Long-term consequences of falanga torture

What do we know and what do we need to know?

Kirstine Amris, MD*, Søren Torp-Pedersen, MD* & Ole Vedel Rasmussen, MD, DMSc**

Abstract

The long-term consequences of falanga are probably the best described consequences of exposure to specific forms of physical torture. Theories about casual lesions in the peripheral tissues of the feet have been put forward based on clinical observations along with international guidelines for the clinical assessment, but still knowledge is needed in several areas. A review of the literature on falanga is presented, mainly focusing on the clinical aspects and possible lesions caused by this specific form of torture that may influence the overall management of the condition. Finally, the article closes with a call for future research, which is needed in order to advance a knowledge-based development of the applied clinical practice.

Keywords: torture, falanga, clinical examination, long-term consequences, review

Introduction

The long-term consequences of falanga are probably the best described consequences of exposure to specific forms of physical torture. Theories about casual lesions in

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*) The Parker Institute
Frederiksberg Hospital
Copenhagen, Denmark
Kirstine.Amris@fh.hosp.dk

**) The International Rehabilitation Council
for Torture Victims
Copenhagen, Denmark

the peripheral tissues of the feet have been put forward based on clinical observations[1-10] along with international guidelines for the clinical assessment.[11] However, larger systematic studies are still scarce and knowledge is needed in several areas.

In spite of a long-standing tradition of clinical assessment, only limited empirical data on the diagnostic value of the applied tests have been established.[12] Further, the time perspective as well as the association between the intensity and duration of the applied falanga and subsequent development of symptoms and disabilities, and pathological changes in the feet and lower legs that can be demonstrated at clinical examination are not known. Neither is the role of imaging in substantiating the clinical diagnosis yet clarified and the present knowledge is mainly based on casuistic reports and studies of smaller samples.[13-21]

Management of the persistent pain and painful foot dysfunction seen after exposure to falanga is based on clinical experience and there are no systematic studies addressing treatment and outcome of treatment after this particular form of torture.

An increased knowledge about the lesions caused by falanga and development of evidence-based examination methods will not only contribute to a more reliable diag-

nosis and improved treatment, but also be an important tool in the medico-legal documentation of torture.

The aim of this article is to present an overview of the literature on falanga, mainly focusing on the clinical aspects and to highlight possible lesions caused by this specific form of torture that may influence the overall management of the condition. Finally, the article will close with a call for future research, which is needed in order to advance a knowledge-based development of the applied clinical practice.

The clinical picture

Clinical presentation

Based on clinical experience and reporting from observational studies, persistent pain in the feet and painful foot dysfunction are described as being cardinal symptoms in the chronic phase.[1,5,6,9,22-28] Two types of pain are usually described: 1) a deep, dull cramping pain in the feet, which intensifies with weight bearing and muscle activity spreading up the lower legs, and 2) a superficial burning, stinging pain in the soles, often accompanied by sensory disturbances.[1,5,9,22,25] Reported walking difficulties include alterations in gait pattern, reduced stride and walking speed and pain-related short walking distance.[1,5,6,9,22,23,25-27]

Supporting these clinical observations, a study which includes monitoring data on 232 torture victims interviewed on average 8.4 years after exposure to torture, found that the strongest predictor of pain in the feet was reporting of systematic, general abuse of the whole body and beating of the lower extremities.[29] Although beating of the soles was not specifically explicated in the monitoring system, the authors concluded that there seems to be a strong association between exposure to falanga and long-lasting pain in the feet. 139 of the torture victims

from the baseline study were included in a ten-year follow-up study and re-interviewed.[30] It was shown that pain reported at follow-up was strongly associated with pain reported at baseline as well as locus-specific torture, and that the prevalence of pain increased considerably during the ten-year follow-up period – 63.3% reporting pain in the feet at follow-up versus 23.7% at baseline. Pain intensity at follow-up was high – on average 7.2 on a 10 cm visual analogue scale (VAS) – and almost half (47.5%) reported pain in the feet at least three to seven days a week. The study also indicated a "dose-response" relationship, as the mere amount of exposure to torture (number of applied torture methods) was a positive predictor of pain in the feet. No clinical examination was included in the study.

