

## CORRESPONDENCE

### Pain on the Plantar Surface of the Foot

by PD Dr. med. Natalia Gutteck, Sebastian Schilde, and Prof. Dr. med. Karl-Stefan Delank in issue 6/2019

#### Biomechanical Functional Considerations

With the verticalization of posture beginning at age 2 years, humans become sole walkers, putting first weight first on the heel of the leading foot and then rolling onto the ball of this foot, while pushing down- and backwards with the toe and forefoot flexors of the non-weight-bearing opposite limb (upright gait of the Pharaoh and the nomads). The adoption of the usual cultural footwear, school enrollment, the practicing and promotion of forefoot weight-bearing by habitual “head-before-heel” walking, the heels of shoes, rolling onto the ball of the forefoot and reduced toe movements due to tight shoes, as well as standing and sitting with weight-bearing on the forefoot have resulted in habitual overloading of the passive plantar fascia close to its origin by prolonged-traction and impulse-related mechanical trauma and of the metatarsal bones by repetitive bending strain (stress fractures) (1).

The distribution of body weight on the plantar surface causes the tracks of the runner, and not the other way around. In persons with normal motor function, the distribution of the body weight over the time integral is the primary determinant of the loading and development of the foot, still before foot motor function.

Habitual inclination posture, highest loading on the forefoot and reduced toe motor function, especially of the long flexor muscles, lead to shortening of the calf, achillodynia and overloading of the plantar fascia and the metatarsal bone, which can be described as a chain syndrome (2). The weakest link develops symptoms, while “protecting” the other chain links. The load is spontaneously taken off the painful side; consequently, the load increases on the opposite side, which may then start to hurt.

Using ultrasound, measurements of the cross-section of the plantar fascia close to its origin can be obtained bilaterally for comparison and over the course of treatment to determine the acuteness and painfulness of the plantar insertional tendonitis (3). The bony heel spur represents the repair of the insertional tendonitis; the site at risk of rupture is covered by calcified material. This biomechanical functional considerations allow for causal treatment strategies with proven effectiveness in affected patients (3).

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#### Efficacy of Radiotherapy

The authors mention low-dose radiotherapy as an established method for the treatment of plantar heel pain (1). We fully agree with their statement that, while the exact mechanism of action is not yet understood, very good outcomes have been reported in retrospective and prospective studies.

We would like to add that in recent years several prospective randomized trials from Erlangen and Homburg/Saar (Germany)—which the authors regrettably did not mention in their article—on the one hand, provided evidence of the efficacy of radiotherapy in comparison to a very low (placebo) dose (2), and, on the other hand, searched for the optimum dose in two further studies (3, 4). The updated S2-guideline (5) recommends that radiotherapy with a total dose of 3 Gy should be administered in individual doses of 0.5 Gy twice a week.

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## Aspect of Reimbursement

First, we would like to congratulate the authors for their article which is definitely worth regarding (1). However, recent developments in 2018 should be mentioned with regard to the reimbursement of extracorporeal shockwave therapy (ESWT) by the German statutory health insurances (*Gesetzliche Krankenkassen*, GKV).

On 19 April 2018, the Federal Joint Committee (*Gemeinsamer Bundesausschuss*, G-BA) in Berlin listed ESWT for heel pain as an outpatient treatment option after reviewing the method. In the future, the statutory health insurances (GKV) will pay for the use of ESWT to treat patients whose usual physical activity has been impaired by heel pain for more than six months, provided that during this period various conservative treatment strategies, such as stretching exercises and insoles, have been applied without achieving relevant relief. In a double-blind, randomized controlled trial, high-energy focused ESWT (electromagnetic 0.25 mJ/mm<sup>2</sup>, 2000 pulses, 3 sessions) significantly reduced the pain (69% versus 34.5%) (2). High-energy shockwave therapy was found to be superior to steroid injections in a meta-analysis including 9 randomized controlled trials (evidence level 1A) (3).

A randomized controlled study in patients with metatarsalgia related to Morton's neuroma (4) found that ESWT was significantly superior over placebo with regard to pain relief (visual analog scale [VAS] 64 to 42 after 1 week and to 36 after 4 weeks of treatment) and the American Orthopedic Foot and Ankle Society (AOFAS) scores within 4 weeks (67 points versus 76 points).

In the light of the above mentioned evidence, we would like to draw attention to this noninvasive treatment option for plantar heel pain and the new reimbursement situation with the GKV.

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## Confusing Nomenclature and Trigger Point Therapy

The usual term “plantar fasciitis” is used in this article too; as its cause, a “mechanical reaction to overloading with many contributing factors” is stated (1)—I think that is correct. In my opinion, the suffix “-itis” should only be used for conditions clearly caused by inflammation or at least with a primarily inflammatory component, even though the English medical terminology is not so strict in this respect. Otherwise, these conditions will continue to be regarded and treated as being related to a lack of cortisol—or non-steroidal anti-inflammatory agents.

With regard to the etiology, it would be interesting to know whether the prevalence of the condition is lower in countries where people usually walk barefoot. If so, it could be assumed that the symptoms are (also) caused by overloading and subsequent hardening of the foot and calf muscles due to hard soles of shoes, which would fit with the onset of pain after rest and then after prolonged exertion.

