. Visual Analogue Scale (VAS)
4. Dorsiflexion range of motion (ROM)

METHODOLOGY

The study was approved by the Ethics Committee of the institute and was conducted at OPD of the parent institute , Runners Club . Athletesdiagnosed with Plantar heel pain and who met the inclusion and exclusion criteria were included in the study. The procedure, benefits of the study were explained to the Subjects.Informed Consent was then taken from the subjects. They were randomly allocated into two groups: Experimental and Control

Patient information sheet which also included the demographic data was filled. Patients were asked to fill Foot function Index, and Lower Extremity Functional Scale Total 50 patients were included in the study (25 in the experimental group and 25 in the control group).

Subjects were treated for a period of 1month with a single treatment session of dry needling once a week along with the conventional treatment in the experimental group and conventional treatment in the Control group a per the group protocol . All the outcome measures were taken pre treatment and post 1 month of treatment for Experimental and Control group

GROUP A

Control group (conventional treatment and exercises) Monophasic current is given along with the Exercises.[20]

The conventional exercises given to patients with plantar fasciitis areas follows:

1. Calf muscle stretching exercise –

Subjects were asked to lie down in supine position, therapist stood on the affected side. The knee of the affected side was slightly bent, while the therapist cupped the heel and performed inversion and dorsiflexion of the ankle with the forearm support. While the dorsiflexion was maintained the knee was slowly extended with the therapist's other hand and the position was maintained.[39]

Dosage: - 2 to 3 stretches of 30 seconds hold was given

2. Plantar fascia stretching

Subjects were asked to lie down in supine position. The ankle of the affected side was maintained in dorsiflexion and the therapist grasped the base of the toes and pulled the toes towards the shin and maintained the position till the subject felt a good stretch on the plantarfascia.

Dosage: - 2 to 3 stretches of 30 seconds hold was given

3. Intrinsic foot strengthening –

Subjects were asked to sit with feet on the floor or in standing; towel was placed under the feet. Subject was asked to wrinkle the towel, by curling the toes and maintaining the contact of the heel to the floor. Subjects were asked to pick up marbles or coins with the toes.

Dosage – 3 sets of 10 repetitions.

Intrinsic foot muscle strengthening

4. Low dye taping – Taping was done

- from the first metatarsal head to the fifth metatarsal head transversely
- from the first metatarsal head to the heel,and back to the first metatarsal head like a water drop shape
- from the fifth metatarsal head to the heel,and back to the fifth metatarsal head
- finally the metatarsal head was taped transversely once again. Dosage – taping was done once a week for 4 weeks

low dye taping

5. **Ultrasound**

subjects were given ultrasound at the most painful spot in the heel. Dosage – 10 minutes per session Total of 10 sessions in a span of 4 weeks.

GROUP B

EXPERIMENTAL GROUP

(dry needling and conventional treatment)

The conventional treatment was given as mentioned in group A. Dry needling was performed for the plantar flexor group of muscles. The needling was performed in prone position. The muscle was palpated for trigger point, by a flat or pincer grip and the part to be needled was cleaned with spirit. A needle size of 0.25 x 25mm to 0.25 x 50 mm was used, depending on the thickness of muscle. The needling was performed in the direction or angle away from the midline. Following the insertion, needle was withdrawn partially and pressed in repeatedly to produce an appropriate local twitch response. After the first local twitch response was obtained, the needle was moved up and down (vertical motions) 3-5mm with no rotations until no more twitch responses were elicited. The needle was left in situ for around 5 to 10 minutes.[18, 20].

