

# The Efficacy of Radial Shockwave Therapy in the Treatment of Leg, Foot and Ankle Conditions: A Retrospective Analysis

Gary M. Gordon, DPM; Alicia A. Canzanese, DPM, ATC; Farhad Foroudi, DPM, PGY1

## Introduction:

- The purpose of this study is to evaluate the efficacy of radial shockwave therapy in the treatment of leg, foot, and ankle conditions.
- Extracorporeal Shockwave therapy (ESWT) was first described for application in medicine as early as 1947 and in 1987 was noted to be first used orthopedically.
- Radial shockwave therapy (RSWT), a type of ESWT, has gained popularity as a tool in the management of sports related conditions and tendinopathies with promising results despite debate in the medical literature
- ESWT utilizes ballistically generated waves to transform kinetic energy to expanding waves which is believed to cause an interstitial and extracellular response leading to tissue regeneration with acoustic signals contributing to a biological cascade leading to cell proliferation and thus healing.
- ESWT noted in many studies to have little to no adverse side effects

## Methods:

- This study retrospectively analyzed a group of 75 participants who underwent outpatient RSWT between 2012-2015.
- Primary pathologies being treated and included were pain about the 1st MTPJ, plantar fasciitis, Achilles tendinitis, and medial tibial stress syndrome.
- Inclusion Criteria: patients who had previously failed at least one form of conservative treatment including stretching, icing, taping, orthotics, shoe modifications, rest, immobilization, injections, and physical therapy.
- Exclusion criteria: patients with knee or hamstring pain, stress fractures, active infections, or an active malignancy
- All patients underwent a total of at least 3 treatments with 1-2 weeks between treatment sessions. Patients started at 1.6 bars and increased to patient tolerance up to and ending at 5.0 bars for a total of 2500-3000 pulses at 11 Hz
- The patients responded to a survey that included:

- Location of pain
- VAS before and after treatment
- Duration of Symptoms
- Time to relief of symptoms
- Satisfaction

