

# Plantar Fasciitis, Another Approach — Using Acupuncture and Looking Beyond the Lower Limb with a Brief Review of Conventional Care: A Case Series

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## ABSTRACT

**Introduction:** Plantar fasciitis is a common idiopathic debilitating condition linked to the biomechanics of the lower limb. Conventional care of stretching, splints, arch supports, extracorporeal shock wave therapy and cortisone injections offer inconsistent results. This case series demonstrates another approach to the management of plantar fasciitis utilising acupuncture and looking beyond the lower limb. In addition to commonly used points, two extra points are used with dense-disperse electro-stimulation. **Case presentation:** Two retrospective cases are presented. Case one is a 23-year-old Caucasian female who presented with a history of intermittent left heel pain which was painful especially on first step in the morning. Symptoms resolved after five acupuncture treatments addressing the plantar fascia, low back and leg-length imbalance. Symptoms would initially recur whenever a back injury recurred. The second case is a 46-year-old Caucasian male who presented with a 12-week history of bilateral plantar fasciitis confirmed on ultrasound. The patient also complained of mild low back pain. Acupuncture treatment addressing the plantar fascia, low back pain and leg-length imbalance led to complete resolution of symptoms after six weekly treatments. **Conclusion:** This case series adds to the limited literature on the treatment of plantar fasciitis with acupuncture and offers a low risk treatment strategy. Two extra acupuncture points are described and provisionally named. Three other areas are identified for further investigation. The first is an association between apparent leg-length difference and some cases of plantar fasciitis. The second is the question of whether platelet-derived growth factor is activated via the electroacupuncture aspect of the treatment. The third is the need to conduct a post-recovery imaging study of the plantar fascia in an attempt to correlate tendon changes to the mechanism of acupuncture treatment.

**KEYWORDS** acupuncture, electroacupuncture, auriculotherapy, dry needling, leg-length difference, plantar fasciitis.

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## Introduction

Plantar fasciitis is one of the most common causes of heel pain with an incidence of 11–15% of all foot symptoms requiring professional care among adults, and an incidence of 10% of all running injuries. Patients typically experience inferior heel pain with the first few steps after rising in the morning or after prolonged sitting. Pain often initially eases but then increases with daily activities. Pain is worse for dorsiflexion of the pedal phalanges and is aggravated by walking up stairs, walking on hard surfaces or walking barefoot. A limp may be present. A history of an increase in the amount or intensity of exercise, often running or walking, frequently precedes symptoms. On examination there is usually pain on palpation of the anterior medial heel.<sup>1</sup> The term chronic plantar heel pain (CPHP) is used interchangeably in the literature to refer to plantar fasciitis.<sup>2</sup>

The plantar fascia originates on the medial tubercle of the calcaneus and fans out over the bottom of the foot to insert into the proximal phalanges and the tendon flexor sheaths.<sup>1</sup> It forms the longitudinal arch of the foot and functions as a shock absorber as well as an arch support via a windlass mechanism.<sup>1,3</sup> The braking strain of this windlass mechanism ranges from 1.4 to 3.4 times the subject's body weight,<sup>3</sup> making the fascia subject to damage with a relatively minimal increase in strain.<sup>4</sup>

The aetiology of plantar fasciitis is poorly understood.<sup>5</sup> Due to its high incidence in runners it is believed to be caused by repeated microtrauma and to be mechanical in origin.<sup>1,5</sup> Contrary to historical perspectives plantar fasciitis is a misnomer as histological evidence shows that inflammation rarely occurs in plantar fasciitis and that it is really a degenerative fasciosis.<sup>6</sup> Risk factors for developing plantar fasciitis include increased weight in a non-athletic population, increased age, decreased ankle dorsiflexion, decreased first metatarsophalangeal joint extension and prolonged standing. Height, weight and BMI are not associated with plantar fasciitis in the athletic population. Evidence of an association between static and dynamic foot motion is inconclusive. An association with leg-length difference is considered to be weak and has only been identified in one study.<sup>2</sup>

A systematic review of diagnostic imaging and chronic plantar heel pain revealed that plantar fascia thickening greater than 4 mm was diagnostic of plantar fasciitis, and that a subcalcaneal spur was strongly associated with chronic heel pain.<sup>7</sup> A diagnosis of plantar fasciitis is, however, a clinical diagnosis, usually based on history and clinical examination;<sup>4</sup> imaging studies are not usually necessary.

