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WHEN SHOULD FOOT ORTHOSES BE PRESCRIBED?

In this continuing series of ProLab Biomechanics and Orthotic Therapy Newsletters, I believe it is important now to step back and discuss a very basic question about foot orthoses that every podiatrist has thought about and considered. That question is "when should foot orthoses be prescribed for my patients?"

First of all, we must define, from a biomechanical and medical standpoint, what a foot orthosis exactly is and what it does (Fig. 1). In January 1998, I published a definition of foot orthoses that still is appropriate and accurate today: *"A foot orthosis is an in-shoe medical device which is designed to alter the magnitude and temporal pattern of the reaction forces acting on the plantar aspect of the foot in order to optimize foot and lower extremity function and to decrease pathologic loading forces on the structural components of the foot and lower extremity during weightbearing activities."*

Note that in my quarter-century-old definition of a foot orthosis, there is no mention that a foot orthosis "holds the foot in neutral position", "locks the midtarsal joint" or even "prevents compensations for deformities". These older ideas, which were taught when I was a podiatry student, have now been superseded by Tissue Stress Theory which states that foot orthoses should be used to reduce the stress on the injured tissues of the foot and lower extremity and, as such, should be specifically prescribed and designed in order to allow more rapid healing of the injured foot and lower extremity structures and to prevent those injuries from occurring again (McPoil TG, Hunt GC: Evaluation and management of foot and ankle disorders: Present problems and future directions. JOSPT, 21:381-388, 1995).

With these simple facts in mind, the question of when foot orthoses should be prescribed becomes more clear-cut. To put it simply, foot orthoses should be prescribed any time that a patient complains of mechanically-based foot and/or lower extremity pathologies and the foot orthosis has the potential to significantly reduce the stress on the injured foot and/or lower extremity tissues that are causing symptoms for the patient. In addition, foot orthoses should be prescribed to patients with a history of chronic foot and/or lower extremity injury and who want to prevent these injuries from occurring again in the future. Likewise, due to recent research demonstrating the ability of foot orthoses to alter the kinematics and kinetics of gait and improve the balance of individuals, foot orthoses should be prescribed when abnormal gait function and/or abnormal balance are identified in a patient that could cause symptoms, deformity or injury in the future.

In the tens of thousands of patients I have treated with foot orthoses over the past 38 years of podiatric practice, the vast majority of these foot orthoses have been used to treat mechanically-based foot and lower extremity injuries. In the plantar foot, orthoses are commonly and effectively used to treat proximal plantar fasciitis (i.e., plantar heel pain), distal plantar fasciitis, painful callouses, plantar plate tears (i.e., metatarsophalangeal capsulitis), plantar neuropathic ulcers, sesamoiditis, intermetatarsal and Joplin's neuromas, and plantar intrinsic muscle fatigue. In the dorsal foot, foot orthoses are helpful in treating medial dorsal midfoot interosseous compression syndrome (DMICS) and lateral DMICS (i.e., lateral column overload syndrome). Foot orthoses are also effective in treating and preventing metatarsal stress reaction/stress fractures and in reducing the pain due to any degenerative or arthritic joint within the rearfoot, midfoot and forefoot. In addition, the discomfort and dysfunction often seen in traumatic dislocations of the

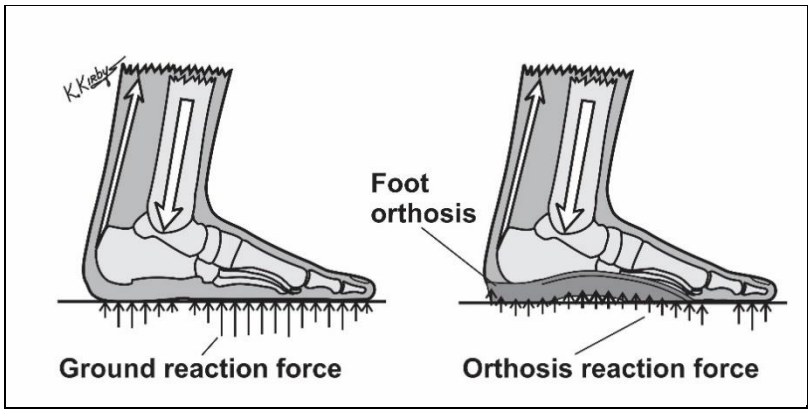

Figure 1. In a foot without a foot orthosis underneath it (left), ground reaction force acts on the plantarly prominent pedal structures. However, when a foot orthosis is placed inside a shoe (right), the foot orthosis alters the magnitude and temporal pattern of the reaction forces acting on the plantar foot in order to optimize foot and lower extremity function and to decrease pathologic loading forces on the structural components of the foot and lower extremity.

midfoot, such as Lisfranc fracture-dislocation, respond remarkably well to appropriately prescribed foot orthoses, whether this injury has or has not been surgically reduced.

