



Plasma radio frequency overmatches extracorporeal shock wave with local anesthetic for treatment patients with intractable plantar fasciitis

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Abstract: Purpose: To compare the effect of plasma radio frequency (PRF) with local anaesthesia and extracorporeal shock wave therapy (ESWT) for treatment intractable plantar fasciitis. **Methods:** From March 2006 to February 2010, 68 patients with hemi-intractable proximalis plantar fasciitis were received due to they received invalid inert conservative therapy. All cases received PRF with local anaesthesia or ESWT. Preoperative intention-to-treat were did, and the effect at preoperative and postoperative 12 months were estimated by VAS ankle metapodium grades (AOFAS,USA). **Results:** The results shown that 68 (100%) patients could receive directly ESWT, 16 patients (23.5%) could receive directly the treatment of PRF with local anaesthesia, 10 (14.7%) patients could receive the treatment of PRF with local anaesthesia after invalid extracorporeal shock wave remedy. The follow-up were achieved in 46 patients. In 1 year postoperatively, VAS grade decreased to 1.9 ± 1.2 from preoperative 5.4 ± 1.1 in ESWT group, AOFAS ankle metapodium grade was raised to 80.7 ± 11.2 from preoperative 50.3 ± 13.5 in 1 year postoperatively, there was a significant differences ($P < 0.05$). Compared with ESWT group, scores after treatment was higher in PRF with local anaesthesia group ($P < 0.05$). **Conclusions:** Both PRF with local anaesthesia and ESWT can treat intractable proximalis plantar fasciitis, while the treatment of PRF with local anaesthesia is more better in curative effect.

[Min Wei, Yujie Liu, Zhongli Li, Zhigang Wang, Qiang Zhang. **Plasma radio frequency overmatches extracorporeal shock wave with local anesthetic for treatment patients with intractable plantar fasciitis.** *Life Sci J* 2022;19(2):22-25]. ISSN 1097-8135 (print); ISSN 2372-613X (online). <http://www.lifesciencesite.com>. 3. doi:[10.7537/marslsj190222.03](https://doi.org/10.7537/marslsj190222.03).

Keywords: plantar fasciitis; extracorporeal shock wave; plasma radio frequency

1. Introduction

Plantar fasciitis is a common fibromyalgia, there are 2 million patients require to receive treatment yearly in American (Liden et al., 2009). Generally, doctors employ the treatment of drug, physiotherapy, heel pad and blocking, but the effect of these treatments are not satisfying. Moreover, the pain is easy to relapse and can lead to persistent, which affect life of patient.

Although losing for plantar fasciitis can relieve symptoms, most patients are not willing to accept this treatment due to its traumatic. Therefore, minimally-invasive-treatments are adopted by doctors in clinical. ESWT and PRF with local anaesthesia are increasingly valued. In this study, patients with hemi-intractable proximalis plantar fasciitis by treating with useless conservative therapy, who were received and treated in our hospital from March 2006 to February 2010. They were treated respectively with PRF with local anaesthesia and ESW treatment, meanwhile, to compare and explore their clinical effects in the meantime.

2. Methods

All 68 patients with hemi-intractable proximalis plantar fasciitis were included into this study from March 2006 to February 2010. Inclusion criteria: (1) The bottom of heel aching, pain onset at the beginning of the exercise, with action proceeding, pain gradually relieve. However, after all day long activities, pain aggravates again. (2) Pain in bottom of calcareous partial interior. (3) recrudescence after conservative management repeatedly. Exclusion criteria: (1) calcareous fracture history. (2) accompany arches of foot malformation. (3) with rheumatic diseases. (4) underwent surgery. (5) biper proximalis plantar fasciitis. There were 60 patients, including 41 men and 27 women. The median age were 52.6 years.

All patients divided into 2 groups on the basis of the willing of undergoing operative treatment or not. The treatment group of ESWT was named as A group, PRF with local anaesthesia was named as B group.

ESWT treatment: Applying supine or prone position, signing the scope of pain in the sole of foot. The 10-15Hz frequency of shock wave is accepted by

therapeutic apparatus(Dolor Clast, Switzerland). The direction of shock: end crossing of energy pillar overlapped with the point of pain. Shock times:500 times each orientation, total number was from 1000 to 2000. The patients are treated 3 times for interval one week. Avoiding over exertion and strenuous exercise during three months, and received regular outpatient review.

PRF with local anaesthesia treatment: Arthrocare corporation in America offer plasma radio-frequency electrode. Marking the scope of pain in the vola pedis, local infiltrating 5 ml 1%-lidocaine till local tenderness disappear. And making 2mm puncture in the center of marking scope, using vessel forceps separate hypodermics to fascia rate, punching 2mm interval with Plasma radiofrequency instrument (Arthrocare, USA). Avoiding over exertion and strenuous exercise during three months, and received regular outpatient review.

Assessment of curative effect: using VAS pain scores and AOFAS ankle- metapedes grades to evaluate curative effect at three months, six months, nine months and twelve months preoperatively and postoperatively, respectively.