## Conventional Care

There is no evidence to define a standard of care based on replicated randomised controlled trials.<sup>8</sup> Conservative care typically consists of a range of interventions including calf and plantar stretching and arch supports.<sup>4</sup> Taping can be used to take strain off the plantar fascia and night splints can reduce first-step pain by preventing overnight atrophy of the plantar fascia.<sup>8</sup> Tatli and Kapasi<sup>4</sup> state that conservative care provides 'satisfactory results' in 80–90% of cases without defining 'satisfactory'. Over-the-counter arch supports appear to be as effective as custom orthotics,<sup>4</sup> and a systematic review found that it is unclear that customised orthotics are of any benefit at all in plantar fasciitis.<sup>9</sup>

Persistent cases may be treated with nonsteroidal anti-inflammatory drugs (NSAIDs),<sup>8</sup> corticosteroid injection, extracorporeal shock wave therapy (ESWT) or botulinum toxin type A (Botox).<sup>4</sup> Corticosteroid injections are the treatment of choice and are more effective when combined with stretching, and more successful when administered under ultrasound guidance.<sup>4</sup> The evidence supporting the use of ESWT is ambiguous, and botulinum toxin type A has been found to reduce the pain of plantar fasciitis in one small study.<sup>4</sup> The finding that inflammation is rarely present in plantar fasciitis forces a re-evaluation of the rationale for using a steroid injection,<sup>6</sup> especially as corticosteroid injections also carry with them the rare risks of plantar fascia rupture and fat pad atrophy.<sup>4</sup>

A more recent addition to treating plantar fasciitis and musculoskeletal injuries in general is the use of autologous blood products. In this procedure 30–60 ml of venous blood is withdrawn from a patient and centrifuged to produce 3–6 ml of platelet rich plasma (PRP). This PRP is then injected directly into the area of injury, preferably under ultrasound guidance. It is believed that the therapeutic benefit of injecting PRP is due to growth factors contained within alpha granules inside platelets. These growth factors include platelet-derived growth factor (PDGF), which is produced following tendon damage, transforming growth factor, vascular endothelial growth factor, epidermal growth factor and fibroblast growth factor.<sup>10</sup>

## Chinese Medical Pathology

Chinese medical theory describes this condition as Bi syndrome.<sup>11</sup> The flow of qi and blood in the channels becomes obstructed resulting in stagnant qi and blood which causes the pain.<sup>12</sup> This condition shows mainly blood stagnation as the pain is intense, fixed and persistent. Where qi and blood stagnate, damp is formed, which can thicken and cause

phlegm. The type of phlegm in this case is non-substantial phlegm which lodges in the channels and joints,<sup>13</sup> further obstructing the flow of qi and blood. Treatment should aim to restore the flow of qi and blood and disperse the phlegm.

## Literature Review

A literature review was conducted using the key words plantar fasciitis and acupuncture, as well as plantar fasciitis and dry needling. Pubmed and Medscape were searched as well as the Chinese medical journals which conform to the STRICTA<sup>14</sup> protocol. A case study was found on a non-indexed ejournal.<sup>15</sup> A total of five articles were found including one randomised control trial (RCT),<sup>16</sup> an ejournal article,<sup>15</sup> a retrospective case series,<sup>17</sup> and two prospective studies.<sup>18,19</sup>

Sconfienza<sup>18</sup> conducted a non-randomised dry needling trial which consisted of an initial perifacial local anaesthetic followed by repeated dry needling of the plantar fascias and a corticosteroid injection. Sconfienza speculates that the dry needling attracts platelets to the area which release healing factors, a similar hypothesis for the therapeutic effect of PRP autologous injections.<sup>10</sup> The trial claims a 90% effectiveness rate.

