Functional Hallux Limitus (FHL)

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Functional hallux limitus is a highly prevalent foot condition that is often overlooked in clinical examination, as pain and symptoms are often limited to the area affected by the 1st MTP joint, but rather occur in remote sites due to compensations during the gait cycle. Having a clinical suspicion that FHL is present can lead to improved outcomes.

The 1st MTP joint represents the primary pivot site about which the majority of extension of the lesser imbricals occurs. The base of the proximal phalanx is also the insertion point for the medial slip of the planter fascia, the longest of all the fascial slips. If normal MTP joint extension occurs during the 2nd half of single support phase, the tendons wrap around the enlarged circumference of the 1st metatarsal head complex (including sesamoids) providing a powerful arch effect that supinates the entire foot even when maximally loaded. This was referred to as the Windsor Effect and was described by JH Hicks in the Journal of Anatomy over 50 years ago. Hicks referred to this supportive effect as “impossible” once it began. In other words, the foot mechanism he described was capable of anti-supporting that the 1st MTP joint dorsiflexed in a timely fashion.

Managing FHL

For the 1st MTP joint to dorsiflex, the 1st metatarsal head must be free to pivot during the 2nd half of single support phase. Having the freedom to accomplish this is often impossible due to pain or instability. The Vasyli-Dananberg device is specifically designed to prevent the formation of FHL by creating an environment in which 1st metatarsal plantarflexion becomes the path of least resistance.

1. Delayed heel lift
2. Absence of heel lift during single support phase
3. Inversion compensation
4. Abduction compensation

Compensation – FHL

2. Absence of heel lift during single support phase

This form of compensation is a progressive variation of delayed heel lift. Most common in the geriatric population, but certainly not exclusive to them. It represents the end result of a long term compensatory process. Whenever heel lift fails to occur during single support phase, gait becomes progressively slower. Balance however, is dependent on maintaining a “resistant paret”. Therefore, whenever heel lift fails to occur, the normal stance phase becomes increasingly unstable. The problem occurs when, for example, the first MTP joint is painful. In geriatrics, this effect can lead to pronounced instability. The real difficulty arises when the normal reaction to instability is to increase the double in single support ratio. However, since foot movement is limited, while two feet are on the ground, the greater the amount of double support, the slower the gait. It becomes progressively more difficult. The slower one walks, the more unevenly distributed the weight of the body. The process can provide marked improvements in steadiness. Careful evaluations of sagittal plane gait and foot positioning with differences in foot segment discrepancy are essential for positive outcomes.

3. Inversion compensation

One of the most inhibiting FHL compensations is the formation of inversion of the 1st MTP joint. Previously described as the “Lisfranc sign”, it is related to a painful 1st MTP joint. A careful analysis of the inversion is clearly not a new phenomenon. What is a new thought, however, is that FHL is not commonly painful in and of itself. Instead, the process of avoidance can cause lateral foot symptoms as the inversion tactic becomes repetitive and stressful to other foot structures. In addition, this patient seems to persist with this “solution” and maintain this inverted posture until adequate treatment is provided.

All of the best clues that this is occurring is to ask the patient to point. Particularly, if they stand barefoot with a pronounced foot posture, lateral view of the mid to rear portion of the shoe is a strong indicator that inversion compensation is occurring. Should the patient participate in a type of rear or front loading, then this inverting posture will be perpetuated, and the symptoms along with.

4. Abducted compensation

The classic pronated foot type shows abducted stance positioning. Again, if the patient pathway to motion is blocked, the foot will find some alternative direction for progression. This is often dictated by ability to stand, balance, and is dependent on hip or lower leg positioning. While the treatment of this condition may effectively reduce some of the abduciton, warning that it may simply not be possible. That said, any reduction in the relative amount of abduction often does great relief to considering the mosaic kneed or hip, and can be used effectively as an adjuvant form of care.

References
5. Hance C C. 1968. Dynamic support of the human