Dryneedling of the gastrocnemius and soleus muscle

In addition to this Home Exercise program was also recommended for the patients

An exercise home program was given to the subjects of both the groups. They were as follows:-

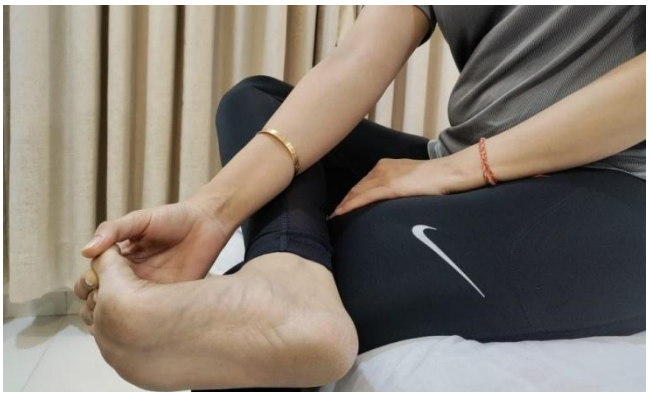
1) Self stretching

a) Plantar fascia

The subjects were asked to cross the affected foot over the contralateral leg.

They were asked to grasp the base of the toes and pull the toes towards the shin until a stretch was felt in the arch[11].

Dosage :- 3 repetition of 30 seconds hold



Self stretch of plantar fascia

b) Calf stretch

The subjects were asked to stand and lean into the wall with the affected leg placed behind the contra lateral leg.

The heel of the affected foot was kept firmly on the ground and the knee was fully extended, while the front was bent[40].

Dosage: - 3 repetition of 30 seconds hold

self stretch of calf muscle

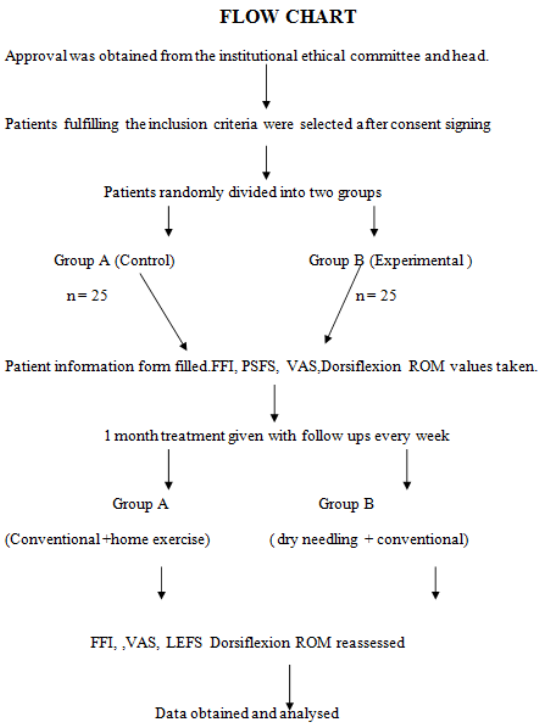
2) Intrinsic foot strengthening

Picking up marbles or coins from the floor

Dosage: - 3 sets of 10 repetitions

intrinsic foot muscle strengthening

FLOW CHART



STATISTICAL ANALYSIS

A total of 50 (25 - experimental group, 25- control group) subjects were enrolled for the study. . Out of 50 subjects , 27 were males and 23 were females.

The outcome measures used were Foot Function Index (FFI), Visual Analogue Scale (VAS) ,Lower Extremity Functional Scale (LEFS) ,Range of Motion (ROM) .

The data was tested for normal distribution using the Shapiro-wilk test.

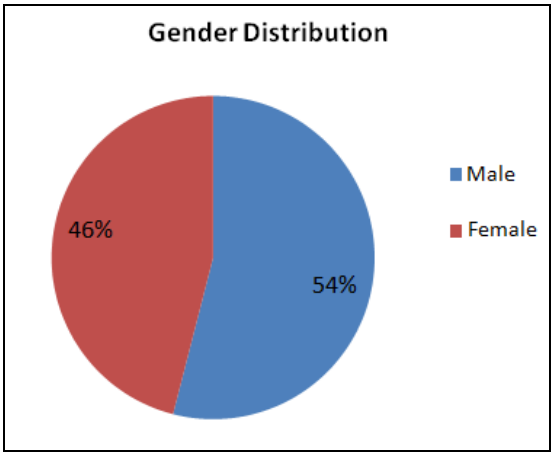


TABLE NO. 1

GENDER	NUMBER/SAMPLE SIZE
MALE	27(54%)
FEMALE	23(46%)

