

**Philip H. Demp, AB, DPM, MA, MS, PhD, CAS, CMath, FIMA**

**Fellow of the Institute of Mathematics and its Applications(UK)**

## **HANDOUT**

### **Metatarsalgia**

Any painful ,pathomechanical foot condition affecting the metatarsal region of the foot

### **Alignment of the Metatarsal Heads**

Obtain Cartesian coordinates of the exact positions of the metatarsal heads

The coordinates form a pattern of a hyperbola, ellipse, parabola or degenerate

Hyperbola's lower branch contains all met heads and we have a prime configuration

Otherwise, we have a pathomechanical configuration

### **When Walking , Load Moves Across the Ball of the Foot**

Load moves across all the metatarsal heads from the 5th metatarsal head to the  
push-off under 1st metatarsal head

If the metatarsal heads form the graph of a hyperbola whose lower branch contains  
all five head positions, then its metatarsal head positions form a healthy  
configuration. This is because the metatarsal heads fit the single lower branch  
of the hyperbola so that a load transfer can move along the five metatarsal heads  
going from the 5th to the 1st metatarsal head along a single smooth path.

If the metatarsal heads are distributed on both branches of the hyperbola , then they form  
a pathomechanical configuration. This is because the metatarsal heads are distributed  
among both branches of the hyperbola so that the load transfer finds it difficult to move  
from the 5th metatarsal head to the 1st metatarsal head along a double path.

Effective treatment of metatarsalgia depends on correcting the pathomechanical configuration.

## **Conic Graph Types of Primates Can Also Exist in Modern Humans**

This occurs when conic graph types of quadripedal non-human Primates are considered to be suboptimal when found in modern bipedal humans.

This indicates that pathomechanical configurations exist in modern humans when the configuration is an ellipse or a parabola.

Based upon the postulate that organisms develop a locomoter pattern for ambulation that is most efficient for their given anatomical structure, one would expect the conic graph types of quadripedal, non-human Primates is suboptimal in modern bipedal humans.

## **Screening and Prevention**

If the foot is asymptomatic and has a pathomechanical configuration (latent), its treatment may be preventive depending on the Doctor's decision.

If a healthy configuration of the foot includes a deformity, then an attempt to perform an operation may produce a pathomechanical configuration.

## **Screening for Pathomechanical Configuration of the Metatarsal Heads**

This test can be used for public health screening in diagnosing a wide range of pathomechanical clinical conditions in the forefoot.

## **Treatment of the Malalignment of the Metatarsal Heads**

For surgical treatment, shortening osteotomy of one or more metatarsals is usually involved in order to obtain a healthy alignment of the metatarsal heads.

For non-surgical treatment, a special modification of orthotics is used to obtain a healthy alignment of the metatarsal heads.