The RCT<sup>16</sup> investigated the single point PC7 *Daling* needled contralaterally to the heel pain compared to LI4 *Hegu* needled contralaterally, finding better pain scores with PC7 *Daling*. The remaining three studies investigated common lower limb points with *ashi* points in the foot and plantar fascia<sup>15,17,19</sup> or gastro-soleus muscle.<sup>19</sup> Two of these studies used or recommended low frequency electroacupuncture.<sup>15,17</sup> None of these studies address pathology above the knee. Only the case study by Smith<sup>15</sup> proposed point selection based on TCM *zangfu* syndrome differentiation. The limited literature available regarding acupuncture and plantar fasciitis combined with the risks of conventional care in recalcitrant cases makes this case series a useful addition to understanding treatment options for this common condition.

## Case One

Case one is a 23-year-old Caucasian female who presented in February 2004 complaining of intermittent left heel pain which was painful especially on first step in the morning. There was no history of specific injury however she did attend recreational dance classes. On examination pain was present at the insertion of the plantar fascia on the medio-inferior aspect of the calcaneus. A scoliosis to the right was present. In the supine position the left anterior superior iliac spine (ASIS) was elevated resulting in an apparent leg-length difference with the left medial malleolus approximately 3 cm higher than the right. The right internal hip rotation was restricted.

## TREATMENT

Soft tissue manipulation (a combination of Bowen method and drainage to the lumbar erector spinae group, gluteals and sacrum) was applied with the intention of addressing the pelvic imbalance and apparent leg-length difference. The calf and plantar surface of the foot were massaged.

Vinco 0.22 x 25 mm needles were inserted bilaterally at BL57 *Chengshan* (10 mm deep), BL60 *Kunlun* (8–10 mm deep), KI3 *Taïxi* (5–8 mm deep), GB39 *Xuanzhong* (alternative location, see Table 1) (10–15 mm deep) and SP6 *Sanyinjiao* (10–15 mm deep). Gentle lifting and thrusting for less than 5 seconds was used to obtain very mild *deqi*. Viva 0.22 x 30 mm needles were inserted bilaterally at two extra points (see Table 1) to a depth of 20–25 mm without needle manipulation. No *deqi* was sought. All needles were inserted perpendicularly except for KI3 *Taïxi* and BL60 *Kunlun* which were directed inferiorly towards the heel. Electro-stimulation was applied with the red electrode at GB39 *Xuanzhong* and the black electrode at extra point 'Lower *Shenmai*' (see Figure 2); and with the red electrode at SP6 *Sanyinjiao* and the black electrode at extra point 'Lower *Zhaohai*' (see Figure 1). An AWQ-104E needle stimulator was used at a dense-disperse setting of approximately 4 and 100 Hz. The intensity was raised to distinct but not uncomfortable and left for 20 minutes. No special instructions regarding footwear or stretching were given.

There was no improvement by the second visit 10 days later. At the second treatment the left ASIS and right internal hip rotation was still restricted and apparent leg-length difference persisted, so in addition to the previous treatment the points BL22 *Sanjiaoshu* and BL23 *Shenshu* were added as they correlated to areas of restriction in the lumbar spine. Vinco 0.22 x 40 mm needles were inserted at these points to a depth of 20–25mm with small rotations and gentle lifting and thrusting for less than 10 seconds until mild *deqi* was obtained and then retained for 20 minutes. At the third treatment there was a slight improvement in symptoms with a patient report of less severe morning heel pain. The ASIS were balanced, the internal hip rotation equalised and there was less than 0.5 cm difference between symmetry at the medial malleoli. The treatment was repeated twice more using the same general needle depth and electro-stimulation settings as for previous treatments (a total course of five treatments at an interval of about ten days apart). After this there were no more symptoms of heel pain or tenderness on palpation until three months later. At this later presentation imbalance between the ASIS and medial malleolus was evident again with an approximately 2 cm difference in symmetry at the medial malleolus. The same treatment was repeated once and the patient was asymptomatic until a recurrence associated with low back pain five months later, which responded to

