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Effectiveness of dry needling combined with ultrasound and stretching on pain and disability in plantar fasciitis

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Abstract
This study aims to find the effectiveness of dry needling combined with ultrasound and stretching for decreasing pain and disability in patients with plantar fasciitis.
Methodology: Thirty patients diagnosed with plantar fasciitis between 20 to 60 years willing to participate voluntarily are taken in this study.
Results and Conclusion: Statistical analyses of data was done by using SPSS version 21.0. The level of significance was set at 0.05. The study showed better results in the group who received dry needling, ultrasound therapy & stretching.

Keywords: Dry needling, plantar fascia, stretching, ultrasound, ultrasound therapy

Introduction
The plantar aponeurosis is the modification of deep fascia which covers the sole. It is a thick connective tissue that functions to support & protect the underlying spiral structures of the foot. The plantar fascia plays an important role in the normal biomechanics of the foot. It provides support for the arch & providing shock absorption. Overstretching of the fascia leads to plantar fasciitis [5]. Plantar fasciitis causes pain & stiffness in the heel & medial arch of the plantar surface of the foot & considerably interfere with activities of daily living. Various terms have been used to describe plantar fasciitis, including jogger's heel, tennis heel & policeman's heel. The exact incidence & prevalence of plantar fasciitis by age are unknown. Still, it is seen mostly between ages of 40 and 60 [14]. It is more common in female than in males. Clinically it is seen there is Heel pain in the morning or after the first few steps after long periods of non-weight bearing, tenderness to the anterior medial heel, reduced dorsiflexion and Achilles tendon tightness, may have a preference to toe walking, pain is more while walking barefoot on hard surface & with stair climbing [5].
The Patho mechanics for plantar fasciitis is due to the tightness of the gastro soleus muscles. During midstance to heel off phase of gait cycle 5degree of dorsiflexion is needed in order to clear the surface [10]. Due to gastro soles shortness, there is limited range of dorsiflexion & this short musculature don't allow tibia to glide anteriorly. This can be compensated by pronation of the subtalar joint leading to plantar fasciitis tightness. It is more common in individuals with poor foot biomechanics that stress the plantar fascia, such as flat foot or weak foot arch control muscles. As investigation X-ray, may show calcification in the soft tissue around the heel or heel spurs, diagnostic ultrasound may show small differences in the plantar fasciitis thickness (5mm-7mm) [12].
There are many simple ways to speed the recovery so that patients can return to their normal activities quickly. After pathologies have been ruled out, the aim is to reduce the inflammation, and the pain experienced by the patients.
Common interventions for plantar heel pain in physiotherapy includes ice therapy, ultrasound (phonophoresis) [5], and iontophoresis into the affected tissue. Various other interventions like manual therapy, myofascial release techniques, stretching, strengthening exercises, kinesio taping, orthosis, dry needling and laser therapy are found to be effective.

Stretching [10] of the foot and gastronemius soleus helps to elongate the muscle in order to improve the muscle elasticity and reaffirm comfortable muscle tone. Dry needling (DN) is used in treating musculoskeletal disorders, it penetrates the skin, subcutaneous tissues, and muscles using a thin needle causing local muscle tremors, which relaxes the area reduces local tension, stiffness and pain [2].

The purpose of our study was to evaluate, the effectiveness of dry needling along with stretching and ultrasound therapy in patients with plantar fasciitis.

Methodology

Source of Data

Population-Subjects from department of physiotherapy, Bhubaneswar, Sample size-30 subjects ranging from 20-60years satisfying the sampling criteria. Study Duration: 2 weeks. Sampling Technique: Allotment of the individual study group was done Block Randomization. Inclusion Criteria: Age group 20-60years, both males & females, patient diagnosed with plantar fasciitis since a period of 2 months, patients failed to respond to NSAIDS, orthosis, silicone heels, heel pads & corticosteroid injections, subjects who are willing to participate, pain ≥ 4 in VAS. Exclusion Criteria: History of Systemic disease, History of heel surgery, calcaneal fractures, calcaneal spurs, any disorder of lower limb that might warrant treatment, uncooperative patients, pregnancy, dermatological diseases in the area of needling, peripheral arterial vascular diseases, chronic medical conditions like rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, septic arthritis.