TABLE NO. 2

GENDER	EXPERIMENTAL	CONTROL
MALE	14(56%)	13(52%)
FEMALE	11(44%)	12(48%)

TABLE NO.3

GROUP	MEAN AGE	STANDARD DEVIATION
EXPERIMENTAL	25.32	7.76
CONTROL	25.80	6.71

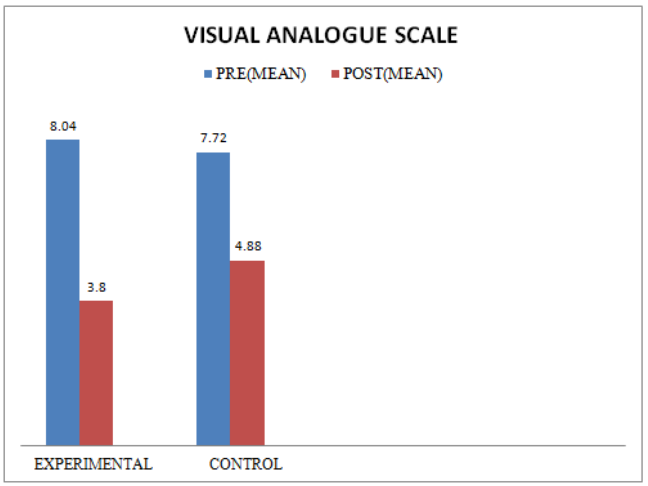


TABLE NO . 4

EXPERIMENTAL GROUP(GROUP B) , N=25	MEAN	STANDARD DEVIATION	SUM OF SIGNED RANKS (W)	P VALUE
PRE TEST	8.04	1.14	-325	<0.0001
POST TEST	3.80	0.96		

MEAN DIFFERENCE=4.24 SPEARMAN COEFFICIENT=0.1172

TABLE NO. 5

CONTROL GROUP (GROUP A) ,N=25	MEAN	STANDARD DEVIATION	SUM OF SIGNED RANKS (W)	P VALUE
PRE TEST	7.72	1.10	-254	<0.0001
POST TEST	4.88	1.45		