In the ankle, foot orthoses can be used to treat posterior tibial tendon dysfunction, anterior tibial insertional tendinitis and also peroneal tendinopathy. Due to their ability to reduce the compression forces within the sinus tarsi during weightbearing activities, anti-pronation foot orthoses can also be very beneficial in reducing the pain from sinus tarsi syndrome/sinus tarsitis (Kirby KA: Rotational equilibrium across the subtalar joint axis. JAPMA, 79: 1-14, 1989). Patients with Achilles tendinopathy also can be helped by judicious use of foot orthoses to stabilize the rearfoot and reduce Achilles tendon stress.

Since the closed kinetic chain pronation and supination motions of the subtalar joint (STJ) are mechanically translated to internal rotation and external rotation motions of the tibia, knee joint, femur and hip joints during weightbearing activities, foot orthoses can be quite helpful at treating many painful pathologies above the ankle joint. In the medial leg, anti-pronation foot orthoses have been shown to be very useful at treating medial tibial stress syndrome and preventing medial tibial stress fractures in running and jumping athletes. In the lateral leg, patients suffering from chronic peroneal muscle fatigue and peroneal muscle pain nearly always respond well to anti-supination foot orthoses.

At the level of the knee, pes anserinus bursitis can be quite effectively treated with anti-pronation foot orthoses. Patellofemoral syndrome, most common in running and jumping athletes, can also be treated with good success with anti-pronation foot orthoses since these orthoses can reduce the internal rotation of the knee during athletic activities. Even runner-patients with the common lateral knee injury of iliotibial band syndrome can be effectively treated with foot orthoses. Anti-pronation foot orthoses can be used to treat medial collateral ligament strain in the knee. Furthermore, there is now a large body of scientific research which demonstrates that valgus-wedged foot orthoses can be very helpful at treating the pain and disability from medial compartment degenerative joint disease of the knee by redirecting intra-articular compression forces from the medial knee compartment of the knee and toward the lateral compartment of the knee.

One of the more surprising and pleasant observations that I have made over the nearly four decades I have been prescribing foot orthoses is how many patients return to me 3-4 weeks after receiving their foot orthoses with the happy news that their chronic low back pain has resolved since they have been using foot orthoses in their shoes. Howard Dananberg, DPM, spent many years studying the effects of foot orthoses in treating low back pain and I highly recommend that all podiatrists read Dr. Dananberg's papers on how foot orthoses can help resolve low back pain (Dananberg HJ, Guiliano M: Chronic low-back pain and its response to custom-made foot orthoses. JAPMA, 89:109-117, 1999).

Limb length discrepancy can also be treated with orthoses and shoes with added heel lifts and/or full-sole lifts in order to equalize the gait mechanics between their left and right lower extremities. Furthermore, patients with neurologically-related balance issues and biomechanically-inefficient or unstable gait patterns can show dramatic changes in their gait and a reduction in fall-risk with appropriately-designed foot orthoses that increase their gait stability. Some of the most pronounced orthosis-related gait changes that I have ever observed during my podiatric practice career have been in patients with neurological disorders such as Parkinson's disease, muscular dystrophy, Charcot Marie Tooth disease and cerebral palsy.

Therefore, when should foot orthoses be prescribed? Foot orthoses should be prescribed when a patient has any mechanically-based foot, lower extremity and/or lower back and/or gait pathology. The motivated podiatrist with a good knowledge of foot and lower extremity biomechanics, Tissue Stress Theory, and the wide variety of orthosis modifications available, will be able to offer their patients a valuable medical service. In this era where few podiatrists seem interested in custom foot orthosis therapy, this service will enable them to have a very busy and lucrative biomechanics and foot orthosis specialty practice for many years to come.

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