

ANTHROPOLOGY

SIGNIFICANCE OF THE MIDTARSAL BREAK

All apes have a mid tarsal break in which the middle of the foot bends as it rocks forward. The absence of this mid tarsal break has been assumed to be a defining feature of the human foot, separating the human foot from the ape foot. Anthropologists reasoned that humans possess a rigid midfoot which acts as an efficient lever during the push-off phase of gait.

Whereas non-human primates have a more mobile midfoot (e.g., a mid tarsal break) which is adaptive for tree climbing.

Then DeSilva and Gill made what they considered to be a shocking observation. Examining the video analysis of 32 (human) hyperpronators, they found that many of them also possessed a mid tarsal break which they believe reflects a common ancestry with apes.

Is their finding surprising?

Not from an embryological point of view. The old adage Ontogeny recapitulates Phylogeny brings clarity to Desilva and Gill's observation of hyperpronators gait patterns:

Ontogeny refers to the embryological development of the human foot (approximately 40 weeks 5-8)

Phylogeny refers to the long evolutionary process (millions upon millions of years) of the evolving hominin foot

I believe we are still in the very early stages of this evolutionary process. My reasoning is based on my clinical work and research into the embryological development of the human foot:

(1) I believe the PreClinical Clubfoot Structure is a very very old structure seen in hominids, going back several million years (Australopithecus fossil foot bones have this foot structure). Depending on the severity of this foot structure (from mild to very severe) it can result in what is referred to as a floppy foot with a definite mid tarsal break/collapse (high pressure areas across the midfoot, greater than 200kPa).

This is a nearly or complete flatfoot, depending on the severity of the structure. Its imprint into petrified substrates can be totally flat - no arches, lateral or medial (See Foot Print below):

(2) The Primus Metatarsus Supinatus structure is a later developing foot structure, probably not to be commonly seen in the anthropological records, possible only 100,000 years ago (plus or minus). This foot has an inner (cavus) and lateral arch, the height depending on the severity of the PMS structure.

(3) The plantargrade foot is the end stage of this evolutionally process where the obligate bipedalism has fully developed its structure where it is very stable and functional in a strong gravitational field (mother earth).

When you carefully study the ontogenetic (embryonic) development of the human foot, you see that these embryonic foot structures developing in linear fashion (e.g., continuum)

First the clubfoot structure (closest to the Ape foot and totally dysfunctional in obligate bipedalism).

Then the PreClinical Clubfoot (PCF) structure, which if the ontogenetic development stops at this point, the child will be born with a floppy foot and demonstrate a mid tarsal break/collapse will he walks. Structurally you will see residual supinatus in the posterior aspect of the calcaneus and head of the talus (as also seen in the calcaneus and talus bones of the Au.sebida foot fossils).

Then the Primus Metatarsus Supinatus (PMS) Foot Structure, which if the ontogenetic development stops at this point, the child will have a well formed lateral and medial arches but they will engage in gravity drive pronation at foot flat (10% into stance phase) to order to bring the medial column of the foot down to the ground. Structurally you will only see residual supinatus in the head of the talus.

And finally, the Plantargrade foot in which the embryonic foot has completed its entire ontogenetic development. This child will be born with a structurally sound foot well adapted for obligate bipedalism. They will ambulate predominantly in hip drive pronation.

I believe 3 million years ago the predominant foot structure in our prototypes was the PCF structure (for all intense purposes, nearly 100% of the phenotype). Although I am sure there was a foot here and there that was either a PMS foot and even possibly a plantargrade foot.

Today, based on my clinical research I find approximately 80% of the patients I have seen and screened at various locations (Mexico, United States, Italy,

Spain and Portugal with patients from 5 continents) to have either the PCF structure or the PMS foot structure - most of these predominantly the PCF structure. The Plantargrade structure is the exception representing less than 20% (of what I project to be) of the world population.

I believe in another 10-50 more million years, humans will have predominantly the plantargrade foot where the PCF structure and PMS foot structure are the exception.

Philip Tobias's concepts of bipedalism (The Tottering Biped 1982) closely parallels my beliefs that modern homo sapien bipedalism is still imperfect. He states: "After perhaps four million year or more, we have not yet evolved a fault-free mechanism. Our bodies are still subject to what Sir Arthur Keith called the ills of uprightnes. They include flat feet, slipped discs, hernias, prolapses and malposture."

Tobias belief's dovetail into what I have written above regarding the three embryological foot types (PreClinical Clubfoot Structure, Primus Metatarsus Supinatus foot structure and the Plantargrade foot) all being present (I suggest) in the Au.sebida feet, as they are today in the h. sapien feet (just in different proportions).

These three foot structures function very differently, which is seen in the foot prints they leave behind. The PreClinical Clubfoot Structure may show a mid tarsal break (depending on its' severity). The Primus Metatarsus Supinatus and Plantargrade foot structures will not.