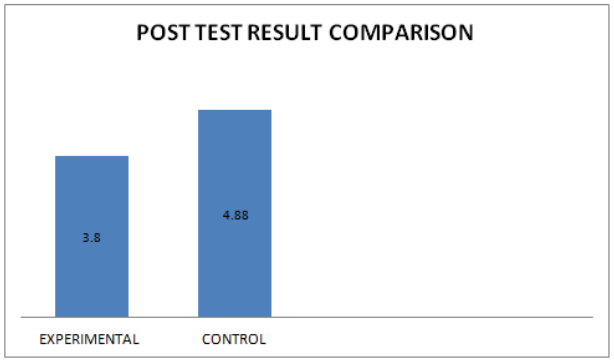


TABLE NO 6

POST TESTREULTS	MEAN	STANDARD DEVIATION	U-VALUE	P VALUE
EXPERIMENTAL	3.8	0.96	199.5	0.0356(<0.001)
CONTROL	4.88	1.45		

SUM OF SIGNED RANKS =524.5, 750.5

SPEARMAN COEFFICIENT= 0.5301

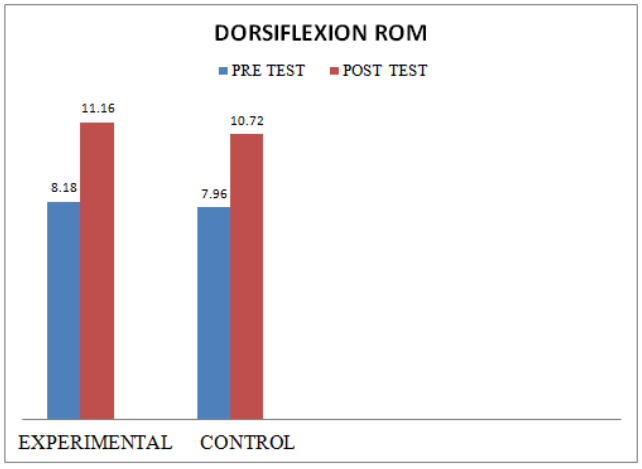


TABLE NO.7

EXPERIMENTAL GROUP (GROUP B) ,N=25	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
PRE TEST	8.18	1.306	10.49	<0.0001
POST TEST	11.16	1.456		

CONFIDENCE INTERVAL (95%)= -3.556 TO -2.404

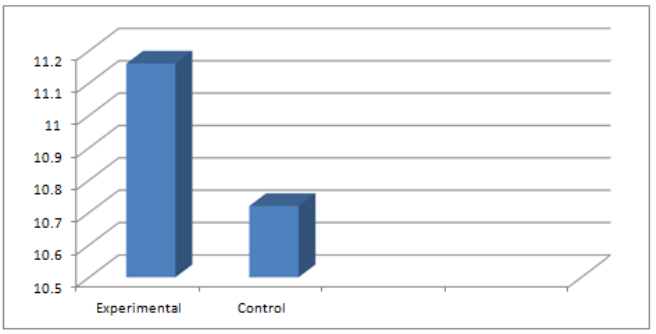
MEAN DIFFERENCE= 2.980

TABLE NO. 8

CONTROL GROUP (GROUP A),N=25	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
PRE TEST	7.96	1.330	10.873	<0.001
POST TEST	10.72	1.339		

Mean difference=2.760

Confidence Interval (95%)= -3.287 to -2.233



POST TEST RESULTS OF DORSIFLEXION ROM TABLE NO. 9

GROUP(POST TEST RESULTS)	MEAN	STANDARD DEVIATION	T -VALUE	P-VALUE
EXPERIMENTAL	11.16	1.456	2.397	0.0118
CONTROL	10.72	1.339		

MEAN DIFFERENCE=0.440

CONFIDENCE INTERVAL(95%)=-1.545 to –0.1354R^2=0.106

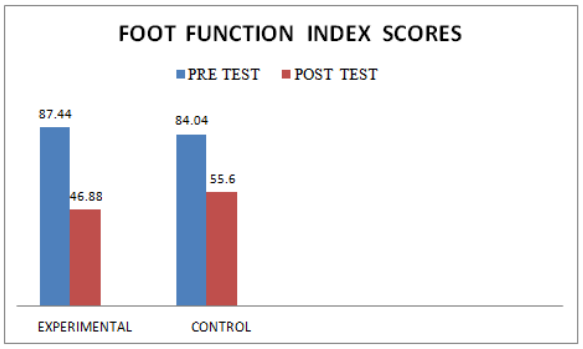


TABLE NO. 10

EXPERIMENTAL GROUP(GROUP B),N=25	MEAN	STANDARD DEVIATION	T-VALUE	P-VALUE
PRE TEST	87.44	10.05	23	<0.0001
POST TEST	46.88	6.827		

MEAN DIFFERENCE=40.56

CONFIDENCE INTERVAL(95%)=44.20 to 36.92
R^2=0.9566

TABLE NO.11

CONTROL GROUP (GROUP A),N=25	MEAN	STANDARD DEVIATION	T-VALUE	P-VALUE
PRE TEST	84.04	8.15	10.45	<0.0001
POST TEST	55.60	9.69		

