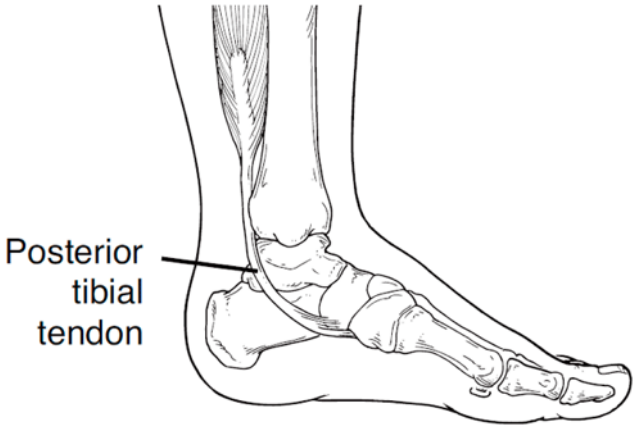
Posterior tibialis tendon dysfunction (PTTD)

What is posterior tibialis tendon dysfunction?

Posterior tibialis tendon dysfunction (PTTD) is a muscle tendon issue usually affecting one foot involving inflammation and degeneration. If left untreated, the tendon can rupture and require surgery. PTTD can occur acutely from specific tendon injury but tends to develop over time and is sometimes called an ‘overuse’ injury or tendon ‘insufficiency’. PTTD is a major cause of developing adult acquired flat foot deformity showing a change in foot shape as the arch flattens over time resulting in bone deformity and osteoarthritis.

Anatomy

The posterior tibialis muscle is long and deep, originating in the lower leg between the tibia and fibula bones and forms the posterior tibialis tendon behind the inside ankle bone. The tendon attaches the muscle to bones in the arch and sole of the foot. By storing and releasing energy, it supports and stabilizes the arch of the foot, enables you to rise on tiptoes and point your foot inwards. Activities such as walking, running or standing on tiptoes depend upon a healthy functional posterior tibialis tendon.



Symptoms and characteristics of PTTD

- Pain, ache, inflammation (warmth, swelling and/or redness), stiffness behind or under your inner ankle or along your instep. You may be tender when you touch along the course of the tendon.
- Difficulty standing, walking, or running – discomfort is usually worse on standing and for the first steps but can become constant and for prolonged time as the injury progresses.
- Weakness, pain and inability to stand on tiptoes on the affected foot.
- Heel rolling inward, ‘duck-footed’ or ‘too many toes’ sign (A) and change in foot shape as it becomes flatter through time (B)

- The change in foot shape creates increased stress on other foot structures and possibly pain on the outside of the ankle or foot and the knee.

PTTD - risk factors and causes

Excessive strain/abnormal load – already having flat feet or over-pronating (feet roll inwards), being hypermobile, being overweight, exercise intensity or duration change (especially sudden change), shoe or equipment change and stiff or weak calf muscles can each present excessive stress and micro tears to the tendon.

Age – the risk of developing PTTD increases with age as ageing naturally leads to degenerative changes in tendons, ligaments, and muscles. It is most common in women aged 40 and above.

Conditions – certain conditions such as diabetes, hypertension, steroid use, or inflammatory arthritis can also contribute to a higher risk of developing PTTD.

Trauma – specific injury to the tendon from high impact or excessive force.

Warning

If your symptoms are a result of a sudden trauma, your foot is persistently painful or keeping you awake at night, you have a high temperature or you feel hot and shivery it is recommended you contact your GP or attend an emergency department to receive medical attention. People with diabetes experiencing redness, swelling or warmth on their foot should also attend an emergency department. We strongly recommend that you do not weight bear on the foot until a full examination by a medical professional, to prevent further damage.

How is PTTD diagnosed?

Your doctor or health professional will consider your medical history, ask questions regarding your symptoms and perform a seated and standing physical examination.

Progression of PTTD

There are four stages of PTTD indicated by increasing symptoms and physical deformity. Treatment options depend on stage. Without treatment the condition progresses with rigid flatfoot and osteoarthritis developing.

Stage 1

- Tendon is inflamed and pain and/or swelling is felt at the inside of ankle and/or arch.
- Little or no change to foot shape and able perform a one leg heel raise.

One Leg Heel Raise

- Treatment options include rest from activity which overloads the tendon, progressive loading exercises and for pain reduction use ice, supportive shoes, arch support insoles (Gomez-Jurado et al 2021) and a brace such as the Aircast with adjustable aircell.

- Exercises are based on gradual and progressive load increase, so the tendon has time to heal and regain the strong elastic qualities necessary for normal functioning. The posterior tibialis tendon has a poor blood supply so can take a long time to heal with no quick fix.

Stage 2

- Tendon is partially torn/ruptured with more severe pain and swelling at the ankle and instep and possibly on the outside of the ankle or foot.
- Increased flattening of the foot arch with difficulty or inability to perform a heel raise.
- Unless ruptured, treatment is the same as Stage 1 with more rigid insole/brace modification and tendon surgery if treatment fails or is ruptured.

Stage 3

- Tendon is torn/ruptured, rigid flatfoot develops with arch collapse, fixed heel deformity and inability to perform single heel raise.
- Arthritic changes in the foot.
- Rigid ankle foot orthoses (AFOs), brace/boot or casting are recommended.
- If non-surgical rehabilitation options are exhausted, surgery may be suggested. Surgery presents with considerable risks of infections, swelling, pain, stiffness and haematoma plus a time of limited activity to allow healing. There are several surgical options and often more than one procedure is performed at the same time. Options are: -
    - Tenosynovectomy – the surgeon will clean and remove any inflamed tendon tissue.
    - Osteotomy – a bone portion may need removing and the heel bone is realigned and fixed with a screw.
    - Tendon transfer/fusion – fibres from another tendon are used to repair the damaged posterior tibial tendon.
    - Lateral column lengthening – a small wedge-shaped piece of bone is removed from the hip and placed on the outside of the heel bone to help realign the joints.

