



Pre-fabricated Insoles and Modifications in Sports Medicine

OTC devices have their place in the treatment of athletes.

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*This is a continuation of a series of sports medicine articles, which were written by members, fellows, board members, and past-presidents of the American Academy of Podiatric Sports Medicine (AAPSM). Excerpts are credited from the evidence-based textbook, *Athletic Footwear and Orthoses in Sports Medicine*, Springer, NY, edited by Matthew B. Werd, DPM that includes more than 30 AAPSM chapter-contributing authors.*

The AAPSM serves to advance the understanding, prevention and management of lower extremity sports and fitness injuries. The Academy believes that providing such knowledge to the profession and the public will optimize enjoyment and safe participation in sports and fitness activities. The Academy accomplishes this mission through professional education, scientific research, public awareness and membership support. For additional information on becoming a member of the AAPSM please visit www.aapasm.org.

Over-the-counter, ready-made, or pre-fabricated insoles are marketed widely for relief of foot pain. Shoe stores, sporting goods stores, grocery stores, and drug stores have shelves filled with such inserts in all different shapes and sizes. One is able to type “shoe insert” or “over the counter foot in-

sert” into a search engine and find more than one million choices. It is not uncommon for the average athlete to self-treat a foot problem using these products prior to seeking professional advice.

It is also common for the medical professional to suggest pre-fabricated insoles before referring them to a podiatric physician or other specialist

tional capacity. A “foot orthosis” is defined as a custom or stock orthosis utilized to treat the foot. A “custom foot orthosis” is a device derived from a three-dimensional representation of the patient’s foot. “Prescription custom foot orthosis” is created specifically to address the pathomechanical features of a foot condition that may be structural or functional in nature.¹

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for care. There are instances when these insoles resolve, or at least improve, the patient’s main complaint; however, there are also times when the non-prescription device does more harm than good. Unfortunately, some professionals and non-professionals (shoe stores, Internet sites, etc.) market over-the-counter insoles as true, corrective orthoses.

The American College of Foot and Ankle Orthopedic Medicine in their practice guidelines published definitions that are now widely accepted. An “orthosis” is a device utilized to assist, resist, facilitate, stabilize, or improve range of motion and func-

The dictionary definition of “orthosis” is a device “serving to protect or to restore or improve function.”² A second, accepted definition is: “an orthopedic appliance designed to straighten or support a body part.”³ If one utilizes these definitions, a custom shoe insert made from a cast in neutral position, or a ready-made device, will satisfy the description of “orthosis.” Therefore, it is important for the professional to define terms using specific language to inform the patient exactly what he or she is receiving as treatment for a condition.

In order for a shoe insert to be

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classified as a true orthosis (i.e., prescription custom foot orthosis), the insert needs to be made from a mold of the foot while the subtalar joint is in the neutral position (neither pronated nor supinated). Once the cast is made, the laboratory will construct a device that, while being worn in the shoe, maintains the subtalar and midtarsal joints in the corrected position during active gait, thereby creating a more biomechanically-efficient gait.

It should be obvious that a store-bought shoe insert, or an insert taken off the shelf chosen strictly by size of the individual's shoe, does not conform to the above description. It has been the experience of this author that retail stores, shoe stores, and some doctors' offices call these store-bought insoles "orthotics" when, in fact, they are not. Common sense should make it clear that simply placing the foot in a foam block and choosing a device based on the configuration of that impression will not satisfy the above definitions. Certainly, pulling a stock shoe insert off the shelf also does not satisfy this designation. Unfortunately, there is no regulation that prevents retail stores from advertising these inserts as orthoses and charging custom orthotic prices for them.

Dr. Richard Schuster, one of the fathers of lower extremity biomechanics, once said that there is a certain segment of the population who would have fewer symptoms if they were to take a sock and roll it up and place it under the arch in their shoe.⁴ These individuals are usually people with rigid, high-arched feet, which does not allow for shock absorption. This is the reason that many people report feeling better with a simple, store-bought insole (Figure 1).

Pre-Fabs

In practice, pre-fabricated insoles do have significant value in certain circumstances. For example, many people have a limb-length discrepancy, either structural or functional. The body at times compensates for this



Figure 1: Examples of over-the-counter arch supports

inequality, but there are times when symptoms develop because of this difference. A leg length difference of 1/2 inch or greater often leads to low back pain, hip pain and, many times, creates pronation of the longer leg creating foot and ankle issues such as



Figure 2: Addition of metatarsal pad

Many forms of arthritis are also characterized by degenerative changes that lead to dorsal subluxation of the toes and plantar prominence of the metatarsal heads. Pre-fabricated insoles are often beneficial in treatment of these individuals. In addition,

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posterior tibial tendonitis and plantar fasciitis. Adding a heel lift onto an over-the-counter shoe insert to compensate for the limb length discrepancy will certainly be helpful.

The athlete with an atrophic fat pad and complaints of pain under the metatarsal heads and/or under the heel may benefit from a pre-fabricated insole with additional cushioning.⁵ Several years ago, it was believed that an injection of collagen would benefit such a patient, using it to replace the natural fat cushion lost in the aging process. This procedure proved both costly and ineffectual as it was often displaced and/or lost after a few weeks of weight-bearing.

