Introduction

Mounting Data in a New Millennium

Modern foot orthotic therapy using thermoformed plastics was developed in the late nineteen sixties, early nineteen seventies by Merton Root DPM and associates, with their newly developed application of custom molded acrylic and polyolefin materials to restrict specified movements, they pioneered a method for treating foot deformities they identified.

These original theories about why foot orthoses were effective as treatment postulated that a measurable mal-alignment, classified as deformity, resulted in predictable motions, around specific joint axes of the foot. evidence and conclusive research to support this early foundational model were almost exclusively anecdotal, based on a compilation of published orthopedic observations.

Despite a lack of empirical data to support the methodology and modality, foot orthoses continued to be prescribed successfully by podiatric physicians throughout the nineteen eighties and nineties. Subsequently other healthcare professions such as Physical Therapists, Chiropractors, Orthotists and Pedorthists began utilizing foot orthotic therapy for treatment of chronic foot, leg, pelvic and lumbar dysfunction, realizing similar successes.

With the advent of sophisticated instrumentation in the latter nineteen-eighties and early nineteen-nineties that could measure kinematic relationships and substantiate anomalies, along with kinetic mapping technology to document plantar pressures, it was discovered that the anatomical displacement model was not corollary to actual dysfunction, in that a measured deformity did not always produce the predicted segmental motions (referred then to as: compensations).

Over the past ten to fifteen years, a mounting body of data has substantiated various orthotic utilization techniques and components, elevating their application from anecdotal theory based a compilation of clinical observations to a predictable set of benefits based on evidence and resulting outcomes.

Normal and Abnormal Function of the Foot

"Using facts revealed by that research which has been completed, and adding the logical reasoning based upon the requirements of each applicable basic science, a story of normal foot function develops which is **coherent** and exciting to those responsible for foot care. Sound methods for diagnosis and treatment of abnormalities can be developed, once normal function and structure of the foot is understood."

Merton Root, D.P.M. (emphasis added)

The Data Confirms

Documented Conclusions Relative to Specific Orthotic Applications

Rear-Foot

McClay, McClay-Davis, Davis

"The short-term CFO intervention led to significant decreases in rearfoot kinematics (maximum eversion angle and velocity) but no changes observed in knee kinematics."

"While wearing the custom foot orthotic, subjects exhibited significantly decreased maximum values in rearfoot eversion angle, rearfoot eversion velocity and internal ankle inversion moment."

"It was interesting to note that changes in lower extremity dynamics occurred primarily in the initial stages of the stance phase. Reported changes in these movement patterns in healthy subjects may help to provide insight into how CFO intervention produces positive clinical outcomes."

"The results suggest that the major component influencing the rearfoot dynamics was the **orthotic** device and not the shoe composition. In addition, data suggest that the foot orthoses appear to compensate for the lesser shoe stability enabling it to function in a way similar to that of a shoe of greater stability."

"these data suggest that inverted orthoses significantly decrease the inversion moment and work at the rearfoot and increase knee adduction and abduction moment when compared with standard and no orthoses conditions"

Kirby

Subtalar Joint Axis Location - Rotational Equilibrium Theory

"The central premise of the theory is that the spatial location of the subtalar joint axis in relation to the osseous components of the foot, which may be altered by both subtalar joint rotational position and foot structure, directly affects the magnitude and relative balance of pronation and supination moments acting across the subtalar joint axis during weightbearing activities."

"Alterations in the spatial location of the subtalar joint axis change the mechanical effect that both external forces (eg, ground reaction force) and internal forces (ie, ligamentous tensile forces, muscular tensile forces, and joint compression forces) have on the structural components of the foot and lower extremity. The net balance of subtalar joint pronation and supination moments then affects not only the rotational position of the subtalar joint but also the direction, angular velocity, and angular acceleration of movement of the foot about the subtalar joint axis, and the other pedal joint axes, during weightbearing activities."

Mid-Foot

Münderman, Nigg

"It is speculated that orthotic effects may be mechanical as well as proprioceptive, that mid-foot and fore-foot movements may be more important to the understanding of orthotic effects, and that the calcaneus may not be the relevant bone to be assessed."

Kulig, Reischl

Adults with Stage I and II tibialis posterior tendinopathy exhibited significant increases in function and reductions in pain after participation in a 3-month intervention program that emphasized education and the use of custom-made orthoses.

Landorf

In conclusion, this trial shows that commonly prescribed customized and prefabricated orthoses produce small short-term benefits for people with plantar fasciitis compared with a sham device. Long-term effects on pain and function are negligible. The effects of prefabricated and customized orthoses are similar.

1st Ray - Forefoot

McPoil

"results of this study certainly support the theory of tri-planar motion traditionally ascribed to the rearfoot, midfoot, and first ray. The complexity of the dynamic weightbearing foot is also illustrated by the results of this study. Treatment and clinical management of the foot, especially of the first ray, should therefore seek to augment or control these motions without preventing their natural occurrence."

Dannenberg

"When functional hallux limitus is specifically addressed in an orthotic treatment plan, 77% of long-term chronic postural pain patients exhibit 50% to 100% improvement in their overall condition, in spite of failing previous therapy on their specific site of pain and never exhibiting any foot symptomatology."

Scherer

"The data revealed a quantitative decrease in subhallux pressure during gait in all of the subjects."

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