TABLE 1 Extra and Alternative Point Locations

'Lower Zhaohai'	Inferior to the high point of the medial malleolus in a depression at the junction of the red and white skin, inferior to KI 6 <i>Zhaohai</i> . See Figure 1.
'Lower Shenmai'	Inferior to the high point of the lateral malleolus, in a depression at the junction of the red and white skin, anterior to BL 61 <i>Pucan</i> , and inferior to BL 62 <i>Shenmai</i> . See Figure 2.
Alternative Location for GB 39 <i>Xuanzhong</i>	3 cun superior to the lateral malleolus in a depression anterior to the Achilles tendon and posterior to the fibula.

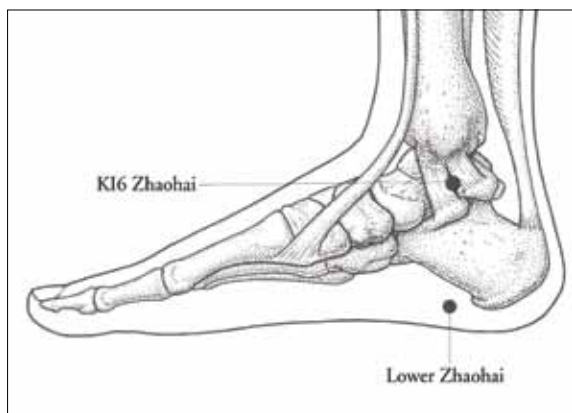


FIGURE 1 Location of 'Lower Zhaohai'

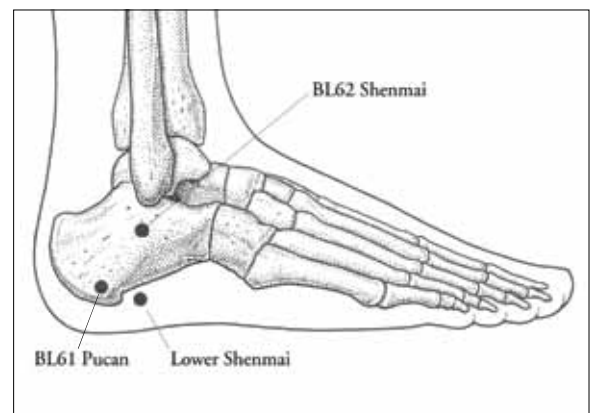


FIGURE 2 Location of 'Lower Shenmai'

Figures 1 and 2 have been adapted from Deadman P, Mazin A, Baker, K. A Manual of Acupuncture. Journal of Chinese Medicine: Hove, East Sussex; 2008. p320, 325, 339, 344.

another single treatment administered as per the previous treatments. This patient continues to dance as of 2010 (six years later) and experiences various self-limited acute injuries however the plantar fasciitis has not returned. The patient continues to present with the tendency to a pelvic imbalance and slight apparent leg-length difference (approximately 1 cm), which may relate to her scoliosis.

## Case Two

Case two is a 46-year-old Caucasian male who presented in November 2006 with a twelve-week history of bilateral plantar fasciitis. He complained of pain in the feet which was worse on rising in the morning and worse in the left lateral heel. He also complained of mild low back pain. X-rays of both feet showed no abnormality and no calcaneal spurs. Diagnostic ultrasound revealed bilateral thickening of the plantar fascia consistent with plantar fasciitis. The left facial thickening was more extensive than the right.

On examination in the supine position the right ASIS was elevated revealing an apparent leg-length difference with the right medial malleolus higher than the left by 3 cm. In the

prone position the left hip internal rotation was restricted. Tenderness was elicited on palpation around the centre of the heel in the vicinity of the plantar fascia attachment to the calcaneus, as well as just inferior to BL63 *Jinmen* on the left foot. A treatment plan of once a week treatment for three treatments before review was determined.

