EFFECTIVENESS OF ULTRASOUND IN PATIENTS WITH PLANTAR FASCITIS

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ABSTRACT

\textbf{PURPOSE:} Plantar Fascitis (PFS) is the most common type of plantar fascia injury, responsible for 80\% cases for heel pain. Plantar fascitis results in pain in the heel and bottom of the foot.

\textbf{METHODS:} Emerging evidence suggests that comparing other electrotherapy modalities ultrasound for plantar fasciitis may be more effective. The purpose of the present study was to systemically review previously published studies concerning the application of ultrasound to the plantar fascia in patients with PFS.

\textbf{RESULTS:} A literature search was performed for the period 2005 - 2020 using google scholar, Pubmed. The literature review search yielded 132 relevant studies. 6 studies evaluated the effect of different interventions on patients with plantar fasciitis using ultrasound. There were variations among studies in term of methodology used.

\textbf{CONCLUSION:} The results indicates that ultrasound can be considered as reliable for reducing the pain for plantar fasciitis.

\textbf{Keywords:} Plantar fascitis, Plantar fascia, Ultrasound.

I. INTRODUCTION

Plantar Fascitis is one of the most common causes of heel pain. It involves inflammation of the thick band of tissue that runs across the bottom of your foot and connects your heel bone to the toes. Risk factors of plantar fasciitis are people who are obese, tight calf muscles, high arched foot or flat foot. Plantar fasciitis is more prone to person who adequately run, jump or dance and people who stands for long time may cause repetitive stress to the plantar fascia. \textsuperscript{1} 99\% cases of plantar fasciitis is treated by conservative management in a period of time. only1\% of people requires surgery. \textsuperscript{2}

Ultrasound is sound waves with frequencies higher than the upper audible limit of the human hearing. Ultrasound was first published in 1958 by the team Donald in Glasgow first utilized sonography as diagnostic tool for the practice of obstetrics and gynecology. \textsuperscript{3} Ultrasound device operated with frequencies from 20kHz up to several gigahertz. Therapeutic ultrasound raises tissue temperature, metabolism, softens the tissue, increases the blood circulation, increases the chemical activity of the tissues, increases the permeability of the cell membranes and protein production. \textsuperscript{4} Maximum energy absorption in soft tissue occurs from 2 to 5cm.

The purpose of this study to systemically review of the previously published studies to comparing other electrotherapy modalities ultrasound is more effective for the patients with plantar fasciitis with therapeutic interventions and mainly focused on the clinical applications.

II. METHODOLOGY

The study was conducted in accordance with guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-analysis group (PRISMA). Ethical approval was not necessary because all analyses were based on previous published studies.
The electronic databases including PubMed, Cochrane Library Medline, Embase were systematically searched for the literatures between March 2005 and March 2020.

The following search terms were used: ultrasound therapy, plantar fascia, plantarfascitis.

In addition, the reference lists of the resulting publications and reviews were also searched for relevant literature.

The literature search was limited to English.

III. STUDY SELECTION

Inclusion criteria for this study includes

- Middle adulthood female (20-40 years)
- BMI (obese/Overweight)
- Both acute and chronic staged of plantar fascitis
- Nprs > 6
- Onset of plantar heel pain

Exclusion criteria excludes

- Rheumatoid Arthritis
- Malignant disease
- Diabetus Mellitus
- Osteoarthritis
- Infections of foot and ankle