MEAN DIFFERENCE= 28.44

CONFIDENCE INTERVAL (95%)=22.82 to 34.06

R^2= 0.819

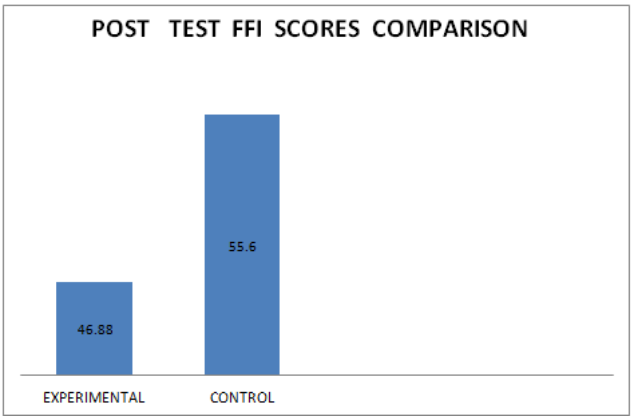


TABLE NO. 12

GROUP	MEAN	MEAN DIFFERENCE	T-VALUE	P-VALUE
EXPERIMENTAL	46.88	8.72	3.67	0.0006(<0.001)
CONTROL	55.60			

CONFIDENCE INTERVAL (95%)= 3.953 to 13.49

$R^{2=}$ 0.219

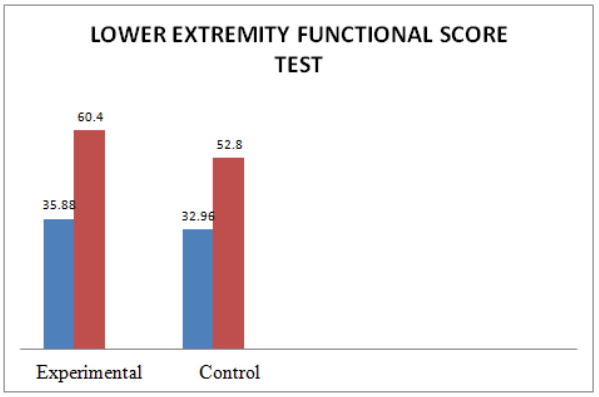


TABLE NO .13

EXPERIMENTAL GROUP(GROUP B),N=25	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
PRE TEST	35.88	7.33	12.403	<0.0001
POST TEST	60.40	6.63		

MEAN DIFFERENCE = 24.52

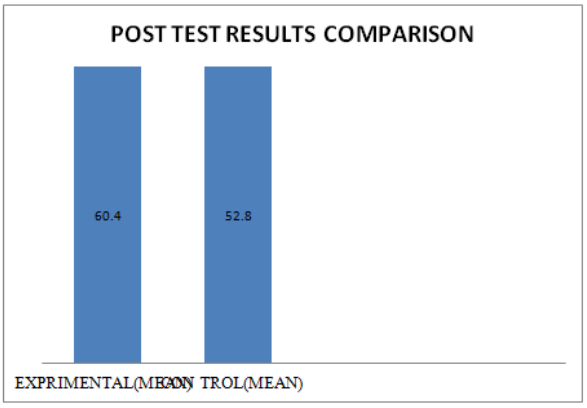
CONFIDENCE INTERVAL(95%)= -28.49 to 20.55

TABLE NO.14

CONTROL GROUP(GROUP A),N=25	MEAN	STANDARD DEVIATION	T VALUE	P VALUE
PRE TEST	32.96	4.63	16.92	<0.0001
POST TEST	52.80	3.59		

MEAN DIFFERENCE=19.84

CONFIDENCE INTERVAL(95%)= -22.20 to 17.4



INDEPENDENT T –TEST COMPARISON FOR POST TESTRESULT COMPARISON

TABLE NO .15

POST TEST RESULTS GROUP	MEAN	MEDIAN	T –TEST	P-VALUE
EXPERIMENTAL	60.4	62	5.041	<0.0001
CONTROL	52.8	53		

CONFIDENCE INTERVAL (95%)= 4.56 to 10.63

R^2= 0.3461

RESULTS

The purpose of the study was to study and compare the effect of Dry needling and Conventional treatment versus Conventional treatment on pain,function and mobility in Athletes with Runner's Heel pain

The results of the study revealed:

1. From the above graphs and tables ,it can be found that of the Total Sample size of 50 , 27(54%) were males and 23 (46%) were females .