## TREATMENT 1-3

Soft tissue manipulation (a combination of Bowen method and drainage to the lumbar erector spinae group, gluteals and sacrum) was applied to the lower back with the intent to address the pelvic imbalance and leg-length difference. Both calves and plantar surfaces of the feet were massaged. Following the soft-tissue manipulations acupuncture was given. In addition to the treatment protocol (with the same needling depths and electro-stimulation settings) used in case 1, Vinco 0.22 x 40 mm needles were inserted at BL25 *Dachangshu* (the focus of the lumbar pain) bilaterally with the patient prone. Lumbar points were needled to a depth of 25-30 mm with small rotations and gentle lifting and thrusting for less than 10 seconds each until mild *deqi* was obtained and retained for 20 minutes. The patient was advised to wear shoes with a supportive sole, to avoid going barefooted, and

advised to undertake calf and plantar stretching and plantar massage daily at home.

After the first treatment the patient reported that symptoms were aggravated for three days and then improved. The treatment was repeated. At the third visit the patient reported a few good days of less pain on rising. At the fourth visit the patient reported that the right foot was no longer painful and that the left foot only was symptomatic. On examination there was an apparent leg-length difference, with the right medial malleolus 3 cm higher than the left in the supine position. The focal point of pain in the left foot was around BL63 *Jinmen*.

#### TREATMENT 4–6

Soft tissue manipulation was applied to the low back, left calf and left foot similarly to the previous treatments. Acupuncture was applied to the left leg only (the right was asymptomatic) as above with the following modification. On the lateral side a Vinco 0.22 x 25 needle was inserted to a depth of 15 mm at the *ashi* point inferior to BL63 *Jinmen* and electro-stimulation was applied with the red electrode at this point and the black electrode at the extra point 'Lower *Shenmai*' (see Table 1). All other points were needled in the same manner as previously. The patient reported local tenderness for three or four days then improvement. An apparent leg-length difference was no longer evident as assessed in the supine position and using visual inspection of the ASIS and medial malleoli symmetry. The treatment was repeated and after a total of six treatments, once per week (three bilaterally and a further three to the left foot only), the patient was asymptomatic. At follow-up at seven months and 18 months later, the patient had no symptoms of plantar fasciitis and demonstrated a difference in medial malleoli and ASIS symmetry of approximately 0.5 cm.

## Discussion

The intermittent nature of case one indicates more qi than blood stagnation and demonstrates treatment of an early presentation of plantar fasciitis. Case two is a typical presentation of plantar fasciitis where blood stagnation dominates. Non-substantial phlegm has lodged in the channels, which is demonstrated by the thickened plantar fascia on ultrasound.

In order to restore the flow of qi and blood, it is necessary to disperse the phlegm stagnation. This is achieved using the extra points which directly access the fascial attachment. It is around this same location that heel spurs are often found, indicating that this is a key point of stagnation where phlegm can congeal forming bony growths. The choice of acupuncture needle for these points is guided by the

need to reach the vicinity of the plantar attachment on the calcaneus. Needles shorter than 30 mm long result in a poor result. Needles of too fine a gauge (less than 0.22 mm) will be difficult or impossible to insert. An adequate gauge results in prompt insertion with minimal discomfort. These points are often not *ashi* points, and, when located properly, they are usually not unduly painful to treat. This can be contrasted with *ashi* points overlying the calcaneus, which must be punctured through thick heel skin and are usually painful.

