A critical appraisal of "Magnetic Resonance Imaging and Clinical Outcomes of Laser Therapy, Ultrasound Therapy, and Extracorporeal Shock Wave Therapy for Treatment of Plantar Fasciitis: A Randomized Controlled Trial"

By

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Abstract

The article provides bias reduced and well-analyzed data over the efficacy for therapy modalities of extracorporeal shock wave therapy (ESWT), low-level laser therapy (LLLT), and therapeutic ultrasound (US) therapy for participants with plantar fasciitis pathology. Since plantar fasciitis is a common foot pathology in the clinical setting, dependable research of effective treatment possibilities for the condition is valuable for the practicing physical therapist. The authors excelled at reducing bias by structuring their study to be single-blinded, requiring all subjects in the study to undergo baseline comparative diagnostic tests, setting inclusion and exclusion criteria, and treating each group impartially. With their findings being reflective of their conclusions, the authors found all three treatments to be beneficial.

Although some supporting literature (referenced in the article) seemed of lower quality, the author's main purpose for conducting the study is for lack of conclusive information about the treatment modalities themselves. Faults of the article include, but are not limited to, the small rate of attrition in the study, shorter follow-up period, limited sample size, and no control group (due to ethical reasons). Even though a placebo group was not tested, the article is classified as a randomized controlled trial due to the structure of the study. Although the study shows faults, the overall significance of this research article is dependable. This study is a reliable reference for health care professionals to use when developing a plan of care for the common foot pathology known as plantar fasciitis.

Keywords: plantar fasciitis, ultrasound therapy, laser therapy, extracorporeal shock wave therapy

Introduction

Plantar fasciitis is a common pathology in patients with foot or ankle pain and consequently, a common pathology seen in the field of physical therapy. This condition impacts a wide array of individuals in the general population; however, treatment modalities for plantar fasciitis are various and somewhat inconclusive of their efficacy. Due to the uncertainty of treatments, I became intrigued to seek high-quality research on effective treatment techniques for the condition. Specifically, would incorporating ultrasound therapy benefit a patient's ability to better function due to decreased pain.

Methods

When searching for potential articles to help answer my clinical question, I used the Cumulative Index of Nursing and Allied Health Literature (CINAHL) Complete through Angelo State University's database. Keywords beneficial to my search were plantar fasciitis, plantar heel pain, ultrasound therapy, and ultrasound treatment. Limits that were placed while searching included, language (must be English), publication date (current and relevant), and the previously mentioned keywords. Preference was given to full text and academic journals in order to assess the quality of the article through its full text and the reputation of the academic journal. The intervention required was ultrasound therapy as a specific key point in my question; however, no exclusions were placed on my search. After 523 hits my article preference was based on relevance to my clinical question, bias level, and the highest quality of evidence in the article.

My article of choice was published in 2017 in the Journal of Foot and Ankle Surgery. Authors Aslihan Ulusoy, MD, Lale Cerrahoglu, MD, and Sebnem Orguc, MD performed their research and published in Turkey. Ulusoy is a Physiatrist and also works in the Department of Physical Medicine and Rehabilitation at Celal Bayar University Medical School in Manisa, Turkey. All subjects in the study underwent baseline comparative diagnostic tests. Also,

investigators compared results from the index tests (VAS, AOFAS, RMS, HTI) to a gold standard test (MRI). Additionally, the research quality of this article is supported due to the investigators being blinded and unaware of the treatment groups. I find the research to be beneficial and with limited bias due to these three factors.

Results

Summary of the study

Plantar fasciitis is a common cause of foot pain in patients with a multifactorial etiology. Treatment of plantar fasciitis includes various methods such as anti-inflammatory drugs, orthotic insoles, stretching, ESWT, LLLT, and US therapy. The current study compares the effectiveness of ESWT, LLLT, and US treatment methods in 60 patients with chronic plantar fasciitis. All patients were randomly divided into three groups and received one of the three treatment methods. Each patient underwent analysis using the visual analog scale (VAS) for heel pain which included measurements for pain in daily activities, first steps in the morning and during exercise. Other analyses used were foot functionality using the American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale, Roles–Maudsley score (RMS), the sensitivity of the heel using the heel tenderness index (HTI), and MRI imaging before and after 1 month of their perspective treatment. The trial design was randomized, prospective, and blind with the investigators kept unaware of the treatment groups. The success of treatment was found primarily in LLLT (70.6%) and ESWT (65%) and then in US therapy (23.5%). Treatment effectiveness was determined by the percentage of decrease in heel pain (>60%) from baseline to 1 month after treatment for greater than or equal to 2 of the 3 heel pain VAS measurements. Patients showed significant improvements through the mean VAS, AOFAS scale, and HTI scores for each group as well as a reduction in plantar fascia thickness through MRI imaging.

The study reveals improvement results in all three categories of treatment for reduction of pain; however, ESWT and LLLT were found to be more effective than US therapy for function.

Appraisal of the study introduction

The author rationalized their introduction statements by literature to comprehensively explain extensive lists of causes, symptoms, and typical treatments for various degrees of plantar fasciitis. The conclusion from the literature review explained even though LLLT and ESWT are becoming more popular forms of treatment for plantar fasciitis, evidence on the treatment's efficacy isn't well supported. The author's specific purpose and intent with the current study is to measure LLLT, ESWT, and US therapy effectiveness in patients with chronic plantar fasciitis.

The opening statement explained plantar fasciitis as a common diagnosis of foot and ankle pain, but not what the condition is nor what the function of plantar fascia is in the foot. Also, several articles used for literature references raised question as to the validity of the article's literature reference credibility. The mentioned articles implied possibility of bias, some written in a foreign language, out of date, and no weblink association with the article at hand.