Clinical findings

At clinical examination reduced elasticity in the foot pads, various skin changes, soreness and coating of the plantar fascia (aponeurositis), sensory disturbances in the soles, foot dysfunction and myofascial changes in the lower extremities and abnormal gait were reported as being characteristic although not pathognomonic. These findings, however, are based on reporting from smaller observational studies including highly selected study populations.[5,7,10,15,23,25,31]

In one descriptive study from 1993[7] which includes 30 torture victims alleging exposure to falanga, clinical assessment included examination of foot pads and the plantar fascia, testing of ligaments and joint mobility in the feet and lower legs, and gait analysis. Reduced elasticity in the heel pads was found in 17 persons, in the medial foot pads in 15, and in the lateral foot pads in 11. Clinical signs of aponeurositis were diagnosed in 22 persons. No characteristic changes in the gait pattern could be

demonstrated and in four of the included torture victims there were no pathological findings at clinical examination. The authors concluded that there is a high prevalence of pathological findings in torture victims alleging exposure to falanga, and that a correct clinical examination makes the diagnosis of falanga sequelae possible. They also stressed that a normal examination should not rule out the possibility of exposure to falanga.

In a more recent study published in 2008,[5] 11 male torture victims reporting exposure to falanga and 11 age, sex, and ethnically matched controls without prior torture history were examined according to a standardised protocol.[32] All torture victims reported pain in the feet and lower legs and several, but not all, had structural changes in the feet at clinical examination, contrasting findings in the control group. Reduced elasticity in the heel pads were found in $9/11$, and soreness and coating of the plantar fascia in $6/11$. All of the torture victims reported walking difficulties and in all a compensatory altered gait pattern was observed at clinical examination.

Theories explaining the persistent pain and foot dysfunction after falanga
Several theories about causative pathological changes in the soft tissues of the feet have been put forward, primarily based on clinical observations and studies including smaller study populations:

Reduced elasticity in the foot pads
Demonstration of reduced elasticity in the foot pads has been a hallmark in clinical diagnosing of exposure to falanga torture.[7,9] The foot pads are situated under the weight bearing bony structures, where in particular the heel pads act as the first in a series of shock absorbers. The heel pad is normally a firm, elastic structure covering the calcaneus. It has

a complex internal architecture consisting of closely packed fat cells surrounded by septa of elastic connective tissue that also contain the vessel and nerve supply to the tissue.

After falanga the heel pad may appear flat and wide, with displacement of the tissues laterally during weight loading. At palpation, the elasticity in the heel pad is described as being reduced and the underlying bony structures easily felt through the tissues.

The pathophysiology of the reduced elasticity in the heel pad is thought to be tearing off the connective tissue septa, leading to deprivation of blood supply and secondary atrophy of fat cells. Once the architecture is destroyed it cannot be rebuilt, and the shock absorbing ability of the heel pad is lost. Similar findings are described involving the lateral and medial foot pads.[9]

Plantar heel pain is common in the general population and occurs in approximately 15% of all adults with foot problems.[33] Clinical evaluation of the elastic properties of the heel pad may be difficult,[12] and several conditions aside from atrophy of the heel pad fat may lead to plantar heel pain, including plantar fasciitis, calcaneal stress fracture and lesion or dysfunction of the tibial, plantar or calcaneal nerves.

Changes in the plantar fascia (aponeurositis)
The plantar fascia functions to maintain the medial longitudinal arch of the foot and assists in absorbing forces in the midtarsal joints. Abnormal biomechanical factors can influence the stress on the plantar fascia and plantar fasciitis is the most common cause of hindfoot pain in clinical practice.[34] The most prominent clinical feature is deep, aching plantar-medial heel pain and localised tenderness on palpation at the anteromedial aspect of the heel.

Changes in the plantar fascia after falanga are reported as a consequence of the repeated

direct traumas to this superficial structure. The fascia is described as thickened with an uneven coated surface on palpation, and tenderness that may be present throughout its entire length from origin to insertion. Disruption of the plantar fascia from its distal insertion has been reported based on the finding of increased passive dorsal flexion of the toes at clinical examination.[7,9]

Closed compartment syndrome
involving muscle compartments in the foot
A compartment syndrome is a condition in which increased pressure in a muscle compartment impedes blood flow and compromises the metabolic demands of the tissues within that space. In most instances the aetiology relates to a limiting noncompliant fascia surrounding the affected muscle compartment. Clinically, one can distinguish acute irreversible and chronic reversible types.

In the acute form a rapid increase in the intracompartmental pressure leads to ischemia that, untreated, may cause severe and permanent nerve and muscle damage. Classic clinical signs are tense swelling of the affected compartment and discoloration of the skin, pain on passive stretching of the involved muscle, and dysfunction of the nerves, which pass through the involved compartments.