Electroacupuncture (EA) is chosen as a comfortable way to stimulate points which could be painful if stimulated manually. Dense disperse is selected to reduce accommodation which can occur at low frequencies. Both the dry needling<sup>18</sup> and autologous blood injection<sup>10</sup> are believed to work via the release of platelet growth factors. Sun, Zhao and Wang<sup>20</sup> have shown that EA (98 Hz) activates the release of PDGF in cats. This finding suggests that the indications and benefits of EA go beyond the conventional understanding of a neurophysiological mechanism of EA and may directly stimulate repair via the release of PDGF. Should the release of PDGF be linked to EA in humans, then EA could become standard care for tendonopathies. It is noteworthy that a study using electro-stimulation to elicit muscle contraction without acupuncture was found to be of no benefit in plantar fasciitis.<sup>21</sup>

The persistent finding on imaging studies<sup>7</sup> of a thickened plantar fascia and frequent calcaneal spurring indicates that in plantar fasciitis the diagnosis of blood stagnation and phlegm retention may relate to a measurable degenerative change in the plantar fascia and at its attachment to the bone. A follow-up imaging study to determine if the plantar fascia returns to its pre-morbid state would be useful to further understand the mechanism of acupuncture in this condition. A finding of true repair of the plantar fascia would aid in further correlating traditional Chinese medical pathology with anatomical pathology.

In both of these cases, low back pathology and an apparent leg-length difference were evident and symptoms did not resolve until this pathology was adequately addressed. In case one, symptoms recurred after a back injury which exacerbated the apparent leg-length difference which accompanies a scoliosis. The biomechanical implications of leg-length imbalance are referred to in the literature; however, a causative association between imbalance and pain remains controversial.<sup>22</sup> Part of this controversy may relate to the need for a simple, reproducible system categorising different types of pelvic postural asymmetry;<sup>22</sup> part may also be due to difficulties in measuring arch mechanics in vivo.<sup>5</sup> Leg-length imbalance is identified as a risk factor in some pathologies such as greater trochanter bursitis;<sup>23</sup> however, it must be noted that leg-length imbalance is not considered a risk factor for plantar fasciitis,<sup>2</sup> nor is any pathology above the knee considered

in treatment.<sup>1,4,8</sup> Considering the limited capacity for the windlass mechanism of the plantar fascia to tolerate increase in strain,<sup>4</sup> and the likelihood that a leg-length imbalance alters the load through the foot and hence the strain on the plantar fascia, it seems reasonable to screen for and treat leg-length difference in every case of plantar fasciitis.

Oriental medical theory identifies that a leg-length difference relates to imbalance in the eight extraordinary channels, in particular the *Yangwei mai* and *Dai mai* connection, and also the *Yinqiao mai* and *Ren mai* connection.<sup>24</sup> An imbalance in the channels can lead to stagnation of qi and diverse pathologies ranging from musculoskeletal pain to gynaecological problems linked to the pathways and connections of the channels involved.<sup>24</sup> Clinically ignoring a leg-length imbalance is to ignore a potential or actual basis for the development of subsequent channel and *zangfu* pathologies. The difficulties in quantitatively assessing and investigating this phenomenon should not result in it being ignored clinically from either a western pathological viewpoint and especially not from an Oriental medical viewpoint.

## Conclusion

This case series demonstrates another safe approach that can be utilised to treat plantar fasciitis. Acupuncture provides a valuable option which can be combined with conventional care of calf and plantar stretching and arch supports (if indicated). The association between apparent leg-length difference and symptoms in these cases merits further investigation to determine their generalisability, and may provide a missing causal link to the pathology of some cases of plantar fasciitis. It is possible that electroacupuncture stimulates the release of PDGF and contributes to the long-term results which are achieved after addressing the low back pathology. A follow-up imaging study of successfully treated patients should be conducted to determine if the plantar fascia thickening is reversed. A correlation of asymptomatic patients and reversed plantar fascia thickening would provide further understanding of the mechanism of acupuncture.

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## Clinical Commentary

This paper demonstrates a comprehensive approach to the treatment of plantar fasciitis. Electroacupuncture is often effective in combination with conventional conservative care of plantar stretching and wearing supportive footwear, along with addressing leg-length imbalance. Although the literature does not associate leg-length imbalance with plantar fasciitis, addressing leg-length imbalance where evident is still important. Acupuncturists who take an eclectic view of treatment are well placed to be the preferred point of contact when treating plantar fasciitis.

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