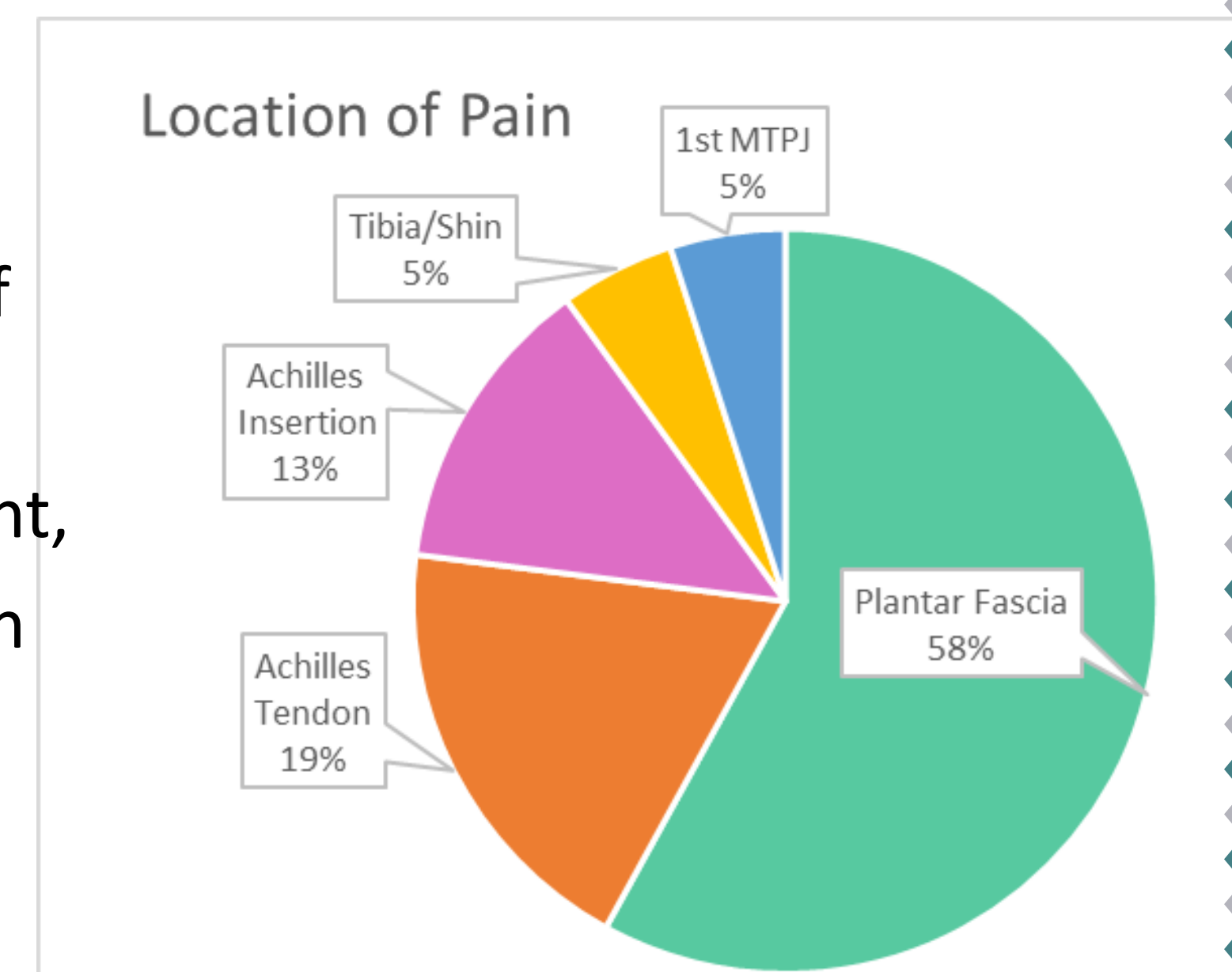


## Hypothesis:

- It is hypothesized that patients undergoing RSWT will experience a reduction in pain of greater than 50% based on VAS within 2 months of initiating RSWT and that this will be correlated with patient satisfaction.

## Results:

- Overall, pain using Visual Analog Scores improved from an average of 7.08 to 2.71 with 84% reporting a pain scale of 5 or less after treatment, 79.4% reported improvement within 2 months or less, and 86.7% stated they were satisfied or somewhat satisfied with the results



Location of Pain	Avg. Pain Before Treatment (VAS)	Avg. Pain After Treatment (VAS)	Percent Satisfied	% Somewhat Satisfied	Percent Not Satisfied
Plantar Fascia	7.23	2.23	65.1%	25.6%	9.3%
Achilles Tendon	6.07	2.79	78.6%	21.4%	0%
Achilles Insertion	6.6	3.7	40%	20%	40%
1st MTPJ	7.25	4	50%	0%	50%
Tibia/Shin	6.25	2.25	100%	0%	0%

Reported Time it Took for Pain to Lessen	Number of Participants (%)
Less than 1 Months	32 (43.8%)
1-2 Months	26 (35.6%)
Greater than 2 Months	15 (20.6%)

- **Plantar Fasciitis Group:** There is focus on this group given the larger sample size (43 of 75 subjects)
  - VAS Pre-RSWT: Range 4-10, Mean 7.23, Median 8, Mode 8
  - VAS Post-RSWT: Range 0-8, Mean 2.23, Median 2, Mode 0
  - 16 (37.2%) participants Post VAS=0, 32 (74.4%) under 5
  - Time to relief of pain: 18 (41.9%) <1month, 16 (32.7%) 1-2months