Chronic recurrent or exertional compartment syndrome is a condition most commonly associated with overuse in well-conditioned athletes. Muscle volume increases with exercise, and a relatively noncompliant fascia may lead to abnormally increased compartmental pressure during muscle activity. It is clinically manifested by recurrent episodes of muscle cramping, tightness, and occasional weakness and numbness during exertion. Symptoms normally dissipate with a period of rest, generally in the order of minutes, but may be prolonged. The gold standard for diagnosis is compartment pressure testing.[35]

The existence of several closed muscle compartments in the foot have been documented by anatomical studies,[36] and it has been shown that crush injuries, forefoot and midfoot fractures, and calcaneal fractures are prone to the development of foot compartment syndromes.[37] Studies have also demonstrated a foot-leg communication between the calcaneal compartment, and the deep posterior compartment of the leg, and that a foot-injury alone may also cause a deep posterior compartment syndrome in the leg and vice versa.[38] Muscle contracture with claw-toe deformity is described to be the primary late sequela of a pronounced foot compartment syndrome, but the actual pressure that the muscles and nerves of the foot can tolerate is unknown.[36]

A closed compartment syndrome involving muscle compartments of the foot has been suggested to contribute to the typical pain pattern and pain-related walking impairment seen after falanga.[3] Muscle nociceptors are mechanosensitive and if tested with natural stimuli these receptors do not respond to everyday stimuli such as weak local pressure, contractions and stretch within the physiological range. However, it has been demonstrated that hypoxia can induce peripheral sensitization with a drop in receptor threshold and increase in suprathreshold responses.[39] Peripheral sensitization could therefore explain pain and soreness that persist after muscle effort in hypoxic conditions and are increased or evoked by movement. A long lasting abnormal input from muscle nociceptors could also lead to changes of dorsal horn neurons and contribute to pain amplification via central sensitization.

Peripheral nerve lesion and neuropathic pain
Neuropathic pain implies pathology of the

somatosensory system, either in its peripheral elements (peripheral neuropathic pain) or in the CNS (central neuropathic pain). Clinically, no single symptom is diagnostic for peripheral neuropathic pain, but typical complaints are stinging, burning, aching pain, often perceived as worse at night; numbness or loss of sensation of the involved area, associated with hypersensitivity and/or allodynia.

Evidence supporting the theory of peripheral nerve lesion and neuropathic pain caused by falanga is now emerging in the literature.[5,6,10,15,40] In the study by Prip et al. published in 2008,[5] sensory dysfunction involving more sensory modalities were found in the majority of the examined feet, indicative of peripheral nerve lesions including large sensory fibres and/or small fibres. The authors concluded that clear signs of a neuropathic pain component were present in 10 of 11 torture victims and that sensory findings indicated two neuropathic pain mechanisms: One dominated by a peripheral pain generator and another by irritative phenomena indicative of central sensitization. Pain in most of the feet was reported to be stimulus-dependent – evoked by mechanical stimuli as in walking – and physical measures designed to minimize the mechanical load of the soles were therefore recommended as a target for intervention.

Overload and strain
The foot is a complex structure made of several small bones with capsular and ligamentous constraints. Many movements of the foot and toes are controlled by muscles that originate from the lower leg and whose tendons are attached to the foot, whereas muscles that have both their origin and insertion in the foot itself control more precise movements. Changes in the anatomical structure of the foot and/or impaired function of the foot may lead to alterations in the biomechanical work pattern of the entire lower leg and subsequent to overload injuries, e.g. development of myofascial trigger points and musculo-tendinous inflammation, also in more remote areas. Pain arising from activation of nociceptors in these tissues may therefore contribute to the overall pain condition.

Diagnostic imaging
The use of imaging in substantiating the clinical diagnosis and documentation of falanga is not yet clarified as larger systematic studies are lacking. At present the available knowledge is mainly based on casuistic reports and studies of smaller samples.

