

Extracorporeal Shock Wave Treatment and Multimodal Pain Management for Tarsal Tunnel Syndrome Associated with Plantar Fasciitis

Ricardo Kobayashi¹

Abstract

Introduction: Plantar fasciitis (PF) is an important cause of musculoskeletal pain and radial pressure waves (RPWs) can be used for patients not improving after 3 months of other non-operative measures. However, in refractory cases of PT, it is imperative to investigate possible differential diagnoses and one of its important differential diagnoses is tarsal tunnel syndrome (TTS). TTS is a rare but important condition which is regularly under diagnosed leading to a range of symptoms affecting the plantar aspect of the foot typically associated with a neuropathic pain pattern.

Case Report: We report a case of PF with TTS and associated neuropathic components. At first, nortriptyline 50 mg and 5% lidocaine patch were used, which improved the neuropathic pattern. After that, three RPW sessions were conducted at weekly intervals, with energy between 2 and 3 bars, frequency between 5 and 7 hertz. In addition to the area of greatest pain in the plantar fascia, treatment was also applied to the myofascial trigger points of the triceps surae and posterior tibial muscles. Three months after the last RPW session, the patient reported a 90% improvement in pain intensity, without limitations in daily activities.

Conclusion: This case highlights the importance of differential diagnoses of PF, especially before the indication of RPW in refractory cases. In addition to the neuropathic pattern associated with TTS, neuropathic pain associated with tendinopathies of the lower limbs is common (1/4 of cases) and needs to be identified and treated in conjunction with tendinopathy for a more effective result.

Keywords: Chronic pain, Plantar fasciitis, Tarsal tunnel syndrome, Mixed pain, Neuropathic pain, Shockwaves

Introduction

Plantar fasciitis (PF) manifests as posterior foot pain or heel pain that occurs along the calcaneus to the digits of the foot. The prevalence of PF in the general population is approximately 3.6–7%; however, PF accounts for 8% of all running-related injuries. A high body mass index and limited dorsiflexion are the most common risk factors for developing PF. The first-step pain and pain during weight-bearing activities are the main symptoms, PF is a clinical diagnosis [1].

Lower limb tendinopathy conditions are common causes of chronic musculoskeletal pain presenting to primary and secondary care. While many of these will improve over 12 months, about 10–35% of patients can be left with ongoing symptoms that can have a

significant impact on quality of life. Central sensitization could play an important role in the pathophysiology of these pathologies [1, 2]. Although subject to clinical debate, the “central sensitization syndrome” is postulated as a condition in which the central nervous system has become hypersensitive to both noxious and non-noxious stimuli with dysfunction of both ascending and descending pathways [1, 2].

The underlying pathology of tendinopathies has been extensively studied over many years, with hypotheses moving away from a primarily inflammation-driven pathology (aka “tendinitis”) to a degenerative/mechanical “failed-healing” model; however, recent studies have shown that inflammatory processes remain involved within the entity of “tendinopathy,”

particularly in the early stages. A wide range of treatment options are available to treat these conditions, which conceptually address nociceptive pain as well as functional impairment. Depending on the tendon location, these may include tension night splints, guided injections - including high-volume image-guided injections or autologous blood injections, extracorporeal shockwave therapy, or surgery in recalcitrant cases [1, 2].

One of the important differential diagnoses: in cases of heel pain is tarsal tunnel syndrome (TTS). TTS is an entrapment neuropathy of the posterior tibial nerve or its branches (medial plantar, lateral plantar and calcaneal nerves) within its fibro-osseous tunnel beneath the flexor retinaculum on the medial side of the ankle. It is a rare but important

¹Department of Neurology, Pain Center, University of São Paulo, Brazil.