2. Experimental Group (N=25) consisted of 14 (56%)males and 11 (44%) females with mean age of 25.32

3. Control group (N=25) consisted of 13 (52%) males and 12 (48%) females with mean age of 25.80

4. It was observed that Dorsiflexion ROM ,Foot Flexion Index (FFI) ,Lower Extremity Functional Scale (LEFS) followed the Normal Distribution Curve

/Gaussian Curve. Thus Paired T test was used to study Intra group studies andindependent T test was used for Inter Group studies

5. Visual Analogue Scale (VAS) did not follow the Normal Distribution Curve ,hence Wilcoxon signed rank test was used to analyse intra group test and Mann whitney test wass used to analyse inter group studiesAccordingly the results of various outcome measures were found out and statisticallyanalysed

1. In VAS scale ,

Experimental group , Pre - Test mean value of VAS was 8.04 and the post-test meanvalue was 3.80 (p < 0.001)indicating significant difference post treatment protocol Control Group ,Pre -Test mean values was 7.72 and and post test mean was 4.88 (p <0.001)indicating significant difference after treatment protocol being implemented.

On comparison of post test values, it was found that both experimental and control groups showed significant change post treatment and experimental group showed more significant change than the control group

2. ROM

Control group, Pre -test mean value was 7.96 and post treament mean value was 10.72 (p <0.001) with difference being 2.76 .This shows significant difference between two values Experimental group,Pre -test mean value was 8.18 and post test mean value was 11.16 (p <0.001) with difference being 2.98.This shows significant difference between two values On comparison of both post test values result it was found that both experimental and control group helped in increasing ROM and experimental group did not show significant difference over control group in increasing ROM

3. FFI

Experimental Group ,Pre -Test mean score was 87.44 +- 10.05 and after 1 month of treatment the post test mean scores was 46.88 +-6.82 (p <0.001) suggesting a significant change in pain,functional outcomes with mean difference of 40.56

Control Group ,Pre -Test mean score was 84.04 +- 8.15 and post -test mean scoreswas 55.60 +- 9.69 (p <0.001)suggesting a significant change post treatment with mean difference of 28.44

Comparing Post- Test mean scores of Both Groups (Group A and Group B) shows that in both the groups there was a significant change in the scores post treatment with the Experimental group showing significant change over the Control Group treatment protocol

4. Lower Extremity Functional Scale(LEFS)

Experimental Group ,Pre -Test mean score was 35.88 $^{+}_{-}$7.33 and post test mean score was 60.40 $^{+}_{-}$ 6.63 with a p value <0.001 suggesting significant change in scores post treatment with mean difference of 24.52 Control group ,Pre -Test mean scores was 32.96 $^{+}_{-}$ 4.63 and Post test Scores was 52.80 $^{+}_{-}$ 3.59 with p value <0.001 suggesting a significant change in scores post treatment with mean difference of 19.84 Comparing Post -test results of Experimental and Control group ,it can be seen that both groups showed significant improvement after treatment on the Outcome scale with Experimental group showing better results as compared to Control Group It can thus be concluded that :

1. The decrease in pain, disability and activity

limitation was more in theexperimental group than control group

2. There was a significant increase in FFI,LEFS scores indicating improvement in activity limitation in the experimental group as well as control group.

3. The improvement in activity limitation was more in the experimental group than the control group.

4. There was a significant improvement in the dorsiflexion range of motion in the experimental group as well as the control group. The improvement in the dorsiflexion range of motion was not more significant in the experimental group compared to the control group.

DISCUSSION

The term Runners Heel was first coined in the year 1971 by P N Sperryn to indicate problems of Heel pain in Athletes ,primarily caused due to Plantarfascitis and Achilles tendon pain .Over the years many researches were done by Ekta Capri et al

,T.N .Novacheck highlighting the injuries taking place in Runners due to Altered Biomechanics of various parts of the body. Also possible treatment methods were researched and recommended by various studies highlighting the growing importanceof these Injuries in Athletes .This study was undertaken to understand The Effect ofDry Needling when used with Conventional Treatment compared to Conventional Treatment alone in Athletes with Runner's Heel pain.