**Sources:** 1) Gerdesmeyer L and Weil LS. Extracorporeal Shockwave Therapy. Towson, MD: Data Trace Publishing Company, 2007. Print. 2) Wang, Ching-Jen. "Extracorporeal Shockwave Therapy in Musculoskeletal disorders." Journal of Orthopaedic Surgery and Research. 2012, 7:11. 3) Visco, Vincenzo, et al. "Experimental studies on the biological effects of extracorporeal shock wave therapy on tendon models. A review of the literature." Muscles, Ligaments and Tendons Journal. 2014; 4(3): 357-361. 4) Notamicola, Angela and Moretti, Biagio. "The biological effects of extracorporeal shock wave therapy (eswt) on tendon tissue." Muscles, Ligaments Tendons J. 2012 Jan-Mar; 2(1): 33-37. 5) Bicer M, et al. "Assessment of the Efficacy of Extracorporeal Shockwave Therapy for Plantar Fasciitis with Magnetic Resonance Imaging Findings." JAPMA. 2018; 108(2): 100-104. 6) Purcell RL, et al. "Clinical Outcomes After Extracorporeal Shock Wave Therapy for Chronic Plantar Fasciitis in a predominantly Active Duty Population." JFAS. 2017 7) Saxena A, et al. "Treatment of Plantar Fasciitis With Radial Sound-wave "Early" Is Better Than After 6 Months: A Pilot Study." JFAS. 56 (2017) 950-953. 8) Wheeler PC, Tattersall, C. "Extracorporeal Shock-wave Therapy Plus Rehabilitation for Patients With Chronic Plantar Fasciitis Might Reduce Pain and Improve Function but Still Not Lead to Increased Activity: A Case-Series Study With Multiple Outcome Measures." JFAS. 57 (2018) 339-345. 9) Additional Contributors to the research paper/methods: Ira Meyers, DPM; Jessica Inthavongxay, DPM

## Discussion:

- Plantar fasciitis and Achilles tendonitis appear to be the most often evaluated conditions for ESWT treatment in the literature given the potential challenge of treating these condition when they become chronic.
- This study is significant in that it showed a significant decrease in VAS with a high degree of patient satisfaction of the plantar fasciitis and Achilles tendonitis groups following treatment. These results are consistent with multiple recent studies such as by Wheeler et al. and Bicer et al. which also showed statistically significant decreases in VAS in patients with plantar fasciitis.
- Non-insertional Achilles tendonitis showed better outcomes than insertional Achilles tendonitis in this study. While the reason is unclear, it is hypothesized by the authors of this study that this could be due in part to the inability of some patients to tolerate a high enough intensity of treatment for it to be effective given the superficial nature of the insertion and osseous structures. However, this theory is refuted in that Shin patients report relief, but in this study care was taken to avoid direct osseous contact during Shin treatment.
- A recent pilot study by Saxena et al. compared VAS scores in treatment of plantar fasciitis in subjects with acute (<3 months) with chronic (>6 months) subjects. Although the scores in the early group were better than the chronic, there was no statistical significance between the two. The best time to initiate shockwave therapy is still up to debate which is relevant as our study involved subacute and chronic individuals but chronicity was not a separate variable.
- Many of the subjects in this study were recreational to elite athletes. Purcell et al. recently studied the treatment of chronic plantar fasciitis in the physically active military population. This study showed better patient rated outcomes in active versus non active individuals.

## Conclusions:

- This study shows that RSWT can be used as an effective tool in the treatment of certain lower extremity conditions
- In regards to plantar fasciitis and proximal Achilles tendinopathy, RSWT was shown to have a significant impact on the reduction of pain
- Proximal Achilles tendinopathy appears to have more consistent results than insertional tendinopathy with RSWT
- Due to small subject size in the 1st MTPJ and tibial treatment groups it is difficult to draw conclusions; however, overall results show that this modality can be considered as a viable treatment adjunct for the lower limb, although further research on parameters is needed.

## Limitations:

- Inherent limitations due to the retrospective nature
- Small sample size, especially in the 1st MTPJ and Tibia/Shin groups
- Lack of differentiation between acute and chronic conditions
- Lack of control over extrinsic variables during treatment course