Prisma Diagram 1
### RESULTS

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<tr>
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<tbody>
<tr>
<td>1</td>
<td>Christopher F Hyer 1, Robert Vancourt, Alan Block</td>
<td>Evaluation of Ultrasound-Guided Extracorporeal Shock Wave Therapy (ESWT) in the Treatment of Chronic Plantar Fasciitis</td>
<td>We screened 178 patients and enrolled 166; 160 completed the 15-week protocol. Entry criteria included age at least 18 years with plantar fasciitis, defined as heel pain maximal over the plantar aspect of the foot of at least 6 weeks' duration, and an ultrasound-confirmed lesion, defined as thickening of the origin of the plantar fascia of at least 4 mm, hypoechogenicity, and alterations in the normal fibrillary pattern.</td>
<td>Patients were randomly assigned to receive either ultrasound-guided ESWT given weekly for 3 weeks to a total dose of at least 1000 mJ/mm(2) (n = 81), or identical placebo to a total dose of 6.0 mJ/mm(2) (n = 85).</td>
<td>We found no evidence to support a beneficial effect on pain, function, and quality of life of ultrasound-guided ESWT over placebo in patients with ultrasound-proven plantar fasciitis 6 and 12 weeks following treatment.</td>
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<td>2</td>
<td>Yigal Katzap, Michael Haidukov, Olivier M Berland, Ron Ben Itzhak, Leonid Kalichman</td>
<td>Additive Effect of Therapeutic Ultrasound in the Treatment of Plantar Fasciitis: A Randomized Controlled Trial</td>
<td>In this prospective, randomized, double-blind, placebo-controlled clinical trial, 54 patients with plantar fasciitis, aged 24 to 80 years, who met the inclusion criteria were randomized into an active intervention and a control group.</td>
<td>Individuals in the active intervention group were treated with self-performed stretching of the plantar fascia and calf muscles and with therapeutic ultrasound. Individuals in the control group were treated with the same stretching exercises and sham ultrasound. Both groups received 8 treatments, twice weekly.</td>
<td>The addition of therapeutic ultrasound did not improve the efficacy of conservative treatment for plantar fasciitis. Therefore, the authors recommend excluding therapeutic ultrasound from the treatment of plantar fasciitis and agree with results of previous studies that stretching may be an effective treatment for healing plantar fasciitis.</td>
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<td>3</td>
<td>Bihter Alu1, and Nezire K</td>
<td>A comparison of the acute effects of radial extracorporeal shockwave therapy, ultrasound therapy, and exercise therapy in plantar fasciitis</td>
<td>Eighty-eight female patients were called for the study who applied to our clinic of Physical Medicine and Rehabilitation with heel pain during January 2013 and December 2014 and had heel sensitivity detected by the physical examination with palpation, and</td>
<td>At the beginning, the demographic data of all patients, their pain levels in the morning, at night and after the 6-min walking test, their leg fatigue levels after the 6-min walking test and their general fatigue levels were measured by using the visual analog scale (VAS). Their walking distances were assessed by using the 6-min walking test. Furthermore, the flexor muscle</td>
<td>As a result of our study it was seen that the exercise therapy, and the US therapy and the r-ESWT therapy applied in combination with the exercise therapy were effective methods for moderating pain and improving walking distance, walking speed and functionality.</td>
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<td>had calcaneal spur as seen in feet-lateral grapy and were diagnosed with PF in a single foot</td>
<td>performances of the patients were assessed by using the heel-rise test and their walking speeds were assessed by using the 20-m walking test. These tests were assessed prior to the randomization and at the end of the therapies (4 weeks after the first treatment).</td>
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<td>4</td>
<td>Evelyn Heigh 1, Laura Bohman 2, Gary Briskin 3, Michael Slayton 4, Richard Amodei 5, Keegan Compton 6, Bob Baravarian</td>
<td>Intense Therapeutic Ultrasound for Treatment of Chronic Planar Fasciitis: A Pivotal Study Exploring Efficacy, Safety, and Patient Tolerance</td>
<td>In this single-blinded study, 33 patients received 2 treatments that were 4 weeks apart on plantar fascia tissue along with conservative standard of care.</td>
<td>Patients were followed for up to 6 months after the first treatment, receiving a physical examination and diagnostic ultrasound at each follow-up visit and completing patient-/subject-reported outcome measure and Foot Function Index surveys. The goal was to reduce overall pain by $\geq 25%$ on average and $&gt;25%$ individually</td>
<td>Intense therapeutic ultrasound for chronic plantar fasciitis is shown to be effective, safe, and well tolerated in this pivotal clinical trial.</td>
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<td>5</td>
<td>James Dunning 1 2, Raymond Butts 2 3, Nathan Henry 2 4, Firas Mourad 1 5, Amy Brannon 6, Hector Rodriguez 7, Ian Young 2 8, Jose L Arias-Buría 1, César Fernández-de-Las-Peñas</td>
<td>Electrical Dry Needling as an Adjunct to Exercise, Manual Therapy and Ultrasound for Planar Fasciitis: A Multi-Center Randomized Clinical Trial</td>
<td>One hundred and eleven participants (n = 111) with plantar fasciitis were randomized to receive electrical dry needling, manual therapy, exercise and ultrasound (n = 58) or manual therapy, exercise and ultrasound (n = 53).</td>
<td>The primary outcome was first-step pain in the morning as measured by the Numeric Pain Rating Scale (NPRS). Secondary outcomes included resting foot pain (NPRS), pain during activity (NPRS), the Lower Extremity Functional Scale (LEFS), the Foot Functional Index (FFI), medication intake, and the Global Rating of Change (GROC). The treatment period was 4 weeks with follow-up assessments at 1 week, 4 weeks, and 3 months after the first treatment session. Both groups received 6 sessions of impairment-based manual therapy directed to the lower limb, self-stretching of the plantar fascia and the Achilles tendon, strengthening exercises for the intrinsic muscles of the foot, and therapeutic ultrasound</td>
<td>The inclusion of electrical dry needling into a program of manual therapy, exercise and ultrasound was more effective for improving pain, function and related-disability than the application of manual therapy, exercise and ultrasound alone in individuals with PF at mid-term (3 months).</td>
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<td>6</td>
<td>BihterAkinoglu 1, Nezire Köse 2, Nuray Kirdi 2, Yavuz Yakut</td>
<td>Comparison of the Acute Effect of Radial Shock Wave Therapy and Ultrasound Therapy in the Treatment of Plantar</td>
<td>A total of 54 female patients with unilateral PF were randomly assigned to two study groups and one control group</td>
<td>the first study group received three sessions of r-ESWT treatment and the second study group received seven sessions of US treatment. The Foot Function Index (FFI) and the American Orthopedic Foot and Ankle Association (AOFAS) hind foot score were determined. Static and dynamic</td>
<td>All groups and particularly the r-ESWT and US groups' symptoms were decreased after treatment. However; FFI parameters were reduced more in the US groups than the other two groups, the ankle</td>
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Hence it is concluded that ultrasound therapy is found to be effective in treating patients with plantar fasciitis but further more research is required to know the efficacy of the treatment.

