Dynamic Chiropractic

ORTHOTICS & ORTHOPEADICS

The Excessively Supinated Foot: Assessment and Treatment

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Overpronation, characterized by a flattened longitudinal arch and rear-foot pronation, is the most commonly detected defect in foot alignment. High-arched feet, referred to as excessively supinated feet, are not nearly as common as overpronated feet. The ratio of overpronation to excessive supination is about 9:1, according to research.[1] Cases of excessive supination do, however, present regularly at chiropractic practices.

Postural stability and dynamic movement begin with the gait cycle. Foot posture and alignment is a critical first link in the kinetic chain. Understanding these postural deficiencies greatly enhances chiropractic management. The use of stabilizing orthotics can also provide the patient with specific support in their subluxation-based care plan.

Striking a Balance

Within the normal gait cycle, both pronation and supination are essential for proper momentum and balance. Upon heel strike, the foot is slightly supinated. As the foot moves through the heel strike, pronation at the ankle and flexion of the knee absorb the majority of the impact. This rolling action, from supination to pronation, also compensates for irregularities in the striking surface. The foot then shifts into supination and acts as a fixed lever, which allows for a strong push-off. This supinated motion also occurs at the subtalar joint, allowing for efficient and strong support at toe-off.

Impact Statement

High-arched feet are unmistakable when evaluating the patient. The clinical term *pes cavus* means, literally, a foot with a cave. There is excessive elevation to the longitudinal arch of the foot, and the toes may be drawn into the hammer position. The cavus foot can be quite painful; its rigid nature forces a clawing of the toes and a redirection of forces to the metatarsal area. Poor shoe fit in both the toe box and along the dorsum of the foot is a consistent observation in these patients. The gait dynamics can be significantly altered and a resultant metatarsalgia can emerge. A quick evaluation of the sole will likely reveal increased callous formation over the fourth and fifth metatarsal heads.

The excessively supinated foot cannot move easily into pronation at heel strike.[2] The rigid foot posture results in a more stressful heel strike and a less accommodating foot on irregular terrains. As these impacts are translated through the biomechanical chain, other structures are affected by the increased shock. Pes cavus is viewed as a contributing component in the development of idiopathic scoliosis.[3] The rigid, supinated foot is actually more unstable than an overpronated or normally aligned foot, and there is greater risk for inversion ankle injuries as a result of this instability.

The high-arched foot also places the first metatarsal in excessive plantar flexion. This altered joint position disturbs the natural, fluid transfer of forces in the midstance phase. Stress is then

concentrated over the first metatarsal head just before toe-off. There is normally eversion of the calcaneus upon heel strike. In the cavus foot, this is replaced by an inversion of the calcaneus. Imagine the instability patients feel when inversion, rigidity, and poor shock absorption are occurring at the same time. In fact, high-arched feet increase the incidence of inversion sprains to the ankle[4] and make the individual more susceptible to stress fractures of the tibia.[5]

Evaluating the Foot

The high-arched foot must be thoroughly analyzed during examination. Biomechanical and neurological considerations must be accounted for when evaluating this foot posture. In most cases, the high arch will be a musculoskeletal complication. Often the patient will report high arches as a family trait. Support and balance are prime considerations for future management, which may include stabilizing orthotics.

There are, however, serious neurological disorders which present with this foot posture, the most common being Charcot-Marie-Tooth disease (CMT). This disorder causes the peroneus longus muscle to contract, pulling the foot into excessive supination. Spinal neural compression syndromes are important to consider, as are progressive degenerative diseases such as muscular dystrophies. One study suggests that 60 percent of all pes cavus deformities are of neurological origin.[6]

The high-arched foot may appear shorter than usual. This is because the excessive arch uses up foot length. The patient will also have a palpably rigid foot. Joint play and motion palpation will usually reveal multiple fixative regions in the forefoot, midfoot and rearfoot. When the foot is inspected from the front, the medial portion of the heel pad is seen to "peek out" from the border of the foot. This is because the supinated foot usually has developed an inverted calcaneus.

There has been a tendency in the management of the high-arched foot to fill the "cave" with rigid support. The difficulty with this approach is that an already stiffened foot can become more inflexible. According to Manoli and Graham, "These rigid conforming orthoses actually make the problems of foot stiffness and reduced shock absorption worse."[7] A stabilizing orthotic with proper calcaneal posting to reduce inversion would be advisable. Shock absorption is a key consideration, and so thought should be given to the choice of components and the style of manufacture.

Other Recommendations

The chiropractor can provide insight as to the shoe style that is most effective for the high-arched individual. In non-athletic shoe styles, a proper choice would include a flexible sole and ample room in the toe-box region to accommodate the clawing or hammering of the toes. A forgiving lacing system would also be beneficial in loosening the tension across the dorsum of the foot.

The chiropractor can also provide assistance in the stretching and retraining of the lower leg, foot and ankle. Because of the rigid nature of the supinated foot, specific mobilizations and adjustments can be directed to the affected arches. The patient should be encouraged to stretch the calf muscles, as well as the tibialis anterior and the peroneal group. Global stretching and strengthening programs for the entire kinetic chain are necessary to provide continued stability. Remember, the supinated foot is only one link in the chain.

References

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