

Common foot injuries in endurance athletes

For an athlete to understand the prevention and treatment of foot injuries, he must have some knowledge of the anatomy of the foot.

There are more than 26 bones in the foot, all of which articulate (to a greater or lesser extent) with their neighbours. The foot is not a solid lump of bone to be jammed in to a pair of ill-fitting running shoes, and forgotten about! Divided in to 3 parts, the foot is constructed from: **the tarsal section**, which is also known as the rear-foot, the **metatarsal section**, which is made up of 5 bones which fan out from the rear foot: **the phalanges**, or bones of the toes.

There are 4 arches in the foot: inner and outer arches running the length of the foot, a transverse (side-to-side) arch running on top of the foot, and a transverse arch which runs across the sole of the foot, under the "knuckles" of the toes. These arches help to strengthen the foot, and also give spring to the movements. Should any of the arches become weak or over-strained through incorrect exercise, poor posture, obesity, or ill-fitting footwear, the supporting soft-tissues will stretch, the arch collapses, and the mechanical integrity of the foot is reduced.

To cover all possible foot injuries in this article would be over-ambitious, so we will concern ourselves with some of the more common disorders arising in distance runners.

Morton's metatarsalgia

If the anterior (front) transverse arch collapses, the metatarsals will move closer together. The space between the "knuckles" of the toes is small, but in a healthy foot there is space for the nerves which supply the toes. If that space is reduced, as it is when the arch collapses, the nerve can be trapped. This usually occurs between the 3rd and 4th toes, rarely the 1st and 2nd, or 4th and 5th. The toes affected may go white and numb, and the runner will complain of pain in the forefoot, often describing it as "running with a stone in the shoe".

Treatment will include assessment of footwear (check the width fitting, and make sure that the sole is not too worn or thin, as direct trauma will aggravate this condition), orthotics may be recommended. Exercises should be prescribed to tone the muscles which help to support the arch. Ice post-training will aid the reduction of inflammation in the region, as can the use of non-steroidal anti-inflammatory (NSAID) gels. In stubborn cases, steroid and/or pain-killing injections can help.

Do not confuse this condition with the symptoms of a March fracture.

March fracture

A stress fracture of the metatarsals is known as a March fracture, because it was first described as a condition amongst army recruits, marching with heavy loads. The condition usually arises as a result of unaccustomed loading of the bone, eg a sudden increase in exercise intensity. It is particularly common in adolescents, and middle-aged runners.

The 2nd or 3rd metatarsals are the most susceptible to this injury, which results in pain in the forefoot, aggravated by impact. The onset is sudden (unlike the Morton's metatarsalgia, which usually builds up gradually), and the foot will be swollen over the fracture site. It is very often more painful on the dorsum (top) of the foot.

Treatment is often conservative in approach: rest from weight-bearing for 4-6 weeks. Some cases require plaster-cast or the equivalent. Advice on the return to training is essential, since it is often poor training regimes which are the origin of this problem.

Plantar fasciitis

Running the length of the sole (plantar aspect) of the foot is a thin layer (fascia) of muscle. If this layer gets injured in any way, a fasciitis can be started. This condition can be very uncomfortable, and it is worth treating very early on.

The fascia helps to support the longitudinal arches of the foot, especially the medial (inner) arch. Anything which causes this arch to flatten or distort will have an impact on the plantar fascia. Yet again ill-fitting or poorly made shoes can have a major impact on the onset of this condition. The long arch must be supported by the shoe, both inside with arch support cushioning, and also by the inner edge of the shoe itself. There is no point in putting designer orthotics in a shoe if the shoe itself is unsupportive.

Treatment of this condition is multi-faceted: rest, orthotics, choice of footwear, assessment of gait and running style, physical therapy (massage, articulation etc), exercises, NSAIDS, steroid injections.

Do not be surprised if your therapist looks at your standing posture, and checks your back, hamstring and calf-muscle tensions. Many foot problems are the result of injuries or poor adaptations elsewhere in the body, and with plantar fasciitis is commonly the case.

Running Gait

The foot forms an interface between the body and the ground. It is designed to accommodate uneven surfaces, while maintaining balance, and also propelling the body forward. Because the feet are the foundations of the body, if there is an abnormality in a foot it may have an impact higher up.

Normal foot action when walking or running

The heel hits the ground on the lateral (outside) edge. Here it is in a position of supination. The foot rolls forward, and flattens inward to the medial (inside) edge. The flattening arch helps to dissipate shock. The movement from outside edge to inner edge is called pronation. THIS IS NORMAL!. The foot continues to roll forwards, and slightly outwards, to transfer weight on to the first 2 toes for "toe-off". The longitudinal arch will have tightened to provide a strong leverage just before the foot leaves the ground.

Over-pronation

After heel strike the foot rolls quickly and heavily inwards. The arch remains flattened on toe-off, with the ankle tilted inwards.

Causes of over-pronation: Leg length discrepancies, genuvarum and valgum (knock-knees and bow legs) flat feet.

Problems resulting from over-pronation: plantar fasciitis, stress fractures, achilles tendonopathies, medial knee problems, hip and/or low back problems.

The over-pronating runner needs a firm shoe with good support on the medial aspect of the shoe. The shoe should have a large medial post, a firm mid-foot shank, and a strong, supportive upper.

Over-supination

The runner lands on the very edge of the foot, then rolls forwards on the outside edge of the foot, before a slight pronation just before toe-off. The long arch does not flatten, so shock is not dissipated well by the foot, and is transferred elsewhere up the body.

Causes of over-supination: leg length discrepancies, genuvarum, congenital high arch, congenital forefoot supination.

Problems resulting from over-supination: Decreased shock absorption leading to early osteoarthritis. Stress fractures, toe deformities, lateral ankle joint instability and sprains, lateral knee problems.

The over-supinating runner needs a flexible, well cushioned shoe, with a curved last to encourage correct foot motion. The mid-foot section should support the high arch, but not increase the tendency to supination.

The subject of foot injuries in endurance athletes is huge, and this article only scratches the surface. Everybody is different, and so each runner should be treated as an individual. This means that footwear will be very personal choice, and your therapist should be treating you as a whole, not just a specific condition.

*Andrew Peters
Osteopath*