

Centres de santé des travailleurs (ses) de l'Ontario Inc.

Plantar Fasciitis

What is Plantar Fasciitis?

- Plantar fasciitis is inflammation of the plantar fascia in your foot.
- Also been referred to as:
 - Painful heel syndrome / Subcalcaneal bursitis / Subcalcaneal pain / Medial arch sprain / Stone bruise / Calcaneal periostitis / Neuritis / Subcalcaneal spurs / Calcaneodynia / Policemen's heel / Heel pain syndrome / Runner's heel



What is Plantar Fasciitis?

- One of the most common causes of heel pain which accounts for approximately 15% of all foot-related complaints.
- Approximately 65% of patients are overweight.
- Peak incidence between 40 and 60 years.
- Tends to occur more in women than men at a ratio of 3:1.
- Approximately 65% of patients are overweight.



Anatomy

- The plantar fascia is a structure that runs from the front of the heel bone (calcaneus) to the ball of the foot.
- It is composed of three bands of dense collagenous connective tissue bundles arranged in sheets and arises from the posteromedial portion of the calcaneal tuberosity on its inferior aspect.
- This dense strip of tissue helps to support the longitudinal arch of the foot by acting similar to the string on a '





Human Gait Cycle (Walking)

- Gait the manner or style of walking
- Gait cycle repetitive pattern involving steps and strides





Human Gait Cycle (Walking)

- Single step consists of two parts:
 - Stance phase occupies 60% of the gait cycle, during which one leg and foot are bearing most or all of the bodyweight
 - Swing phase occupies 40% of the cycle, during which the foot is not touching the surface and the bodyweight is borne by the other leg and foot
 - In a two-step cycle both feet are in contact with the floor at the same time for about 25% of the time (double support).





Human Gait Cycle (Walking) - Phases

- Heel Strike (Initial Contact) begins the moment the foot touches the ground and is the first phase of double support
- Loading response phase Body absorbs the impact of the foot
- Midstance body is supported by one single leg and begins to move from force absorption at impact to force propulsion forward
- Heel off Begins when the heel leaves the floor
- Toe off (pre-swing) toes leave the ground



Function of the Plantar Fascia

- During the gait (walking) cycle the plantar fascia functions during single support
- During this time, the foot structures experience a higher vertical ground reaction force and larger acceleration than at any other time in the gait cycle.
- As the heel lifts, the plantar fascia will start to tense
- The higher the heel lifts, the tighter the plantar fascia will get.
- It acts to elevate the foot's medial longitudinal arch, regulates movement about the ankle, and distributes forces evenly across the foot during loading (windlass mechanism).





Symptoms of Plantar Fasciitis

- The primary symptoms of plantar fasciitis include:
 - Pain in the center of the heel with initiating walking.
 - Resolves as walking continues
 - Localized tenderness.
 - Pain with the first few steps after getting out of bed, or after a long period of rest.
 - Pain when climbing stairs.
 - Greater pain after (not during) exercise or activity.
 - Usually one foot (not always)
 - + Stiffness, swelling, tight Achillies tendon





Diagnosis of Plantar Fasciitis

- Usually, a clinical diagnosis based on history and clinical examination
- Clinical Examination
 - Area of localized tenderness on the bottom of your foot, just in front of your heel bone
 - Limited dorsiflexion, or "up" motion, in your ankle
 - Stiffness or tightness of the arch in the bottom of your foot.
 - Stiffness or tightness with your Achilles tendon.
- History
 - Exclude other causes of foot pain
 - The absence of symptoms from other conditions, such as insertional Achilles tendinitis, calcaneal (heel) stress fracture, or plantar nerve entrapment
 - A high arch or flat foot





