

Plantar fasciitis

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Definition

Plantar fasciitis is currently thought to be a degenerative condition originating from overuse. Suggestion has been made that it should be called more correctly 'tendinosis' or 'fasciosis' as investigation shows evidence of relatively little inflammation.

The plantar fascia is a multilayered fibrous aponeurosis that originates from the medial calcaneal tuberosity. It radiates distally becoming wider and thinner. It inserts into the flexor sheath and the volar plate and periosteum of the base of the proximal phalanx of each toe.

Aetiology

The condition typically is precipitated by biomechanical stress. It is common, affecting 10% of the population at some time during life.²

Gastrocnemius and soleus (together called the triceps surae) constitute one of the most powerful muscles in the body after gluteus maximus and quadriceps femoris.³ Tension in the belly of the triceps surae pulls through the pulley mechanism of the calcaneus on the sub-talar joint and the plantar aponeurosis. Contraction causes plantar flexion, adduction and supination. Fibres are thought to rupture or pull off the

medial calcaneal tuberosity. They set about repairing but are pulled off again resulting in thickening, rigidity and further shortening.

Gastrocnemius crosses both the ankle and knee. It is held shortened during sitting (both joints flexed) and tends to tighten in sedentary people.

Factors altering the mechanics of the foot such as flat feet with excessive pronation, pes cavus with rigid high arches, and lack of arch support can all contribute to the development of plantar fasciitis.

A change in the amount of standing, walking or stair climbing and change in the terrain can all play a part in the causation of this condition.

Symptoms

The major symptom is sharp lancinating pain. It is typically well localised, being felt over the origin of the plantar fascia from the medial calcaneal tuberosity.

The pain is aggravated by standing, and is worse at the beginning of exercise, easing with activity. It is typically worst on first putting one's feet on the floor in the morning or on getting up after sitting for a period.

Signs

Tenderness is most often localised over the medial calcaneal tuberosity. However, sometimes the tenderness is generalised and includes most of the fascia.

Tightness of the calf muscles restrict dorsiflexion of the ankle and through the calcaneus tightens the plantar fascia, thus restricting extension of the toes. This tightness should be tested with knee straight (gastrocnemius on stretch) and knee bent (so-

leus only on stretch, gastrocnemius not on stretch).

Investigations

Investigations are rarely either helpful or necessary.

X-rays are often ordered as there is a frequently held misconception that plantar fasciitis is caused by a calcaneal spur. There is an association in up to 50% of cases. However spurs are common, being found on x-ray in 27% of asymptomatic people.⁴

They are thought to be traction spurs resulting from tension, which causes microtrauma and scarring with calcification extending into the repairing enthesis.

MRI and ultrasound^{5,6,7} may show swelling within the fascia and may occasionally be of help in difficult cases.

Management

The writers of the Cochrane Review⁸ of interventions for treating plantar heel pain, came to the following conclusions: *'Although there is limited evidence for the effectiveness of local corticosteroid therapy, the effectiveness of other frequently employed treatments in altering the clinical course of plantar heel pain has not been established in comparative studies. Well designed and conducted randomised studies are required.'*

Thus, as in so many areas where meta-analysed data is presented, there appears to be a trend towards a nil effect. The meaninglessness of some of the data included in the review is highlighted by its containing both the following sentences in the same paragraph. Firstly, *'There was no evidence for the effectiveness of injected corticosteroid'* and later, *'There was lim-*

ited evidence of the superiority of corticosteroid injections over orthotic devices.' Such confusion offers little help to the therapist facing a patient who has anecdotal experience of someone being helped greatly by a particular therapy. Failure to take heed of this experience means that patient is likely literally to vote with his/her feet.

Plantar fasciitis is typical of overuse syndromes and is commonly treated initially by PRICE (although the scientific evidence is not strong).

1. PRICE

Price is an acronym for protection, rest, ice, compression and elevation:

- *Protection* can be by support such as strapping, arch supports, and avoiding excessive loading at full extension as happens when walking uphill.
- *Rest* is relative and can involve simple restrictions such as cycling (using the heel instead of the toes if necessary) rather than walking.
- *Ice* is applied for 10 minutes after each bout of exercise and at the end of the day.

2. Activity

Activity is best continued but may need alteration of usual training, as pain may make jogging impracticable. Alternatives such as swimming or 'running' in the pool are examples of such exercise.

Once symptoms start to settle, walking can be reintroduced gradually as symptoms allow. Support should be provided until the foot structure and biomechanics have been restored.