Address of Correspondence

Dr. Ricardo Kobayashi,
Department of Neurology, Pain Center, University of São Paulo, Brazil.
E-mail: koba@globo.com



Dr. Ricardo Kobayashi

Submitted Date: 22 Mar 2024, Review Date: 21 April 2024, Accepted Date: 03 Jun 2024 & Published: 30 June 2024

© 2024 by Journal of Regenerative Science | Available on www.jrsonweb.com | DOI:10.13107/jrs.2024.v04.i01.133

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License (<https://creativecommons.org/licenses/by-nc-sa/4.0/>), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

DN4 Questionnaire

Please complete this questionnaire by ticking one answer for each item in the 4 questions below:

INTERVIEW OF THE PATIENT

Question 1: Does the pain have one or more of the following characteristics?

1 - Burning 2 - Painful cold 3 - Electric Shocks	<table border="1" style="margin: 0 auto;"> <tr><td style="padding: 2px;">yes</td><td style="padding: 2px;">no</td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> </table>	yes	no				
yes	no						

Question 2: Is the pain associated with one or more of the following symptoms in the same area?

4 - Tingling 5 - Pins and Needles 6 - Numbness 7 - Itching	<table border="1" style="margin: 0 auto;"> <tr><td style="padding: 2px;">yes</td><td style="padding: 2px;">no</td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> </table>	yes	no				
yes	no						

EXAMINATION OF THE PATIENT

Question 3: Is the pain located in an area where the physical examination may reveal one or more of the following characteristics?

8 - Hypoesthesia to touch 9 - Hypoesthesia to prick	<table border="1" style="margin: 0 auto;"> <tr><td style="padding: 2px;">yes</td><td style="padding: 2px;">no</td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> </table>	yes	no				
yes	no						

Question 4: In the painful area, can the pain be caused or increased by:

10 - Brushing	<table border="1" style="margin: 0 auto;"> <tr><td style="padding: 2px;">yes</td><td style="padding: 2px;">no</td></tr> <tr><td style="padding: 2px;"> </td><td style="padding: 2px;"> </td></tr> </table>	yes	no		
yes	no				

Figure 1: Douleur neuropathique 4 questionnaire. Each positive item is equivalent to 1.

A 42-year-old patient, previously diagnosed by another physician with chronic and refractory PF, was referred for radial pressure wave (RPW) treatment. The complaint had been present for 7 months and started after spending more time barefoot at home due to increased work from home. The pain was in the medial plantar region of the left heel. Initially, the aggravating factors included the first step in the morning, walking

Neurological examination revealed a positive Tinel's sign and decreased tactile sensation in the medial retromaleolar region, suggesting possible neuropathic pain. point, and a score equal to or >4 is indicative of neuropathic pain [6,7].

Complementary exams

MRI of the foot demonstrated plantar fasciopathy and posterior tibial tendon tendinopathy, with neural compression in the tarsal tunnel region.

Therapeutic intervention

The diagnosis of TTS with a neuropathic pattern led to the indication of medications for neuropathic pain. A 5% lidocaine patch was prescribed for the localized neuropathic pain area, to be used for 12 h daily, along with amitriptyline 12.5 mg, 3 h before bedtime for 1 week, increasing to 25 mg in the 2nd week.

After 1 month, the patient had a partial improvement of 20%. It was suggested to continue the lidocaine patch and increase the amitriptyline dose to 37.5 mg for 1 week and then to 50 mg if side effects were tolerable. In the 2nd month of treatment, the patient had a 30% improvement. However, drowsiness from the medication affected adherence, leading to a switch to nortriptyline 50 mg to try to reduce side effects. After 3 months of treatment, the patient showed significant improvement (>50%) in the neuropathic pain pattern but continued to experience pain during the first step of the day and long walks. Treatment with nortriptyline 50 mg and a 5% lidocaine patch for 3 months resulted in pain and function improvement. It was considered that pain related to PF was the main current source of pain and disability, leading to the indication of RPW treatment.

Three RPW sessions were conducted at weekly intervals, with device pressure between 2 and 3 Bar and a frequency between 5 and 7 Hertz. In addition to the area of greatest pain in the plantar fascia, treatment was also applied to the myofascial trigger points of the triceps surae and posterior tibial muscles.