Differential Diagnosis/Similar Conditions

- Neurological
 - Nerve entrapment (Tarsal Tunnel Syndrome), Neuropathic Pain, S1 Radiculopathy (Sciatica)
- Skeletal
 - Calcaneal stress fracture, bone contusion, osteomyelitis, neoplasm rare, Pagets disease, Haglund deformity
- Soft Tissue
 - Achilles Tendinopathy, Tendinitis of Other Tendons, Fat Pad Atrophy, Bursitis, Painful Heel Pad Syndrome (runners), Plantar Fascia Rupture
- Inflammatory disorders
 - Inflammatory Arthritic Conditions, Sarcoidosis



Differential Diagnosis/Similar Conditions





Diagnosis of Plantar Fasciitis - Testing

- Not routine
- Labs not needed
- If patient is not responding to conservative care imaging may be required
 - X-rays to rule out other conditions such as fracture, arthritis or heel spur
 - Ultrasound to detect an increase in the thickness of the fascia
 - MRI for finding bone fracture or infection







- Many of the factors that can affect plantar Fasciitis are related to Newton's Third Law of Motion:
 - "For every action, there is an equal and opposite reaction."
- Ground Reaction Force (GRF) when we walk (single support phase) our foot impacts the ground (exerts force) and at the same time the ground exerts an equal force onto the foot.
- GRF is affected by factors such as:
 - Hard floor surfaces
 - Footwear (hard sole, weight)
 - Speed





Footwear

- Shoes with inadequate cushioning (hard sole) or poor construction may lead to additional micro-tears with repetitive traction, resulting in reparative inflammatory responses in the plantar fascia (Rajput & Abboud, 2004).
- A sufficient work boot must provide heel and arch support in order to reduce the strain placed on the plantar fascia.
- They should also be relatively flexible to allow for a proper toe off (Young et al., 2001). The feet make a rolling motion with every step taken; as a result, the boot needs to bend along with the foot (Young et al., 2001). If it remains stiff, unnecessary pressure is applied to the sole of the foot, irritating the plantar fascia (Young et al., 2001).



Comparison of GRF for soft padded soled shoe (solid line) to hard soled shoe (dashed line)



- Stair Climbing
 - We ascend and descend stairs using out toes.
 - Places the metatarsal joints in a state of dorsiflexion until the next foot takes over support.
 - Same mechanism that occurs during toe off (normal gait cycle) except that the position is held for a longer period of time depending on the number of stairs to be climbed.
 - Results in increased stress being placed upon the plantar fascia.
 - In simple terms, the plantar fascia is stretched and subject to micro tears during stair climbing and descent
 - Greatly increases with the use of rigid soled footwear such as steel-toed safety boots which requires addition effort to push off with the toes.







- Increased Body Weight
 - Alters a person's centre of gravity for which the body must adapt to this change.
 - Increases the amount of ground reaction force due to the weight gain.
 - Riddle at al. (2003) stated that "Individuals who spend the majority of their workday on their feet and those whose body-mass index is >30 kg/m² are also at increased risk for the development of plantar fasciitis."





Change in centre of gravity with weight gain.



- Foot Conditions
- Flat Feet (Pes planus)
 - Causes over-pronation which occurs in the walking process when a person's arch collapses upon weight bearing, causing the plantar fascia to be stretched away from the heel bone.
- High Arch (Pes cavus)
 - Causes excessive strain on the heel because the foot does not effectively evert or absorb shock





- Leg Length Discrepancy
 - Uneven distribution and transmission of ground reaction forces to the feet.
 - Compensatory mechanisms like excessive hip and knee flexion, and excessive hip circumduction all increase the stress and tensile forces on the plantar fascia.
 - Plantar fasciitis commonly affects the longer limb because greater forces are transmitted to the foot on the longer side.





- Tight Achilles tendon
 - Results in inadequate dorsiflexion stretching the plantar fascia





- Genu valgum (Knocked knee)
- Is when the knees angle in and touch each other when the legs are straightened.
- Genu valgum has its main point of contact with the ground on the inside of the foot. With this rotation, extra strain is placed upon the plantar fascia.