With regard to treatment: In patients with clear association of the condition with shortening of the calf muscles, stretching exercises and, if necessary, gastrocnemius release surgery are recommended. Treatment of myofascial trigger points accomplishes efficient and lasting release of the shortened muscles in a gentler way (2). This does not only apply to the triceps surae muscle, but also to the quadratus plantae muscle which is often involved.

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Dr. Behrens received fees from Elsevier for the publication of the book “Leitfaden Triggerpunkte”. He receives fees for continuing medical education from the Deutsche Ärztegesellschaft für Akupunktur and the Kneipp-Ärztebund.

## In Reply:

A sincere thank you to all our readers for their interest and their valuable comments which provided important additional information to the complex field of foot pain.

We agree that heel pain is a symptom of complex causal chains which need to be accurately analyzed to enable targeted treatment. Rightfully, the importance of a shortening of the calf muscles—clinically assessed using the Silverskjöld test—is repeatedly highlighted. As mentioned in our article, dorsal flexion  $\leq 0^\circ$  in the talocrural joint is associated with a 23-fold increased risk of developing plantar foot pain compared to dorsal flexion of at least  $10^\circ$  (1).

The level of muscle stretching adapts to the functional demands and the individually required range of motion of the respective joint; here, optimal overlapping of the individual sarcomere filaments is sought to ensure delivery of maximum muscle force. Prolonged muscle training across the full range of motion of the joint leads to an increased degree of sarcomere stretching, inducing growth processes based on serial

sarcomere addition to achieve optimum filament overlapping to produce maximum force. Conversely, muscular inactivity with permanently reduced range of motion of the joint results in sarcomere reduction and consequently shortening off the muscle (2). The normal position of the calcaneus in relation to the tibial axis is slightly valgus. In patients with shortened calf muscles, the pronation of the calcaneus is further increased by increased muscle traction on the slightly eccentric position of the calcaneus.

The acentric (from dorsal-caudal-lateral to ventral-cranial-medial) joint axis of the subtalar joint, in combination with the increased calcaneal pronation, contributes to increased mechanical stress on the plantar fascia with increased micro-trauma risk on exertion.

Also important is the comment that bilateral ultrasound examination of the origin of the plantar fascia with comparison of the sides can be a useful strategy to document the course of treatment. As a means of primary diagnostic assessment, however, ultrasound is of limited value, because the origin of the plantar fascia can be thickened (>4 mm) in asymptomatic patients too (3).

We would like to thank Prof. Niewald for the important information that prospective randomized controlled trials have demonstrated the superiority of radiotherapy over “placebo” irradiation. The current version of the S2-guideline for radiation therapy of benign diseases even contains a “shall” recommendation for radiation therapy, if indicated (painful plantar fasciitis of more than 3 months’ duration, exhaustion of other conservative methods, patient age between 30 and 40 years). The success of treatment varies between studies, a pain-free state was reportedly achieved in 13% to 81% of patients and pain alleviation in up to 90% of patients. These results underline the relevance of this treatment approach among the conservative treatment options available (4).

Also highly valuable is the letter by Prof. Dr. Knobloch et al. with information about the most recent development with regard

to the reimbursement of the cost of extracorporeal shockwave therapy (ESWT) by the statutory health insurances. We think that, against this background, the successful treatment with significant pain reduction, demonstrated in double-blind, randomized controlled trials, justifies the inclusion of ESWT as an integral part of the treatment concept for chronic plantar heel pain after a period of 6 months.

In summary, it can be said that plantar foot pain can be successfully treated with a variety of conservative treatment strategies. The composition of the various treatment components should be decided on a case-to-case basis. In agreement with the contributions to the discussion, a conceivable concept for the conservative treatment approach is to prescribe, when physiotherapy and potentially fitting of insoles were unsuccessful, after 3 months radiotherapy and after 6 months ESWT.

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## CLINICAL SNAPSHOT



Cutaneous efflorescences of the lower extremities

## Marked Cutaneous Manifestation of Florid Endocarditis

A 43-year-old man with a 6-month history of B symptoms (night sweats, 35 kg weight loss) was admitted to the hospital with dyspnea and a high temperature. Echocardiography showed high-grade aortic valve insufficiency, cardiac magnetic resonance imaging revealed perimyocarditis, and an upper airway infection was found on clinical examination. The infection was treated empirically with antibiotics, and the patient was put on the waiting list for surgical aortic valve replacement and discharged. The operation was delayed owing to further diagnostic work-up of the B symptoms. Three months later, the patient was urgently readmitted due to severe dissecting endocarditis of the aortic and mitral valves. On admission, he was subfebrile and hemorrhagic efflorescences were noted that had been present for a number of months, concentrated on the lower extremities (Figure), but had not yet been linked to the endocarditis. These skin lesions vanished within the first few weeks after a complex double valve replacement procedure. The preoperative blood cultures were negative for all bacteria tested, but investigation of the resected cardiac valves by polymerase chain reaction (PCR) showed the presence of *Streptococcus mutans*.

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