Conventional x-ray
Fractures after falanga torture are relatively seldom. In one study, only five persons out of 59 reported fractures of the feet due to falanga. Only four had an x-ray taken and the location of the fractures were not described.[6] In a study of 11 Greek falanga victims with walking difficulties, eight had x-rays and abnormalities were found in only two. One had an enchondroma, measuring 15×18 mm lateral and plantar to the fourth metatarsophalangeal joint. In another person the radiography showed a small, periosteal calcification medially and proximally on the plantar aspect of the metatarsophalangeal joint.[3] On a casuistic basis, fractures have been reported in calcaneus, distal phalangeal, metatarsal and tarsal bone.[6,16,31,41]

Bone scintigraphy
Bone scintigraphy is a sensitive, but unspecific indicator of bone pathology and may reveal signs of bone trauma overlooked by conventional x-rays and other imaging modalities. Increased activity at bone

scintigraphy in the feet and lower legs with normal findings in conventional x-rays, computerised tomography and magnetic resonance imaging has been reported after falanga.[13,17,18,21]

Magnetic resonance imaging
MR imaging is superior in revealing soft tissue pathology. In one MRI study comparing torture victims (n=12) exposed to falanga with healthy volunteers (n=5), significant thickening of the plantar fascia was found in all the victims.[20] Apart from this, morphological changes were present. Two layers of the fascia were demonstrated: a deep, thin portion with a normal homogeneous appearance and a superficial thicker portion with an inhomogeneous appearance, possibly representing scar tissue formation. No signs of closed compartment syndrome or visible changes in the heel pads were shown in this study.

Ultrasonography
In one pilot study 11 male torture victims exposed to falanga and presenting with chronic symptoms were examined and compared to six healthy male volunteers (hospital staff).[14] Sagittal sonograms were obtained of the plantar aspect of the foot, and the thickness of the plantar fascia was measured in the midfoot, halfway between the proximal calcaneal origin and the distal insertion on the phalanges. The morphology of the entire fascia was recorded. Analogous to MR imaging ultrasonography showed morphological changes with a layered plantar fascia in all torture victims as compared to controls. In this small material a non-significant ($p < 0.15$) difference was found as concerning the thickness of the plantar fascia (median: 0.184 cm in torture victims versus 0.169 cm in controls). No signs of detachment of the distal insertion of the fascia were found at dynamic examination (passive dorsal flexion of the toes). The authors concluded that ultrasonography, which is a readily performed and well-tolerated examination method, may prove useful in future studies of the sequelae after falanga and in connection with medico-legal assessment of torture.

Management of the long-term sequelae after falanga

Management of the persistent pain and pain-related disability seen after exposure to falanga is based on clinical experience and contributions from other specialities, e.g. sports medicine and orthopaedics. As of today, there are no systematic studies addressing treatment and outcome of treatment after this specific form of torture.

Various forms of physiotherapy, including manual therapy, graded exercises and balance training based on an individual, systematic assessment and aiming at pain reduction, improved function and development of active coping skills has been recommended.[1,9,22,27] Taping, stabilising bandages, shoe modification and shock absorbing foot orthoses are likewise recommended in order to improve gait and the level of ambulation.[1,9]

No recommendations on pharmacological pain treatment has been put forward, but Transcutaneus Electrical Nervous Stimulation (TENS) and education in self management of pain based on a cognitive-behavioural approach have been suggested as an integral part of pain management.[1]

In one study, conducted at a Danish rehabilitation centre, the aim of the study was to estimate the change in pain reporting (prevalence and level of pain in head, back and feet) at 9 and 23 months follow-up.[42] 69 torture victims were included out of which 71% had been exposed to falanga. Of the 69

torture victims interviewed at baseline 84% received comprehensive, multidisciplinary treatment consisting of medical assistance, physiotherapy, psychotherapy, and social counselling. Despite intervention, no change in symptom prevalence or symptom level could be demonstrated – 59% reporting pain in the feet at baseline versus 67% at 9 months and 70% at 23 months follow-up. The authors concluded that persistent pain related to locus specific torture presents a considerable challenge to future evidence-based development of effective treatment programmes.

**Future perspectives
– what do we need to know?**
Seen from a clinical perspective, the treatment approach to the persistent pain and pain-related disability seen after falanga still lacks precise standardisation – reflecting an incomplete understanding of the underlying pathophysiological mechanisms, scarcity of validated examination methods and absence of outcome research.

Future research should therefore focus on:
- evaluation of key pain mechanisms including the possibility of a predominant neuropathic pain component and/or pain amplification due to peripheral and/or central sensitization
- evaluation of specific torture induced soft tissue lesions including the possibility of a chronic compartment syndrome involving foot muscle compartments and muscle compartments of the lower legs
- the validity and reliability of applied clinical test and overall diagnostic accuracy of clinical examination
- outcome of non-pharmacological treatment based on multidimensional outcome measures relevant to chronic pain populations

- efficacy of pharmacological pain treatment including analgesics used in the treatment of other neuropathic pain states (antidepressants and antiepileptics).

Further knowledge is needed in order to advance evidence based clinical guidelines and to improve treatment efficacy.

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