Outcomes

Three months after the last RPW session, the patient reported a 90% improvement in pain intensity, without limitations in daily

condition which is regularly underdiagnosed leading to a range of symptoms affecting the plantar aspect of the foot. Accurate diagnosis can be difficult as symptoms are like those associated with other lower limb conditions. The diagnosis of TTS is made by history and examination - not by nerve conduction studies. Surgical intervention is considered after a failed course of non-operative treatment and where a definite point of entrapment is found [3]. Nociceptive pain is more common in these cases of PF; however, some studies indicate that around a quarter of cases may have associated neuropathic pain, configuring a mixed pain pattern. However, TTS usually presents with a neuropathic pattern [2, 4, 5]. The objective of this article is to show the importance of differential diagnoses of PF and the importance of treating different types of pain for therapeutic success.

Case Report

barefoot, long walks, and playing tennis, which led him to stop playing the sport. As the condition progressed, the patient reported a change in the pain pattern with the appearance of electric shock sensations, tingling, and numbness.

The intensity of the pain at the worst moments reached a score of 10 according to the visual numerical scale and remained at 4 when it was less intense. Previous treatment included non-steroidal anti-inflammatory drugs, ice, and physical therapy, with no significant improvement (<30%).

The "Douleur Neuropathique 4 Questionnaire" for neuropathic pain [6,7] screening was administered, with a positive result (Fig. 1).

Physical examination

On physical examination, the patient presented with flexible flat-valgus feet and tenderness on palpation of the plantar fascia, partially reproducing his symptoms.

activities, and was able to resume playing tennis, which was his primary treatment goal. The intensity of pain in the worst moments reached a score of 2 according to the visual numerical scale and remained at 0 most of the time.

Discussion

Systematic reviews and meta-analysis concluded that patients with chronic PF will be treated more effectively by RPW without a local anesthetic than with a placebo.[1,8,9]. Moreover, recommend RPW to be used for patients not improving after 3 months of other non-operative measures [1,8,9]. Identifying the patterns of nociceptive and

neuropathic pain is essential because the treatment for each pain pattern is distinct. In this case, the decision was made to first treat the neuropathic pain pattern with first-line medications and then treat the PF with RPW. The combination of different treatment modalities, following the concept of multimodal treatment, was crucial for the success of the treatment [5-7,10-12].

A point for reflection is whether the use of these medications before RPW can optimize the result even in cases of pain without a neuropathic component, given that evidence shows that the use of tricyclic and dual antidepressants improves chronic pain even in patients without associated mood

disorders. However, studies are needed to confirm or refute this hypothesis that medications for chronic pain associated with RPW can optimize treatment outcomes [13].

Conclusion

This case highlights the importance of differential diagnoses of PF, especially before the indication of RPW in refractory cases. In addition to the neuropathic pattern associated with TTS, neuropathic pain associated with tendinopathies of the lower limbs is common (1/4 of cases) and needs to be identified and treated in conjunction with tendinopathy for a more effective result.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflicts of Interest: Nil. **Source of Support:** None.

