Understanding Hallux Abductovalgus

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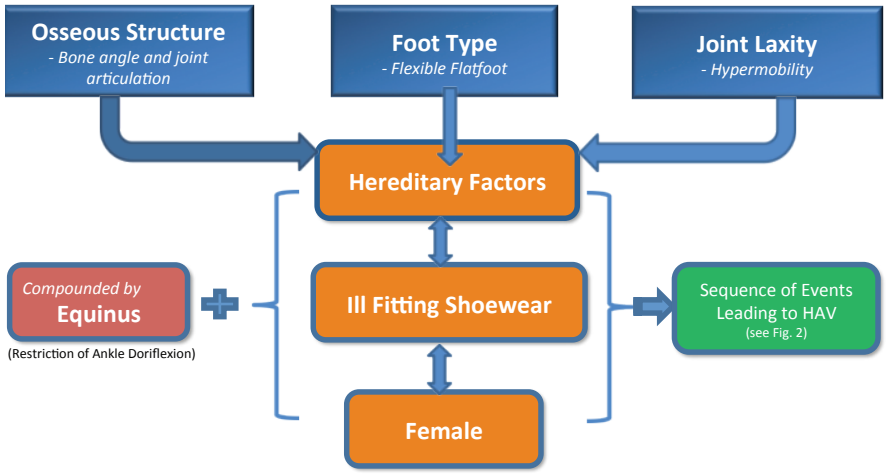
Figure 1
Hallux Abductovalgus Components of Development



Anyone who has worked in the retail shoe industry or provided medical foot care to patients has been asked, "Why do I have bunions?" Sometimes the questioner even has his or her own theory: "My mother had bunions," or perhaps, "I wore tight shoes when I was younger." Often you will hear "It just started!" Beyond these commonly held beliefs, as practitioners we seek to answer the question of the etiology of hallux abductovalgus (HAV).

It is estimated that more than 200,000 bunion correction surgeries are performed in the United States annually. This deformity is one of the most common problems podiatrists face, with patients reporting swelling, inflammation, and foot pain. It has been linked to functional disability, impaired gait, poor balance, and falls in the elderly.


Advanced HAV.

HAV is a progressive deformity of the foot recognized by the medial projection of the first metatarsal and the abduction of the hallux away from the longitudinal axis of the foot. The patient's initial concerns are usually cosmetic. He or she may also face difficulty when buying regular shoes and frequently report irritation and blistering from footwear. Shoe fit eventually becomes a major problem as most shoes will be too tight across the ball of the foot, but switching to a wider shoe to accommodate the bunion leaves the new shoe loose at the heel. Increased pain during ambulation may result in less activity leading to a decrease in overall health. Due to different defining criteria, it is difficult to accurately estimate the prevalence in the general population, but in one meta-analysis conducted in 2010, it was estimated at 23 percent in adults 18–65 years old, and 35.7 percent in those older than 65.[1]

In this article, we will review the pathomechanics—changes in the normal biomechanical function—that lead to the condition and propose an algorithm that outlines the progression of HAV. Because it is suspected that the causal conditions exist in children, with better understanding and clear treatment protocols we may be able to prevent the costly effects of its advancement later in life.

History

Over the past 100 years, many causes have been proposed for the slow abducting migration of the great toe. These include joint mobility, inherited factors, the presence of flatfoot, and poorly fitting shoes. It affects women at a rate at least twice as high as that seen in men, and the incidence increases with age. Several studies also confirm the presence of HAV in children.


Eight year old with early-stage HAV.

One body of orthopedic research has looked at the role of joint articulation and bone angles in the progression of the condition. While there is evidence that abnormal bone and joint orientation coexist with HAV, there is no clear model showing them as the causative factor in its development. Likewise, other researchers have investigated ligamentous laxity. Again, while not conclusive, there are indications of a higher incidence of generalized hypermobility in subjects with HAV. One such study concluded that "while hypermobility may be associated with HAV in juveniles, its presence does not necessarily make it the primary predisposing factor."[2] Several works also cite an involvement of positive family history at least two thirds of the time.