Over Pronation

- Results in excessive foot mobility, which increased the level of stresses applied to the plantar fascia through plantar fascial elongation.
- Alters centre of pressure and application of GRF



- Age
 - As we age, the very important fat pad that makes up the fleshy portion of the heel becomes thinner and degenerates.
 - This leads to inadequate padding on the heel and chronic pain in this area.



Gait Analysis

- Important to look for correctable biomechanical factors
- Personalized treatment plans
- Prevention of recurrence
- Monitoring Progress (especially during rehabilitation)

By Whom

- MD
- PT, DC
- Chiropodist, Podiatrist



Conservative Treatment of Plantar Fasciitis

- Rest Activity modification
- NSAIDS ibuprofen or naproxen reduce pain and inflammation.
- Ice rolling your foot over a cold-water bottle or ice for 20 minutes is effective. This can be done 3 to 4 times a day.
- Supportive shoes, inserts and orthotics.
- Stretching
- Taping can help protect the fascia and allow time for healing to occur.
- Shockwave Therapy initiate a healing process in soft tissue injuries by sending pulses of pressure waves (sound) through the skin
- Casting prevents foot from moving
- Cortisone injections
- Platelet Rich Plasma injections
- Dry needling





Surgical Treatment of Plantar Fasciitis

- 90% respond to conversative treatment
- If no improvement after 12 months surgery may be an option
 - Gastrocnemius recession surgical lengthening of the calf (gastrocnemius) muscles
 - Partial plantar fascia release partial cut is made at plantar fascia insertion at the heel (the spot where the ligament attaches to the bone) to relieve tension in the tissue. If there is a large bone spur, it can also be removed.



- Proper footwear
 - Weight
 - Solid/Rigid Sole

	Steel Toe	Composite Toe
Material	Steel toe caps	Carbon fiber, Kevlar, plastic, and/or fiberglass
Price	Cheaper	More expensive
Weather	Cold in winter	Thermal Insulation
Weight	4 lbs.	2 lbs.



- Proper footwear Orthotics
 - Help to maintain arch of foot
 - Can be used in work boots







- Work Surfaces
 - Walking on hard surfaces increase the ground reaction force
 - Use anti-fatigue mats if you stand for prolonged periods of time
 - Some work boots have anti-fatigue insoles to reduce impact
 - Anti-fatigue over-shoes to reduce impact





- Avoid flip flops
 - Need padding and cushioning
- Exercises
 - Avoid high impact activities running
- Diet/Weight Loss
 - Reduces ground reaction force





Workers Compensation - Denied

- The Panel acknowledged the mainstream view that plantar fasciitis is usually not considered to be related to occupational factors:
 - However, Decision No. 58/12 highlighted the fact that the characteristics of each individual worker are an important factor in the likelihood of their developing plantar fasciitis, and that the activities that an individual is engaged in serve as possible causative factors as well.
 - The Panel was satisfied that the worker's prolonged walking and standing at work, coupled with her use of inappropriate footwear on the job, significantly contributed to the onset or development of plantar fasciitis.
 - While those work-related factors may not have been the sole causes of her plantar fasciitis, the factors combined to play more than a de minimis role in her development of the condition.



Workers Compensation - Denied

- The worker did not have entitlement for plantar fasciitis.
 - The condition was not a disablement from the nature of the worker's work.
 - Evidence did not support the claim of prolonged standing and walking while wearing safety boots.
 - There was no consensus in the medical community concerning the causes of plantar fasciitis.



Workers Compensation - Accepted

- Letter carrier had entitlement for plantar fasciitis.
 - Condition was a disablement from the nature of her work.
 - There was supportive medical opinion from the worker's family doctor and from her physiotherapist.
 - Condition was directly caused by the worker's workplace duties, including the lengthy mail route and uneven surfaces on which the worker had to walk.



Workers Compensation - Denied

- A letter carrier did not have entitlement for plantar fasciitis.
 - The condition was not a disablement from the nature of her work.
 - The Panel noted that a Tribunal medical discussion paper indicates that the causes of plantar fasciitis remain uncertain.



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