

Fancy Foot Work

HYPOTONIA: TO BRACE OR NOT TO BRACE? AN ORTHOTIST'S VIEW

By Bernie Veldman

It's no surprise to anyone who works in a clinical setting with both adult and children that pediatric patients, as a whole, can present some of the most difficult challenges. While many of the issues seem simple on the surface, deeper examination often raises more questions than answers for both clinicians and the child's caretaker.

Parents and caretakers can be the most devoted, informed, and involved members of the clinical management team. They typically carry a set of hopes and expectations for their child's potential abilities. Although the Internet is a wonderful tool for research, in the medical field, it can truly become a double-edged sword, and information is not always correct.

As therapists, we owe it to these families—and to ourselves—to take the time to educate them and help them fully understand their child's orthotic needs and the options that are available to them. For these efforts, we can gain both confidence in our clinical decisions and expect an increase in caretaker compliance that comes with understanding.

Two of the most prevalent and widespread misconceptions that I see in parents of children with hypotonia are very simply a misunderstanding of the term "hypotonia" in and of itself and a belief that their child has somehow inherited "flat feet" from his or her parents.

DEFINING HYPOTONIA AND PRONATION

Hypotonia or *low muscle tone* is often equated with a lack of muscle strength. Obviously, muscle tone and muscle strength are related, in that they both are measures of one property of the same muscle, but I would contend that this is where their relationship ends. Muscles with low tone can become very strong at their excessive length, though they are weak at normal length. In short, *low* tone does not equal *low* strength.

This hypotonia brings with it a hypermobility of the joints, which is generally attributed to a laxity in the ligament structure, resulting in excessive joint travel.

The combination of these issues will most obviously present at the foot and ankle, as this tends to be the area most affected by the



Improved alignment while wearing SureStep SMO. This is the same patient as the calcaneal valgus photo from same view.



Calcaneal valgus

hypermobility. As the child begins to bear weight and the ligament structures—primarily the deltoid ligament complex—around the foot and ankle complex fail to adequately stabilize the joints, the feet pronate. Foot pronation draws the body weight forward over the foot, adding more stress to the supporting ligaments and further compromising the function of the muscles and ligaments of the foot.

Pronation of the foot is normally a way to reduce shock forces in early stance in gait. In young children, pronation is normal while the supporting ligaments gain integrity and the musculature gains strength. Pronation of the foot originates with the collapse of the calcaneus into valgus or eversion, causing the midfoot to dorsiflex, abduct and invert on the everted heel. However, the developing foot resolves pronation before the heel lifts during propulsion. If pronation persists through the stance phase of gait, the foot joints and musculature can adapt, producing deformity. Many physicians, clinicians, and parents view this as a problem that is isolated to the foot and ankle. On the contrary, after infancy, as the load-bearing foot pronates the entire body weightline is drawn forward and the joints proximal to the ankle flex and rotate medially, causing a valgus tension at the knees, spawning an adduction of the hips. These flexible joint deformities introduce an entirely new dynamic for children to contend with as they begin to bear weight and transition toward independent ambulation.

The muscles supporting the movements of the knee and hip joints, as they articulate outside their optimal axes, lose their optimal kinematic function and efficiency. Inefficient muscle recruitment strategies caused by malaligned joints can impair movement skills, impacting balance, coordination and most importantly, endurance. It is far too common for infants with hypotonia to achieve independent walking later than their peers.

There seems to be little question that these issues require some type of physical management. The dilemmas tend to be, in large part, more related to the timing and degree of intervention. *(continued on page 31)*

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INTERVENTION

Bracing, while quite capable of managing these positions, presents its own set of problems: decreased mobility of the foot, discomfort, non-compliance, areas of increased pressure, and, most importantly, a possible reduction of recent functional achievements. Feet move and braces do not.

The end goal of most of the bracing systems designed to control pronation is to return the foot to its subtalar neutral position, or as close as possible in most cases. While this has in many ways become the “gold standard” in lower extremity bracing, it is static position. If maintaining subtalar neutral is truly the end goal, and the goal is achieved, how then can the foot move dynamically through the gait cycle? From where does intrinsic movement come if the foot is held in a single static position? If a plastic orthosis prohibits the foot from moving naturally through the pronatory and supinatory phases during the gait cycle, then how will the intrinsic musculature develop? In orthoses that deliberately decrease foot joint mobility, the development of movement strategies that depend upon optimum foot function are compromised.

Movement is the goal. Movement is good.

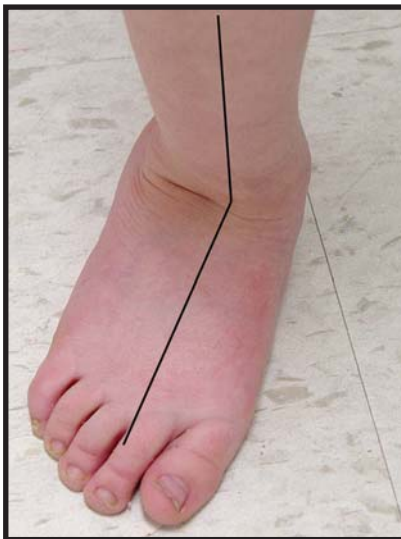
So, many physicians, physical therapists, orthotists and caregivers wrestle with the question of whether to brace or not to brace the hypotonic foot. For many years, this has been an impasse that prevents the recommendation or prescription for orthotic management of the hypotonic foot. Standard orthotic intervention brings with it a set of variables which will prevent a child from developing a natural gait pattern, while waiting will almost invariably facilitate the formation of gait deviations during a very crucial phase of a child's gait development.

THE MOVING ORTHOTIC

The SureStep Dynamic Stabilizing System is a unique and revolutionary approach to management of the hypermobile foot. It transcends the traditional orthotic concepts, focusing instead on creating stability while allowing for natural movement. The end goal of the SureStep system is stability, both in and



Midfoot eversion/collapse is just one of the components of pronation



Forefoot abduction



Surestep SMO

out of midline. Increased stability improves balance and coordination, which results in more walking and running. The method that is used is actually quite simple: *compression*.

A very thin and uniformly flexible plastic evenly distributes pressure around the foot, so that as the orthosis is tightened and the soft tissue of the foot is compressed, providing a dynamic stability to the foot. This concept is not new to the orthotic world, but innovative in the management of the foot. In short, it requires a much more dynamic way of thinking—letting go of the programming many of us received during our formative years that sustained subtalar neutral is desired and can only be achieved in static fashion. Again, remember this: movement is the goal. Movement is good.

SureStep brings stability to the foot with the heel in midline, yet allows movement in and out of this position as need. SureStep is dynamic in that it actually moves with the foot in and out of this midline position, but will always encourage the hindfoot to return towards midline. This movement will facilitate the development of the intrinsic musculature, movement patterns, and normal muscle strategies necessary for an even, stable, and efficient gait.

Since the SureStep system is so flexible, it will move along with the foot, and the typical problems that have become associated with bracing, such as reddened or blistering areas, do not occur. As a result, compliance improves.

SureStep can be obtained through any orthotic/prosthetic facility and is generally covered by many early intervention programs, state Medicaid programs, and many private insurance companies. ■

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