This study focuses on Plantarfascitis cause of Runner's Heel pain as being the most common occurrence in Athletes[57].The various risk factors involved in the development of plantar fasciitis include aberrant foot biomechanics, improper footwear, prolonged standing, tight Achilles tendon and obesity[3,2] .More specifically, foot over pronation is believed to put increased tension on plantar soft tissue and create potential for injury to occur.[7]

It has been mentioned in several studies that pain from plantar fascia occurs from excessive tension applied to the plantar fascia by repetitive micro trauma to the fasciaitself. Micro trauma is caused by an overuse injury which develops when repetitive stress is applied to the bone and musculotendinous structures. A combination of extrinsic factors such as improper footwear, surface and intrinsic factors such as pronation, supination of the foot, flexibility deficits predispose to develop this injury.[43]

Patients with over pronated foot , have a more flexible forefoot as compared to the normal foot type along with tightness of gastrosoleus leading to a weak supporting force to the arch of the foot. This results in an increase load on the plantar fascia leading to overstretching of the plantar fascia. Also Achilles tightness leads to limited Dorsiflexion resulting in compensatory mid tarsal unlocking.This leads to excessive pronation and overpressure on Plantarfascia .

In this study, 50 Non Amateur Athletes were chosen and were randomly divided into 2 groups : Group A(Conrol) and Group B (Experimntal).Both the groups had approximately similar baseline values of dependent variables at the start. The research hypothesis stated that Dry needling when used along with Conventional treatment is more effective than Conventional treatment alone .This hypothesis was proven to be correct by the Study undertaken .The Patients selected were between the age group of 18 to 40 years.

At the end of 1 month of treatment with follow ups ,scores were recorded again using scales like FFI,LEFS ,VAS, and Dorsiflexion ROM .There was significant improvement seen in both the groups post treatment with Experimental group showing better outcome results in FFI, LEFS, ROM over the Control group.VAS scale showed significant differences in both the groups post treatment but significant difference was not seen between the results of Experimental and Control Group.

Dry needling as a Treatment technique has gained popularity in the recent years owing to its relatively easy yet effective application. Solid filiform needles are inserted into trigger points which are supposed to be the main causative factors forMyofascial pain .[22,23,24]

In Experimental Group treatment Protocol ,Dry Needling was given alongwith conventional treatment ,it lead to better outcome scores on FFI, LEFS,VAS ,ROM .as can be seen in table 4,7,10,13.

Heel pain radically alters a gait pattern which may result in the development of an abnormal muscle firing pattern and the development of a trigger point (TrP) in the gastrocnemius and soleus muscle[50] .The development of TrP also gives reffered pain to the heel. Therefore it is important to treat the TrP which could probably be the secondary impairment giving rise to heel pain.

Pain relief can be mostly attributed to the physiological effects of dry needling leading to analgesia owing to peripheral sensitization of the afferent nerve fibers leading to blockage of pain carrying fibers and release of Acetycholine stores and receptors site alteration .The protocol followed was mentioned in Single Blind controlled trial by Babaei Ghazani et al(2015) which

recommended a single session of Gastrocsoleus myofascial trigger point Dry needling Increased range of motion can be attributed to the combined effects of calf stretching ,plantarfascia stretching

Low dye taping had a more preventive role as it supports the plantarfascia group of muscles and prevent it from getting worse during activities of fascia loading duringthe stance phase of Running [5]

In Control Group ,interventions included Ultrasonic therapy,low dye taping and Stretching exercises. Intrinsic muscle strengthening was also included as part of thetraining program as it has been shown to provide necessary lower truss support responsible for maintaining stance control during running and prevent foot from falling flat. Latey et al (2014) showed of a possible link between intrinsic muscle weakness and painful foot problems like Plantarfascitis. There was a significant improvement in pain as measured on pain scale of VAS and functions as measured through FFI, LEFS and Dorsiflexion ROM scores in the subjects post 1 month of treatment ($p < 0.001$) as seen in Tables 5,8, 11,14. The dorsiflexion ROM also improved probably due to decrease in pain and also due to stretching of gastroc- soleus muscle and plantar fascia.