V. DISCUSSION

In this study, a literature review was conducted to evaluate the effect of ultrasound therapy in patients with plantar fasciitis. Overall, the analysis suggested that ultrasound therapy is a reliable source of treatment for patients with plantar fasciitis. As there were only 6 studies included in this study and there are still further more studies that has controversial cases about ultrasound therapy in reducing pain in patients with plantar fasciitis. We require further more research on efficacy of ultrasound therapy in treating plantar fasciitis. Ultrasound therapy also proved effective in motor nerve conduction velocity of the ulnar nerve.\(^1\)

Some articles concludes saying intense ultrasound therapy is proved to be effective when used as a combination with exercise therapy in treating plantar fasciitis.

This literature review has some limitations. First, only 6 studies were included, and sample size was relatively small.

REFERENCES

10. Sujatha, K., Durairajasingh, V., Silambarasan, K."Determination of some heavy metals in fish, water and sediments from bay of Bengal."Pollution Research, 2016, 35(4), pp. 797–799

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<td>Fasciitis: A Randomized Controlled Study</td>
<td>equilibrium were evaluated with the single leg standing test and the functional reach test. Ankle proprioception sense was determined with the Biodex III isokinetic device. Patients were evaluated before and four weeks after the first treatment.</td>
<td>propproprioception sense increased in the r-ESWT group, and there was no change in the other groups.</td>
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