Procedure: 30 subjects with plantar fasciitis were screened according to the inclusion & exclusion criteria's & patients willing to participate in the study were taken and a informed written consent was taken. Their demographic data were collected. The other areas assessed during this were for quantification of pain profile by using VAS & disability level by foot function index. After this all subjects were allocated into 2 groups such as experimental group (Group A) & control group (Group B). Subjects in experimental group (Group A)were treated with Dry Needling for the taut band of skeletal muscles for calf muscle especially 4 tender point of gastrocnemius muscle and plantar fascia using a dry needle with length of 0.25mmx25mm. The participants were lying flat prone, the insertion of the needle was partially withdrawn & advance to produce an appropriate response for twitch by pecking method, once this has occurred the needle was left in the site for 3 minutes. Dry needling was given 3times a week for 6 treatment sessions in 2 weeks. Along with Dry needling the subject was given therapeutic ultrasound at the calf muscle and plantar fascia for 7 minutes in pulsed mode (1:4) at 1 Hz intensity by using a 1MHZ transducer head. The patients were taught home exercises like plantar fascia & calf stretching 10 times each with a hold of 5 seconds twice a day with a rest time of 2 sec followed by ice can roll for 10-15 minutes. All the treatment were continued thrice a week for 6 treatment sessions at the end of 2 weeks of treatment with pain in VAS & disability level on Foot function index were assessed & noted. Group B: Subjects in control group (Group B) were treated with ultrasound therapy for 7 miutes,1 HZ in pulsed mode (1:4) by using a 1MHZ transducer head for 6 days a week for 2 weeks and the patients were taught home exercises like plantar fascia & calf stretching 10 times each with a hold of 5 seconds with a rest time of 2 seconds twice a day followed by ice can roll for 10-15minutes. All the treatment were continued 6 days a week for 2 weeks at the end of 2 weeks of treatment with pain in VAS & disability level on Foot function index were assessed & noted.

Statistical Analysis

The statistical analysis carried out is as follows Means and standard deviation of the values were calculated for each variable. The sex ratio of two groups were analyzed by chi square test. Intergroup comparisons between the group were also achieved by unpaired T test was carried out for subjective assessment of data such as VAS score & Foot function index value. Confidence level & P value <0.05 was considered a statistically significant.

Results

Table 1: Patient details

SL. No	Demographic Data	Group A	Group B
1	Age (years)	36.4±10.3	41.5±12.2
2.	Sex	10(f)/5(m)	9(f)/6(m)

Table 2: Change in Pain (VAS)

Group	Pre-Treatment (N=15), Mean ±SD	Post-Treatment (N=15), Mean ±SD	P-Value*
Group A	8.2±0.7	1.9±1	< 0.01
Group B	8.5±0.74	5±1	< 0.01

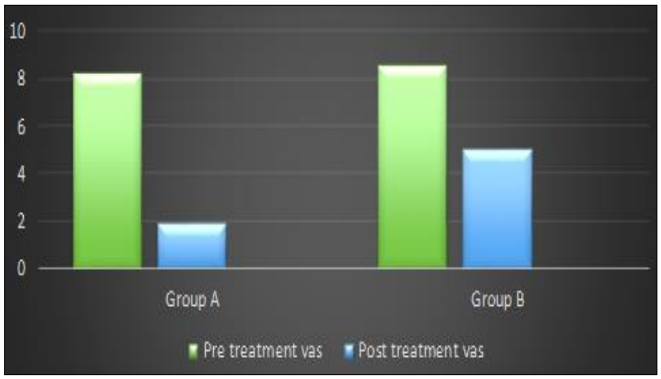

Fig 1: Pre Treatment Vas and Post Treatment Vas

Table 3: Analysis of foot function index

SL. No	Pre-Treatment (N=15), Mean ±SD	Post-Treatment (N=15), Mean ±SD	P-Value*
Group A	149.7±7.2	36±8	< 0.01
Group B	153.5±7.6	86±5	< 0.01

On the 12th day mean VAS score of group A and group B was found to be significant i.e. 1.9 cm for Group A and 5cm for group B (P=<0.01). It is seen there is betterment in pain in group A as compared to group B. The disability level foot function index which was 36for group A and 86 for group B (P=<0.01) which shows improvement in overcoming disability level in group A who were treated by dry needling and UST.

Discussion

This study shows the effect of dry needling with ultrasound to reduce pain and to overcome disability in plantar fasciitis. The main result shows clear difference in decrease in VAS for pain assessment and decrease in foot function index for disability assessment. Both VAS and FFI for both the group is significantly equivalent i.e. P=<0.0.

Dry needling for treating various trigger points have shown

good results in reducing pain, increasing muscular functions. Several studies have shown good results in tender point healing by improving blood flow and causing local vasodilatation [1, 2, 9] Therapeutic ultrasound in pulsed mode has the potential to reduce inflammation and relieve pain [4].
Stretching has a greater improvement in the muscle flexibility. Stretching of plantar fascia gives a windlass mechanism and prevents from microtrauma and inflammation [10].

Conclusion
The present study concludes that there was remarkable significant improvement in both the groups. However, greater improvement was found in the subjects who received dry needling, ultrasound therapy & stretching.

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The authors declare no conflict of interest.

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