One of the best methods of resolving this complaint is simply cushioning the foot with a full-length, soft or semi-rigid, over-the-counter device. In addition, athletes who play on unyielding surfaces such as asphalt or concrete may also benefit from such cushioning, especially when they wear thin-soled athletic shoes.

tion, modifications can be placed on top of or underneath the insert (Figure 2) to further disperse weight from one particular area.

Diabetic athletes may also benefit from a pre-fabricated insole. Foot problems commonly seen in diabetic patients include vascular impairment, neuropathy, atrophy of the soft tissues, and deformity. The importance of addressing insensitivity, paresthesia, decreased vibratory sense, and motor weakness cannot be stressed enough. Motor neuropathy is commonly believed to lead to weakness in the intrinsic muscles of the foot, upsetting the balance between flexors and extensors of the toes.⁶

Atrophy of the small muscles responsible for metatarsophalangeal plantar flexion is thought to lead to the development of hammertoes, claw toes, and prominent metatarsal heads. These deformities are common sites of abnormally high pressure, and repetitive pressure at these

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sites could result in the buildup of calluses and/or ulceration.

These patients will benefit from pre-fabricated insoles for the same reason as stated earlier. The insoles can also be easily modified with dispersion using a U-shaped pad or metatarsal pad (Figure 3). These are very helpful in off-loading an area that may be predisposed to ulceration. Diabetic athletes need to be monitored closely, and the off-loading material may need to be increased in thickness or placed in other positions if one sees that there is still pressure in a sensitive area.

The same type of off-loading a pre-fabricated insole may be of benefit in athletes who present with fore-foot pain due to other pathology such as neuroma or nerve compression, lesser metatarso-phalangeal capsulitis, and/or metatarsalgia.

In athletes, whether professional, college, high school, or recreational, pre-fabricated insoles often have a place in treatment. It is well documented that the forces on the foot are at least three times normal when comparing a running gait to a walking gait.⁷ These forces may increase when running downhill or on uneven surfaces, predisposing an athlete to an

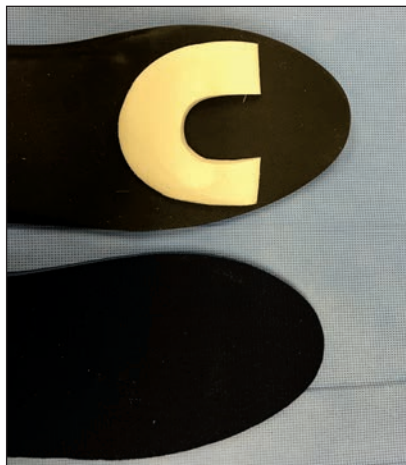


Figure 4: Addition of varus wedge

overuse injury. If an individual's biomechanical examination reveals only a minimal discrepancy, then symptoms may not occur in a walking gait, but may become obvious during running. A pre-fabricated insole may be used as a trial, either alone or with a



Figure 3: Addition of U-shaped pad for dispersion

modification such as a varus wedge (Figure 4), and may be sufficient to eliminate the athlete's symptoms.

Many times the human body will compensate for imbalances, whether they are structural or biomechanical. Care must be taken not to change an individual's biomechanics solely because an abnormality is documented on examination. It is important to address an athlete's flexibility deficiencies before addressing any biomechanical issues noted on examination.

Any shoe insert, whether custom made or not, will not work, for example, if the athlete has a gastrocnemius/soleus equinus as there will be premature heel lift-off and the insert will have no effect on the motions of the subtalar or midtarsal joint.

When treating an elite athlete, it is especially dangerous to change the biomechanics unless other attempts at treatment have failed. A professional football running back with early posterior tibial tendonitis, for example, has reached this highest level of achievement with certain biomechanics. Why would one consider changing that with such an individual? One would think this person could be treated without modifying his gait.

It is important for an individual to have an understanding of exactly what he/she receives when a shoe insert is purchased. As stated above, people use different terms to describe each product. Many people use the word "orthotics" to describe what professionals call a pre-fabricated insole. The Internet, shoe stores, and even some professionals dispense off-the-shelf inserts and will tell customers that they are receiving a device that will solve all their ills. Wearing such a device, especially in young children, may do more harm than

good. It is widely known, for example, that during gait, there is internal rotation of the knee.

Adding an over-the-counter insert in the shoe will change that rotation and may even create rotation in the other direction, creating acute symptoms such as lateral knee pain, hip pain and/or low back pain. In addition, while placing a device into a shoe fills the arch, which at times is good, it may also supinate the foot too much, causing an excessive amount of stress laterally. This may, in fact, create a stress reaction (or stress fracture) in the fourth or fifth metatarsal.

It should be noted that most pre-fabricated insoles are made of a soft or semi-rigid material. Overweight athletes will, therefore, compress the insole to such an extent that it will limit its effectiveness.

There is a use for pre-fabricated insoles in the treatment of foot, ankle, lower leg, knee, and low back problems. The professional needs to know when it would be more appropriate to prescribe a custom foot orthosis. It is critical that the athlete makes an educated decision when he or she purchases a pre-fabricated insole. **PM**

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