3. Stretching

Stretching should really be thought of as 'releasing' as too much force can damage the repairing enthesis causing microtrauma and further

degeneration. This perpetuates the condition.

Muscle release is done by taking the muscle to its barrier of movement, activating it for 10 seconds and then relaxing and moving firmly but not forcefully to the new barrier of motion over a period of 20 seconds.

Sitting for long periods with knees bent tends to shorten gastrocnemius. High heels should be avoided as they have the effect of shortening the entire calf muscle complex.

Technique

The patient faces a wall with their feet pointing straight ahead. While keeping the knees straight they lean forward until the heels are on the point of leaving the ground. At that point they rise up on their toes slightly so that the heel leaves the ground by approximately a centimetre and hold this position for 10 seconds. They then lower the heels back to the floor and gently but firmly ease their pelvis forward towards the wall for 20 seconds. This puts both gastrocnemius and soleus on stretch and affects a post isometric relaxation release and elongation. This is repeated from the new barrier and then repeated a third time and done four times a day to train the muscle into the habit of being longer.

4. Exercises

The foot has three arches which give the foot the shape of a jib swollen by the wind. All three alter with plantar flexion in order to give maximal propulsion at step-off. The medial arch is critical in this condition as it flexes the most. Excessive pronation causes increased tension on the medial aspect of the fascia and thus on the medial calcaneal condyle.

This traction is countered by use of the foot supinators and by the intrinsic muscles of the foot which can be strengthened as described below.

Key Points

- Plantar fasciitis is common, affecting 10% of the population at some time during life.
- Factors altering the mechanics of the foot such as flat feet with excessive pronation, pes cavus with rigid high arches, and lack of arch support can all contribute to the development of plantar fasciitis.
- Tenderness is most often localised over the medial calcaneal tuberosity. However, sometimes, the tenderness is generalised and includes most of the fascia.
- Plantar fasciitis is typical of overuse syndromes and is commonly treated initially by PRICE (although the scientific evidence is not strong).
- A number of studies have reported positive outcomes from ultrasound guided steroid injection.

Technique

1. Spread a towel on the floor, then gathering it up into a ball, using the toes, exercises the intrinsic muscles.
2. Endeavour to pick up a tennis ball off the floor with the foot. The tennis ball can be left on the floor at the usual place of work. Rolling the foot back and forwards across it massages the area of fasciitis and can help mobilisation.

5. Taping

Strapping can provide support for the medial arch of the foot. One study⁹ of conservative modalities showed taping and orthoses more effective than anti-inflammatories.

Technique

Firm inelastic tape is applied diagonally across the foot from the base of the 5th toe fanning out across the arch to the dorsum over to the top of the foot from the cuboid to the navicular.

6. Orthotics

Orthotics of various types were combined with simple stretching in a study by Peffer¹⁰ comparing stretching plus one of four different types of orthotic device v. stretching alone. The percentages improved in each group were (1) silicone insert 95%; (2) rubber insert, 88%; (3) felt insert 81%; (4) stretching only, 72%; and custom orthosis 68%. Medial arch support can be given by simple arch supports, and by orthotics incorporating medial wedging. The last can be custom made for the patient or bought across the counter (as, for example, Formthotics brand which are well designed, reasonably priced and resilient).

No randomised trials evaluating orthotic devices were identified in the Cochrane Review.

7. Splints

There is limited effectiveness of dorsiflexion night splints reducing pain.¹¹

8. Electrical therapies

There is no evidence to support the effectiveness of therapeutic ultrasound,¹² low-intensity laser therapy,¹³ exposure to electron generating device¹⁴ or insoles with magnetic foil.¹⁵ There is limited evidence for the effectiveness of low energy extracorporeal shock wave therapy¹⁶ in reducing night pain, resting pain and pressure pain in the short term (12 weeks).

9. Steroid injection

Only one randomised small study¹⁷ of 19 patients met inclusion criteria for the Cochrane Review. This was

done half a century ago and showed no benefit.

A three-pronged study of steroids v. orthosis v. steroid + orthosis¹⁸ demonstrated limited advantage of steroid over orthosis.

There have been a number of studies^{5,6,7} using ultrasound to assess the effects and in some cases guide the accurate administration of steroid. These studies have reported positive outcomes from ultrasound guided steroid injection.

Conclusion

Plantar fasciitis frequently presents a difficult therapeutic challenge requiring patience, support and a combination of a number of treatment options. In common with many of the overuse syndromes it responds best to continued supported activity, avoiding excessive loading, and to release of muscle tension from the affected enthesis.

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