

Treating Hallux Limitus with Orthotic Therapy

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'The Doctor says it's just arthritis - after all it is just a stiff joint.'

This is what many of my patients say and they hardly ever come to see me for this problem specifically, as this condition is usually diagnosed as the underlying causation to a problem in the upper structure

It is a condition where movement of the great toe (hallux) is restricted to less than the normal range of motion or flexion 65 – 70 degrees. We need flexion in the big toe to maintain the correct walking gait action to perform normal functions such as stooping down, climbing up, or even standing. For these reasons this disorder can be very troubling and even disabling.

Early signs and symptoms include:

- Pain and stiffness in the big toe during use (walking, standing, bending, etc.)
- Pain and stiffness aggravated by cold & damp weather
- Difficulty with certain activities such as running and squatting.
- Swelling and inflammation around the 1st MTPJ
- Dull pain in the knee, hip, or lower back due to an alteration of the normal gait cycle.

In my experience I have found two main biomechanical underlying causations;

1. A long 1st metatarsal shaft

2. A short 1st metatarsal shaft

In the case of the long metatarsal shaft this allows the 1st MTPJ to strike the ground early and dorsiflexes the 1st metatarsal head. As this happens it restricts the proximal phalanx from propelling over the 1st MTPJ and allows a jamming action to occur.

This causes osteoarthritic changes in the metatarsal joint and narrowing of the joint space leading to hallux limitus. If preventative action is not undertaken it eventually leads to hallux rigidus.

A short metatarsal shaft will adduct to the midline of the body to gain ground contact as this happens it will plantarflex and rotate, and the ground reaction forces will cause dorsiflexion of the 1st metatarsal head. This, when combined with the pronation factor, will create jamming at tarso metatarso joint and reduce the proximal hallux's ability to propel over the joint.

The tarsometatarsal joint will in this instance be stressed and the ability of the proximal hallux in the propulsive phase of gait to flex to its normal range of motion will be reduced as it jams the 1st MTPJ.

Often this is referred to as a Functional Hallux Limitus (FHL) as it combines with the pronation factor and ground reaction forces to limit movement.

Limited flexion will usually cause 2 types of compensatory biomechanical action outcomes:

1. An adductory twist: this is where the calcaneus pivots medially at the propulsive phase of the gait cycle. This is in turn assisted by the external hip rotators such as piriformis, gluteals and ITB's, and as this takes place medial ground reaction forces (GRF)

put pressure on the 1st MTPJ. As the patient attempts to toe off this causes the hallux to deviate and develop medial callosity.

2. The distal phalanx of the hallux becomes the alternative propulsive mechanism which is due to limited joint mobility at the 1st MTPJ, thus causing dorsiflexion of the distal hallux with secondary action of nail trauma & nail thickening (or onychogryphosis). The result of this is that many patients wear through the dorsal aspect of their shoe or socks.

Correctly aligned and modified orthotic device will alleviate these outcomes and allow the 1st MTPJ to function within the parameters of the structural abnormalities of the foot of the presenting patient.

This condition is not new as it has been understood for some time that a combination of bad biomechanics, pronation and ground reaction forces will give limited joint flexion (FHL). In my experience as soon as the structure is realigned and maintained in the neutral position pressure is taken off the 1st MTPJ and increased flexion in the joint is achieved.

If the condition is diagnosed early it is more likely to respond to less aggressive treatment. In fact, in many cases, early treatment may prevent or postpone the need for any future surgery.

Rx: Treatment for a long 1st metatarsal shaft would be to prescribe an orthotic to lift the proximal hallux and at the same time deflect the 1st MTPJ by way of a depression placed under the joint using a heat gun on a 100% EVA orthotic device - using a full length

orthotic style is best (see fig. 1 below).

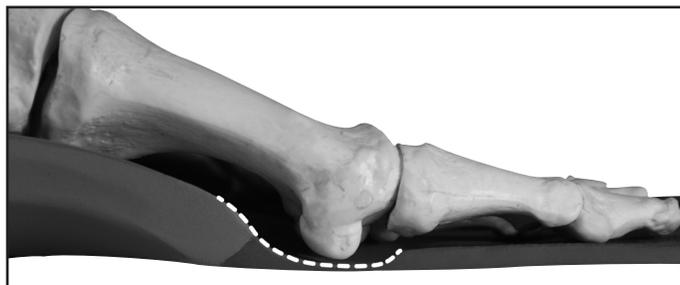


Fig. 1: Depression made by applying heat and pressure.

Composite orthotic products have limited heating ability and do not allow for easy deflection creation.

Rx: Treatment for a short 1st metatarsal shaft is more complicated as we need to attack the problem on a number of fronts:

1. We need to correct the pronation factor using an orthotic device moulded to the patient's NCSP (Neutral Calcaneal Stance Position) which will control rearfoot eversion. Generally a device with between 4°-6° rearfoot varus will give the required control.
2. Orthotics to Control and correct both the Sub talar and mid tarsal joint pronation together using a device that can be moulded to effectively follow the contour of the patients arch to reduce longitudinal arch collapse (which would encourage the foot to evert during the propulsive phase) whilst maintaining rearfoot control.
3. Use a 'mortons extension addition'* to lift and support the hallux and allow the hallux to propel over the joint (see Fig. 2). The mortons extension lifts the 1st MTPJ to level with the lesser metatarsal joints and allow the proximal phalange to maintain its position and stops the 1st MTPJ from plantarflexing & rotating which will encourage the pronatory effect.



Fig. 2: Mortons Extension Addition.

Shoe modification such as Rocker-bottom soles may also be recommended for patients with hallux rigidus to reduce pressure on the toe and joint. However such modification must be applied to both shoes to reduce the likelihood of creating a functional long leg syndrome .

Ultrasound or other physical therapy modalities may be undertaken to provide temporary relief.

Non-steroidal anti-inflammatory drugs (NSAIDs), may be prescribed to help reduce pain and inflammation in the 1st MTPJ.

Prolotherapy can be used to strengthen the ligamentous tissue.

Supplements such as glucosamine-chondroitin sulfate and some vitamins and mineral supplementments may also be helpful .

Differential Diagnosis: Check for gout, rheumatoid and Psoriatic arthritis.

* The mortons extension is a 3°- 4° inversion ramp under the phalange to allow the patient to propel off at the toe off stage of gait. To create a mortons extension you can use an ICB 4° Forefoot wedge and trim as explained in Back to Base Issue 5.

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