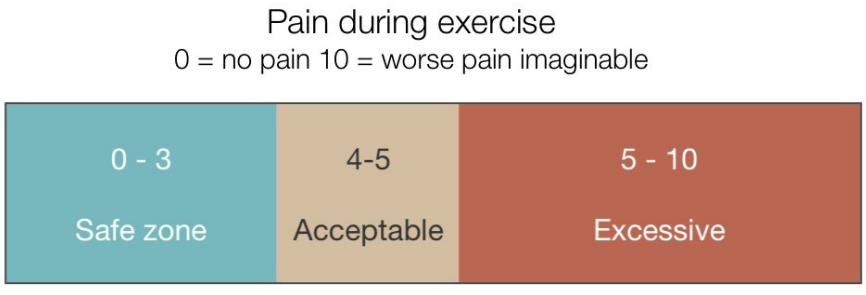
Stage 4

- The same signs as Stage 3 are evident plus ankle joint arthritis/deformity. This may require hind foot fusion surgery (arthrodesis) - joints are fused together to stop the condition progressing further. This will provide stability and pain relief but side to side foot movement is lost.

Symptom management

1. Aim for a **healthy body weight** for recovery and to prevent reoccurrence.
2. **Stable footwear with fastening**, such as a stiff rocker soled walking shoe or boot.
3. **Pain management** – applying ice to the affected area will help reduce pain and swelling. Use bagged crushed ice wrapped in a towel to prevent ice burn for a maximum of 10-20 minutes every two hours. With severe or lasting pain, it may be helpful to take Paracetamol.

Moderate pain is acceptable during exercise as moderate tissue stress stimulates tendon regeneration. Follow the system below to help you with recognising therapeutic pain levels.



It is acceptable to feel some discomfort but not significant pain. If you are worse tomorrow, you've done too much.

Range of motion – it is important to keep the ankle mobile during recovery.

Lying or sitting barefoot, use your toes and ankle to draw letters of the alphabet.

Calf stretch – the calf/Achilles tendon is often tight with PTTD/AAFF.

Sit with knee straight and towel looped around involved foot. Gently pull until stretch is felt in calf. Repeat with knee slightly bent feeling stretch lower in calf.

Load reduction

While the tendon is painful, it is important to reduce activities that aggravate the tendon by load reduction – this allows the tendon fibres to regenerate. However, complete rest is discouraged, and the following exercises will provide an exercise level that the tendon can tolerate aiming to slowly increase repetitions and load within acceptable pain limits.

While seated with feet off the ground slowly bring soles of feet together. Press inwards and upwards against the resistance of each other.

Seated with feet flat on the floor, slowly raise heels then return heels to the floor. When this is easy, press on knees or put weight on lap to increase the load.

Progress to recovery when load reduction exercises can be completed within pain safe zone (0-3)

Recovery

You can wear shoes and insoles/brace to be able to perform the exercises and to keep pain within acceptable levels.

1) Perform heel raises with heels turning inwards. To progress, put a tennis ball between the heels.

2) Walk on the outside of your feet, slowly and carefully to keep balance.

3) Eccentric exercises offer benefit in treating PTTD (Ross et al, 2018). On a step, allow your heels to drop below the level of the step while counting to five, then push up into tiptoes counting two. Repeat to tire. When performed pain free, progress to the next exercise.

4) On a step, push up into tip toes through both feet counting to two, shift your weight to the affected side only, focus on slowly lowering through that side only taking 5-10 seconds to lower back down. Return to start and repeat to tire.

Once able, push up into tiptoes and lower as above but on the affected side only.

Progress to rebuild when recovery exercises can be completed within pain safe zone (0-3)

Rebuild

Rebuild is a progression from recovery with the addition of external weight such as the use of a heavy rucksack with the standing exercises. Staying within acceptable pain levels and performing slowly at 3-8 repetitions, aim for 70-90% of maximum intensity/loading capacity for most benefit (Morrison & Cook 2022; Radovanovic et al., 2022). You can also change from wearing a brace to an orthotic or removal of the orthotic and shoes to barefoot. In this stage you can consider returning to more strenuous walking, gentle running or jumping.

Sources of information

Gomez-Jurado, I., Juarez-Jiminez, J.M., & Munera-Martinez, P.V (2021). Orthotic Treatment for stage I and II posterior tibial tendon dysfunction (flat foot): A systematic review. Clin Rehabil. 2021 Feb;35(2):159-168.doi:10.1177/0269215520960121. Epub2020 Oct.11. PMID: 33040609.

Morrison, S. & Cook, J (2022). Putting “Heavy” into Heavy Slow Resistance. Sports Medicine, 52: 1219-1222.

Radovanovic, G., Bohm, S., Peper, K,K, Arampatzis, A &Legerlotz. (2022). Evidence-based high-loading tendon exercise for 12 weeks leads to increased tendon stiffness and cross-sectional area in achilles tendinopathy: a controlled clinical trial. Sports Medicine - Open 8:149

Ross, M.H., Smith, M.S., Mellor, R. & Vincenzino, B. (2018). Exercise for posterior tibial tendon dysfunction: a systematic review of randomised clinical trials and clinical guidelines. BMJ Open Sport & Exercise Medicine.

Important information

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After reading this information are there any questions you would like to ask? Please list below and ask your nurse or doctor.

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Reference

The following clinicians have been consulted and agreed this patient information:
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Next review date: May 2027
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