Mechanics

Others maintain that the medial deviation of the first metatarsal is not itself a causal factor but rather a consequence of

HAV—the hallux abducts first, and then the first metatarsal moves medially. This is encouraged by a gradual imbalance in tension from the hallucis longus tendons, which facilitates the process of slowly pulling the hallux into valgus.

The one factor that seems most closely associated with HAV is the presence of a mobile flatfoot. In almost all cases, patients presenting with HAV will be seen to have a low-arch foot. It is believed that pes planus affects the stability and orientation of the first metatarsal bone, opening the way for the deformity.[3]

Improper footwear is another agent implicated in the development of bunions. Studies have found that while HAV is noted in all populations, the incidence is up to 15 times higher in shoe-wearing societies compared to the unshod. It is thought that narrow, constricting footwear plays a role, and this may partially explain the higher incidence in females. By some accounts, it is estimated that 75 percent of the general population wear ill-fitting shoes—shoes of incorrect length, width, or shape. Combining this statistic with other predisposing factors may indicate a path by which symptoms develop.

Equinus also plays a role as it is often a primary causative factor in pronation that subtly influences foot function. Equinus is defined as any restriction in ankle joint motion that limits ankle dorsiflexion to less than 10 degrees. (*Author's note: For more information, read "Equinus" in the April 2013 issue of* The O&P EDGE.) Essentially the presence of equinus sets up a sequence of events that can impede movement of the first metatarsophalangeal joint (MPJ). HAV is one potential compensation for this impediment that seeks to restore lost motion in the sagittal plane.

Figure 2

Sequence of Events	Observation	Contributing factors
In the presence of pes planus, the subtalar joint remains in **pronation after heel lift.**	Pronation late in the gait cycle.	Flatfeet, unsupportive footwear and equinus
With hypermobility the **first ray will dorsiflex.**	The first metatarsal and hallux are pushed up in relation to the rearfoot.	Hypermobility
This causes **compression at the first MPJ.**	Development of hallux limitus results in blocking motion.	Poor articulation of first MP joint
To compensate for the restricted motion, **the hallux abducts.**	The foot turns outward. *You will observe a medial roll-off, and often there will be a telltale "pinch callus" on the medial side of the big toe.*	
A cycle of compensations begin that over time accentuate the deformity.	The off-centered hallucis tendons will guide the hallux further into abduction.	Narrow footwear

With time, the first metatarsal skews medially, and the hallux drives the second toe up creating the additional problem of a hammered second toe.

Algorithm

These components of development have been summarized in Figure 1. In assessing the data and understanding the relevance to overall foot health, Justin Wernick, DPM, FACFOAM, developed a concept of function to incorporate into a model. The contributing anatomical factors, when combined with environmental conditions such as improper shoes, lead to the progressive change in the alignment of the great toe and the first metatarsal (Figure 2).

It is vitally important to understand the contribution and relationship of these factors if we are to attempt to control and prevent this costly and debilitating condition. This is especially true as it is documented that 40 percent of juvenile patients develop HAV before they are ten years old, and about 50 percent of all adults with HAV began to develop it in adolescence.

Although the hypothesis has not yet been tested in a formal study, given the high long-term medical costs of treating HAV, it would seem sensible to validate the pathway and build a protocol for early intervention. A consensus would provide physicians and other practitioners with a guideline to screen for HAV in children and then prescribe appropriate measures, such as proper footwear and foot orthotics. Any equinus condition should also be addressed conservatively and inexpensively with the use of heel lifts and stretching or, in advanced cases, surgically.

Pedorthic Solutions

In the early stage, it is possible to slow the progress of HAV. For example, a custom foot orthotic with a first ray cutout or a drop for the first MPJ may help maintain motion of the first MPJ. In later stages, it becomes very difficult to get a proper shoe fit, and the condition cannot be reversed unless the patient undergoes surgery. With time, patients usually require extremely wide shoes with very high toe boxes. Shoes with stretchable Neoprene uppers may also accommodate these foot types. Finally, the patient may have to opt for custom shoes to get an adequate fit, which may incorporate features such as rocker soles to aid ambulation. O&P EDGE

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