References

1. Charles R, Fang L, Zhu R, Wang J. The effectiveness of shockwave therapy on patellar tendinopathy, Achilles tendinopathy, and plantar fasciitis: a systematic review and meta-analysis. *Front Immunol.* 2023 Aug 16;14:1193835. doi: 10.3389/fimmu.2023.1193835. PMID: 37662911; PMCID: PMC10468604.
2. Wheeler PC. Up to a quarter of patients with certain chronic recalcitrant tendinopathies may have central sensitisation: a prospective cohort of more than 300 patients. *Br J Pain.* 2019 Aug;13(3):137-144. doi: 10.1177/2049463718800352. Epub 2018 Sep 21. PMID: 31308939; PMCID: PMC6613072.
3. Ahmad M, Tsang K, Mackenney PJ, Adedapo AO. Tarsal tunnel syndrome: A literature review. *Foot Ankle Surg.* 2012 Sep;18(3):149-52. doi: 10.1016/j.fas.2011.10.007. Epub 2011 Dec 21. PMID: 22857954.
4. Wheeler PC. Neuropathic pain may be common in chronic lower limb tendinopathy: a prospective cohort study. *Br J Pain.* 2017 Feb;11(1):16-22. doi: 10.1177/2049463716680560. Epub 2016 Nov 24. PMID: 28386400; PMCID: PMC5370628.
5. Camargo LS, Kobayashi R. Case report: Extracorporeal shock wave treatment in plantar fasciitis with an associated neuropathic component. How to optimize the result? *J Regen Sci* 2022;2:21-3.
6. Bouhassira D, Attal N, Alchaar H, Boureau F, Brochet B, Bruxelle J, Cunin G, Fermanian J, Ginies P, Grun-Overdyking A, Jafari-Schluep H, Lantéri-Minet M, Laurent B, Mick G, Serrie A, Valade D, Vicaut E. Comparison of pain syndromes associated with nervous or somatic lesions and development of a new neuropathic pain diagnostic questionnaire (Dn4). *Pain.* 2005 Mar;114(1-2):29-36. doi: 10.1016/j.pain.2004.12.010. Epub 2005 Jan 26. PMID: 15733628.
7. Santos JG, Brito JO, de Andrade DC, Kaziyama VM, Ferreira KA, Souza I, et al. Translation to Portuguese and validation of the Douleur Neuropathique 4 questionnaire. *J Pain.* 2010 May;11(5):484-90. doi: 10.1016/j.jpain.2009.09.014. Epub 2009 Dec 16. PMID: 20015708.
8. Aqil A, Siddiqui MR, Solan M, Redfern DJ, Gulati V, Cobb JP. Extracorporeal shock wave therapy is effective in treating chronic plantar fasciitis: a meta-analysis of RCTs. *Clin Orthop Relat Res.* 2013 Nov;471(11):3645-52. doi: 10.1007/s11999-013-3132-2. Epub 2013 Jun 28. PMID: 23813184; PMCID: PMC3792262.
9. Sun J, Gao F, Wang Y, Sun W, Jiang B, Li Z. Extracorporeal shock wave therapy is effective in treating chronic plantar fasciitis: A meta-analysis of RCTs. *Medicine (Baltimore).* 2017 Apr;96(15):e6621. doi: 10.1097/MD.0000000000006621. PMID: 28403111; PMCID: PMC5403108.
10. Colloca L, Ludman T, Bouhassira D, Baron R, Dickenson AH, Yarnitsky D et al. Neuropathic pain. *Nat Rev Dis Primers.* 2017 Feb 16;3:17002. doi: 10.1038/nrdp.2017.2. PMID: 28205574; PMCID: PMC5371025.
11. Attal N, Cruccu G, Baron R, Haanpää M, Hansson P, Jensen TS, Nurmiikko T. EFNS guidelines on the pharmacological treatment of neuropathic pain: 2010 revision. *Eur J Neurol.* 2010 Sep;17(9):1113-e88. doi: 10.1111/j.1468-1331.2010.02999.x. Epub 2010 Apr 9. PMID: 20402746.
12. Finnerup NB, Attal N, Haroutounian S, McNicol E, Baron R, Dworkin RH, et al. Pharmacotherapy for neuropathic pain in adults: a systematic review and meta-analysis. *Lancet Neurol.* 2015 Feb;14(2):162-73. doi: 10.1016/S1474-4422(14)70251-0. Epub 2015 Jan 7. PMID: 25575710; PMCID: PMC4493167.
13. Finnerup NB. *Nonnarcotic Methods of Pain Management.*

N Engl J Med. 2019 Jun 20;380(25):2440-2448. doi:
10.1056/NEJMra1807061. PMID: 31216399.

Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Kobayashi R | Extracorporeal Shock Wave Treatment and Multimodal Pain Management for Tarsal Tunnel Syndrome Associated with Plantar Fasciitis | Journal of Regenerative Science | Jan-Jun 2024; 4(1): 31-34.