2.1 Statistical analysis

We used the software of SPSS 10 to statistically analyze the data collected, Statistically Speaking, $P < 0.05$ indicated a significant difference.

3. Results

Overall 62 patients, 52 patients are overweight (BMI>25) and 31patients are fat among them

(BMI>30); there are 49 patients who often took part in entertainment physical activities in mean time, and 13 patients regularly took part in rhythmic sportive sports.

A willingness result to receive treatment showed that 68(100%) patients could receive directly the treatment of ESWT, 16(23.5%) patients could receive directly local anaesthesia PRF with local anaesthesia, 10(14.7%) patients may consider receiving local anaesthesia TOPAZ after the treatment of ESW in vain. Nobody hope to receive releasing fascia treatment by cutting apart orthophoria or fascia released under the supplementary of arthroscope, except two(2.9%) patients ,who were willing to consider it after the failure of some other therapies.

There were 44 patients in ESWT group, two patients exited from the remedy due to they could not tolerate the treatment of ESW, 12 patients lost to follow-up, and 30 patients acquired follow-up. Sixteen patients were include into PRF with local anaesthesia group, all of them achieved follow-up. Patients in two groups had no significant difference in age, gender and index of BMI($P > 0.05$).

VAS grades had no significant differences ($P > 0.05$) before treatment of each group, however, VAS grades after 12 months therapy was lower than that at preoperation ($P < 0.05$); VAS was 1.9 ± 1.2 in PRF with local anaesthesia group after 1 year, it in ESWT group was 1.1 ± 1.2 , and the following chart shown there was a significant differences between two groups ($P < 0.05$; Table 1).

Table 1. VAS grades

	preoperation	3 months after therapy	6 months after therapy	9 months after therapy	12 months after therapy
ESWT	5.4 ± 1.1	2.2 ± 0.9	1.5 ± 1.0	1.4 ± 1.0	1.9 ± 1.2^a
PRF with local anaesthesia	5.5 ± 1.3^b	3.6 ± 0.9	1.1 ± 1.3	1.1 ± 1.1	1.1 ± 1.2^{ay}

Table 1. VAS grades

Through t teat, comparing postoperation with preoperation, $^aP < 0.05$; and comparing PRF with local anaesthesia group with ESWT group, $^bP > 0.05$, $^yP < 0.05$.

As shown in Table 2, there was no significant differences($P > 0.05$) for function grades before treatment of each group, however, function grades at 12 months after therapy was higher than grades of preoperation($P < 0.05$); function grades in PRF with local anaesthesia group was 88.6 ± 18.8 postoperation, it of ESW group was 80.7 ± 11.2 , and the following chart shown there was a significant differences between the two groups($P < 0.05$).

Table 2. AOFAS ankle joint metapedes grades

	preoperation	3 months after therapy	6 months after therapy	9 months after therapy	12 months after therapy
ESWT	50.3±13.5	79.0±10.7	87.2±7.6	84.3±9.1	80.7±11.2 ^a
PRF with local anaesthesia	50.1±9.0 ^b	76.6±6.0	87.6±2.5	89.3±13.3	88.6±18.8 ^{ay}

Through t test, comparing postoperation with preoperation, ^aP<0.05; and comparing PRF with local anaesthesia group with ESWT group, ^bP>0.05, ^yP <0.05.

4. Discussion

Overburden and excessive strain can cause attractive damage of the attachment of plantar tendon calcaneus, which result in proximalis plantar fasciitis. Fascia comes about tiny tissue tearing, which beyond the capacity of plerosis and results in the decrease of mechanical property. Conservative treatment involved changing the manner of activity, taking non-steroidal anti-inflammatory drugs, local injection of cortical hormone, wearing brace and physiotherapy, however, it has a poor effect for some patients, which reduces severely the quality of patients' life.

Traditional self myofascial release techniques fascia with arthroscopes cause a certain trauma, so, it is difficult to accepting for patients. In here, the survey showed that nobody willing to receive releasing fascia by cutting apart orthophoria or fascia released under the supplementary of arthroscope, except two(2.9%) patients, who were willing to consider it after the failure of some other therapies. And therefore, we adopted the requirement of more minimally invasive treatment clinically.

The energy from ESWT can form acoustics cavitation effect in target region, damage the cell membrane of phlogistic fascial but not the organelles and induce curing reaction(Mariotto et al.,2009; Orhan et al.,2004). It is reported that the ESWT is valid for calcaneodynia, which can be adopted by patients due to ESWT do not influence patients' regular work for it neither involve anesthetization nor surgical operation, and it costs not much(Lee et al., 2009; Takahashi et al., 2007). The survey shown that 68(100%) patients can directly receive the treatment of ESWT, finally, 52 (76.5%)patients were included into ESWT group. But it needed spend long time during course of ESWT treatment, furthermore, pain may aggravate during the treatment process, two patients quitted the treatment because of pain, 10 patients lost to follow-up. Finally, the follow-up results are archived in 32 patients. VAS scores was 5.4±1.1 preoperatively and decreased to 1.9±1.2 one year after therapy, AOFAS ankle metapedes scores was 50.3±13.5 preoperatively increased to 80.7±11.2 one year after therapy, there was a significant differences between two groups(P<0.05).