Appraisal of the study methods

The article's research design is a randomized controlled trial (RCT) with 3 different experimental groups and no control, which is considered an RTC due to the structure of the study. The direction of this study is prospective, the duration is longitudinal, and the design analyzes subjects between the groups as well as within a group. Each subject's group assignment and treatment methods are concealed from the investigators. Although the subjects in the groups were not blinded to their treatment, their investigators were, reducing overall bias. Inclusion and exclusion criteria also reduced skewed results for their findings because each participant's trauma was of similar intensity. Each group was tested and treated the same, except for the treatment interventions, which reduces bias as well. Treatment interventions were described by the authors in such a manner that future studies or qualified

therapists could replicate the intervention easily, given they had the proper equipment. Statistical analyses were conducted with SPSS for Windows, the Wilcoxon, McNear, Kruskal-Wallis, Crosstab Chi-Square, Mann-Whitney U, and Pearson correlation test; all appropriately utilized for the specific analysis being measured.

Sixty patients were recruited for the study; however, two withdrew during the treatment period, four were unable to complete the follow-up examination, and two refused the follow-up MRI (due to improved symptoms). The article did not mention why the participants withdrew from the study; however, any attrition raises cause for concern about the study. Another fault in the article's methods is the study only provides references to support one out of five outcome measurements. Furthermore, the outcome measures were mentioned but not explained how to administer nor the significance of the tools. Based off the information given in the article, one would not be able to replicate the test accurately, simply because the authors failed to include the details of their data collection strategies.

Appraisal of the study results

Each question presented was addressed with findings and the authors reported outcome measures presented in the methods. Statistically significant results included pre and post values (from all 3 groups) with the VAS score and the AOFAS score. The primary measure of efficacy was determined by a decrease in heel pain greater than or equal to 60% for 2 of the 3 heel pain VAS measurements. The authors found significant findings in each category and considered a p-value of less than .05 statistically significant. VAS, US, AOFAS, and RMS, found improvement amongst all three groups with HTI finding ESWT being more effective than US therapy. The authors made connections through the MRI measurement, finding greater pain scores associated with persistent soft tissue edema and increased fascial thickness. Based on my current knowledge, the results seem to be clinically meaningful. Each test results before and after changed significantly for each therapy, showing, of course, ESWT and LLLT to be more effective than US therapy.

Although I do believe the findings to be significant, the presentation of the results should be presented in a clearer manner. Since the researchers used various testing procedures, the findings of each test were hard to track. It was a challenge to interpret the information, especially with Table 2 and Table 7 because reference ranges were not provided, creating questions on whether or not the numbers were beneficial. Other faults were that the article does not include a confidence interval and the authors did not mention any minimal clinically important difference or a number needed to treat.

Appraisal of the study discussion

The authors referenced previous studies for the effectiveness of each treatment tested in their study. In the references, they mentioned how their outcomes were different as well as the possible reasons for the different results. Their conclusions were reflective of the results and indicated meaning with the discussion section being that each treatment assessed would be effective in the clinical field.

Although the authors linked literature references to existing findings, the literature references were either out of date, not in English, not accessible, or non-conclusive, which stands to reason as to why the authors decided to initiate the study in the first place. Limitations of this study are recognized by the authors included, the short follow-up period, the limited sample size, as well as no control group (due to ethical reasons). Another limitation mentioned was the costly expense while using the MRI as a measurement tool. Although, worth the investment, not many studies would have such a budget for this measurement. Additionally, the authors failed to mention any future studies, which is a concern considering the past literature results were inconclusive as a whole.

Discussion

This study and its findings provide dependable data and references for effective treatment modalities for plantar fasciitis, a pathology with seemingly inconclusive treatment interventions. The article answers my clinical question by providing scientific evidence showing US therapy for plantar fasciitis is not as effective as other forms of treatment such as LLLT and ESWT in

terms of pain and functionality. The information gained from this article helps my classmates and me in our future profession with foot pain/plantar fasciitis cases in providing a more effective and evidence-based treatment plan for our patients.

With confidence, I support ESWT and LLLT therapy as an effective treatment intervention for plantar fasciitis. Based on the findings of the current study, each group's pain and functionality improved the most with these two treatment modalities. ESWT and LLLT benefit patients by providing pain relief and function of their foot without the need of undergoing surgery. Potential risks involved with the treatment interventions are the unknown long-term effects. My argument could be strengthened if the study included the reoccurrence rate of the condition and/or the long-term effects for each modality. Although the long-term effects are unknown, the effectiveness of the treatments outweigh the unmentioned lasting effects. Any degree of relief and improved functionality is hard to come by with this disabling condition and it would be unethical to not provide proven effective relief to patients.

I have enough confidence in the quality of research provided in the current study to use ESWT or LLLT with future patients. The research design and execution provides a stable foundation for dependable results. In overview, limitations mentioned in the study are minor when considering the audience the article is targeting. For example, most healthcare professionals have a foundational background in pathology and most likely know what plantar fascia is. Since LLLT and ESWT are common methods of treatment for various other physical conditions, many clinics readily have the means to provide equipment as well as clinicians having the skills to administer the intervention safely.

In conclusion, I have confidence in supporting ESWT and LLLT as a form of treatment for plantar fasciitis patients. Although the current study has limitations, I consider the benefits of ESWT and LLLT treatment to outweigh the limitations mentioned. The authors provided a well-

conducted study with minimized bias and dependable results. Plantar fasciitis is a debilitating pathology leaving patients with hopelessness of recovery. The current study provides evidence of hope for those patients. Due to the results found, I would recommend this article and the treatments tested to any physical therapist in search of an effective treatment for plantar fasciitis.