It has been theorized that inflexibility of the gastroc-soleus complex can lead to excessive pronation and overcompensation of the plantar fascia at the first metatarsal phalangeal joint, and thereby increasing the stress at the medial calcaneal insertion[48].

When a stretch is applied to the tissue, the tissue responds through either temporary lengthening or permanent lengthening according to the stress strain curve. Thus stretching of gastocsoleus muscles is aimed permanent lengthening with the protocol for holding the stretch for 30 seconds and continuing for 3 sets.

DONELLA et al. conducted a study on increased navicular drop, which leads to pronation of the foot due to fatigue in intrinsic foot muscles. They concluded that it was important to strengthen the intrinsic foot muscles as they played an important role in supporting the medial longitudinal arch

On comparing both the final outcomes of both the groups it was found that Experimental group showed much better results as compared to the Control group on various indicators FFI,LEFS indicating better improvement in functional activities with Dry Needling as an adjunct to the Conventional treatment .The probable cause for better outcome can be attributed to the physiological effects of Dry Needling overTrigger points in Gastro soleus muscle which leads to increase Local Blood flow and release of Taut band which allows better elasticity of muscle fibers and gradual improvement in functional length utilization.[25,26]

Improved Range of motion can be attributed to Stretching post Dry Needling which leads plastic deformation of the muscle tissue fibers leading to tissue elongation.

Tissue elongation helps in better functional range of the Gastrosoleus which allows better ankle movement during Stance phase and better weight transition and preventing accessory movements at the joint level. At the physiological level ,there must be a disruption of the taut bands and preventing overlap of actin-myosin complex ,thus reducing muscle stiffness . Better extensibility due to Stretching .Also Low dye taping and Intrinsic foot musculature have a supportive role to play in maintaining optimum pressure on the plantarfascia by preventing foot collapse duringGait cycle.

Thus it can be seen that when using Dry needling as an effective adjunct to the Conventional acceptable Treatment there is significant relief for patients in terms of pain ,disability and improvement in the Activity limitation as measured by various Outcome measures .Thus Null hypothesis is rejected and the original Hypothesis of Dry Needling being an effective adjunct to the conventional treatment is proved.

LIMITATIONS

1. The study could not be assess the Long term impact of the treatment protocol due to the short term nature of the study (1 month)

2. It was limited to only the Athletes with planar heel pain due to Plantarfascia problems. Plantar heel pain arising due to other causes in runners has not been considered for the study .Further research and study is required to better understand the effects of Dry needling in Heel pain due to other causes

CONCLUSION

The Study found that Both Treatments I.e. Conventional Group (Exercsies ,Ultrasound ,taping)and Experimental Group (conventional group +Dry Needling) both were effective in reducing pain ,as noted on the VAS score ,with experimental group showing better results than Control group The Functional Scales ,FFI an LEFS ,showed significant improvement in outcome scores in both groups post treatment .Experimental group showed significant Change over Control group outcome suggesting effectiveness of Experimental group protocol over Control group protocol in improving

Functional Scales .Thus Dry needling can Be used as an effective adjunct therapy with the conventional therapy in improving the Functional limitations of the Runner's Heel pain

The ROM measurement done using Universal Goniometer shows effective improvement in ROM in both the groups ,Control (Group A)and Experimental (Group B) with no significant difference in the outcomes of both the groups.

Thus we can effectively conclude that The present study rejects the Null hypothesisthat there will not be any significant difference between Dry needling and conventional treatment and it supports the Alternative hypothesis that Dry needling when used along with the Conventional treatment provides better results when compared to Conventional treatment alone.

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