PRF with local anaesthesia electrode forms a thinnish storey of vaporization, its electric field leads to dissociation of gases and forms a plasma, particles in plasma carry with strong energy, it can make a breakage of the molecular chemical bond of most connected soft-tissue. Using RF to punch on muscle tendon aponeurosis, it can stimulate cell viability, start cell proliferation, stimulate healing response, recover tendon revascularization, these processes are beneficial to restore physical health. Neovascularization is an important part of healing response. Bi-Polar RF can stimulate the growth of vessel and help to adjust numerous growth factors, improving fascial nutrition, and creating proper environment for healing. Documents (akahashi et al., 2007; Nobuyasu et al., 2007) indicated that nerve fiber emerged regression in early stages after dispose of radio frequency(RF), following by producing healing response, consequently, improving local symptom.

It is reported that the effective rate of RFA can reach to 85~92%(Sollitto et al.,1997; Hormozi et al.,2011; Sean et al.,2010) for proximalis plantar fasciitis. However, the survey showed that only 16 (23.5%)patients were able to receive local anesthesia PRF with local anaesthesia treatment directly, 10 (14.7%) patients may consider receiving local anesthesia PRF with local anaesthesia treatment when ESWT therapy is invalid. Reasons for unwilling to accept the treatment of PRF with local anaesthesia are involved in anesthesia, surgical intervention, higher cost and so on. Sixteen patients who can directly receive local anesthesia PRF with local anaesthesia treatment were divided into PRF with local anaesthesia group. In practice, local anesthesia can achieve a good effect to finish the operation. VAS score was 5.5±1.3 preoperatively and decreased to 1.1±1.2 one year after therapy, AOFAS ankle metapedes score was 50.1±9.0 preoperatively and increased to 88.6±18.8 one year after therapy, there was a significant differences between two groups (P<0.05).

Results shown that the curative effect of PRF with local anaesthesia under local anesthesia is superior to ESWT group(P<0.05). For reasons, one is that patients received a survey before treatment, they

were not assigned two groups randomly. Another important reason is that pain may aggravate during therapeutic process of ESWT. Consequently, the results of this test may have selection bias.

In conclusion, PRF with local anaesthesia is more effective though both PRF with local anaesthesia and ESWT can treat intractable proximalis plantar fasciitis.

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References

1. Liden B, Simmons M, Landsman AS. A Retrospective Analysis of 22 Patients Treated with Percutaneous Radiofrequency Nerve Ablation for Prolonged Moderate to Severe Heel Pain Associated with Plantar Fasciitis. *The Journal of Foot & Ankle Surgery* 2009; 48:642-7.
2. Mariotto S, de Prati AC, Cavalieri E, Amelio E, Marlinghaus E, Suzuki H. Extracorporeal shock wave therapy in inflammatory diseases: molecular mechanism that triggers anti-inflammatory action. *Current medicinal chemistry* 2009; 16: 2366-72.
3. Orhan Z, Cam K, Alper M, Ozturan K. The effects of extracorporeal shock waves on the rat Achilles tendon: is there a critical dose for tissue injury? *Arch Orthop Trauma Surg* 2004; 124: 631-5.
4. Ogden J, Alvarez RG, Cross GL, Jaakkola JL. Plantar fasciopathy and orthotripsy: the effect of prior cortisone injection. *Foot Ankle Int* 2005;26: 231-3.
5. Lee GP, Ogden JA, Cross GL. Effect of extracorporeal shock waves on calcaneal bone spurs. *Foot Ankle Int* 2009; 24: 927-30.
6. Takahashi N, Tasto JP, Ritter M, Ochiai N, Ohtori S, Moriya H, Amiel D. Pain Relief Through an Antinociceptive Effect After Radiofrequency Application. *The American Journal of Sports Medicine* 2007; 35:805-10.
7. Ochiai N, Tasto JP, Ohtori S, Takahashi N, Moriya H, Amiel D. Nerve Regeneration After Radiofrequency Application. *The American Journal of Sports Medicine* 2007; 35: 1940-4.
8. Sollitto RJ, Plotkin EL, Klein PG, Mullin P. Early Clinical Results of the Use of Radiofrequency Lesioning in the Treatment of Plantar Fasciitis. *The Journal of Foot & Ankle Surgery* 1997; 36:215-9.
9. Hormozi J, Lee S, Hong DK. Minimal Invasive Percutaneous Bipolar Radiofrequency for Plantar Fasciotomy: A Retrospective Study. *The Journal of Foot & Ankle Surgery* 2011; 50:283-6.
10. Sean NY, Singh I, Wai CK. Radiofrequency microtenotomy for the treatment of plantar fasciitis shows good early results. *Foot and Ankle Surgery* 2010; 16:174-7.

5/11/2021