

# On the Front Lines of the Diabetes War

## *Pedorthists Battle to Save Feet With Proper Footwear*

by Gordon Zernich, CP, BOCP

On the lower-extremity front of what is expected to soon become an epidemic, podiatrists, pedorthists, prosthetists and orthotists are being called upon to treat the wounds – small and great – that diabetes is indiscriminately inflicting on the American public.

Shoes and foot orthotics are important weapons in this battle because diabetic or peripheral neuropathy frequently accompanies the condition. Neuropathy is a type of nerve damage that leaves the foot void of sensation and the person unaware of any injury that develops or currently exists. Those injuries can lead to foot ulcers, joint dislocations, fractures, gangrene, amputation and even death if they are not medically treated.



Roger Marzano, CPO, CPed (certified pedorthist), a highly trained practitioner in shoes and foot orthotics, shares his knowledge about the prevention of initial foot injuries

and how to keep a bad foot condition from getting worse. He also discusses various techniques to optimize the comfort and function of a foot after it's been severely ravaged by the disease.

The process starts with the practitioner having the vision and then taking the time to examine both of the patient's lower extremities for any potential or current problems and then helping the patient select the correct footwear.

For those recently diagnosed with diabetes, but without foot injury or a deformity sometimes caused by the disease, the goal is to keep things that way. Success is measured by the number of partial foot or leg amputations that are prevented through improved medical care and appliances.

To accomplish this, it might be necessary for the patient to upgrade his or her footwear to a shoe and shoe insert that will significantly minimize any shear (friction caused by sliding) between it and the foot. Shear causes calluses, and calluses are trouble for the approximately 60 percent of people with diabetes who will inevitably suffer peripheral neuropathy as a result of the disease. (Approximately 20.8 million Americans have diabetes today.)

Remember: By preventing the initial injury, we can prevent the following harmful consequences of that injury.

### What Kind of Shoe?

A shoe with a deep, seamless toe box is important for preventing damage to the toes. For some people, a shoe with an expandable spandex-like cloth top may also work well, as long as shear is minimal.



"Many patients prefer an athletic shoe," Marzano states. "They don't like those ugly orthopedic shoes that many vendors try to sell them. But people with toe deformities have to be careful with athletic shoes."

Seams can be a problem, he explains. "Some of those shoes have three, four, or five leather seams above the dorsal forefoot and toe areas, and that material will win every time it comes into contact with anyone's foot; it breaks down the skin there with repeated contact." Unfortunately, even a ball and ring shoe stretcher will not effectively modify the area on that type of shoe to eliminate this problem.



In addition to using the right type of shoe, the right fit is also essential. For those with diabetes, it is especially important that their shoes are fitted by a pedorthist. These individuals can't afford the risk of skin breakdown or worse since it may be complicated by other impaired systems (neurological, circulatory and skeletal) of the body as well.

Today, fabric that includes silver fibers is being used as a top cover for an increasing number of diabetic inserts, shoe liners and stockings because silver promotes thermal conductivity.

"We know thermal injury is one characteristic of an ulcer, and silver dissipates the temperature of that injured area," explains Marzano. "It promotes healing and reduces the chance of further injury. It also has antimicrobial properties. It is the bacteria that produce that awful odor of some feet and shoes; silver diminishes the odor since it inhibits bacterial growth."

## Techniques for Relieving Pressure Areas

Two things are needed to heal diabetic ulcers on the foot: the absence of pressure and good blood circulation.

Some of the most commonly involved problem areas are the toe tips and the metatarsal heads (crescent-shaped, bony prominences on the bottom of the forefoot at its widest juncture). Hammertoes are also a problem because a lack of space in the toe box of conventional shoes will often cause calluses or blisters on the knuckle. More room is also needed there to accommodate toes that may overlap each other.

To relieve the pressure on callused or ulcerated areas in the forefoot, pedorthists might use the "drill and fill" shoe modification technique.

The process usually works like this. A patient may have a callus or an ulcer on the first metatarsal head that needs relief from the constant pressure it experiences throughout the day. The technician will remove the shoe insert and will use a marker to mark it under the problem area. It is then reinserted into the shoe; the technician presses on the marked area so that it transfers over to the inner sole of the shoe. An awl is then used to punch a hole through

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the bottom of the shoe to hit the mark, and a drill and hole saw are used to make the relief. The shoe sole is then covered with two- to three-millimeter-thick Vibram (a type of molded rubber). Sometimes, the shoe's original sole may be split at the forefoot to make the modification, but that technique takes longer.

An off-the-shelf shoe or a custom diabetic shoe insert is then replaced so that it now acts as a membrane to keep the callused or ulcerated area of the foot from going into the relieved area of the inner sole. The goal is to allow the shoe insert to give under the weight of the affected area and provide relief during each step.

Though Medicare doesn't pay for this type of modification, it can cost as little as \$25 and could save many toes and forefeet from further debilitation and/or amputation.

Toe and forefoot calluses may also be defeated by a modification called the metatarsal bar (a three-sixteenths-inch thick

or so wedge that extends from one-quarter inch behind the widest and bottom part of the forefoot and tapers to the shoe's heel breast). Though some in the business consider this an antiquated modification, research has shown that it reduces forefoot and toe tip pressures by 35 percent and 25 percent, respectively.

"The metatarsal bar acts as a fulcrum when it is correctly applied on the shoe sole," explains Marzano. "The leverage it provides is a great help for that patient with diabetes who is, for example, standing in the kitchen and washing dishes at the sink. I heal toe tip and forefoot problems all the time with that."

Hallux rigidus, a painful deformity of the big toe, will often prevent people with diabetes from being able to extend or hyperextend the big toe during the heel off and push off aspect of the gait cycle. In such cases, the use of a metatarsal bar on the shoe will reduce the metatarsal-phalangeal extension of that toe by 15 percent so that the person's pain is lessened. Fortunately, this is an approved Medicare shoe modification, saving the patient out-of-pocket expense.

Marzano says that the company where he works probably adds more metatarsal bars to patients' shoes than they do rocker soles, also known as rocker bottoms.

"The idea of the rocker bottom is to create a negative, offloaded heel effect, but the effort is sometimes defeated when the heel area of the shoe ends up higher than the toe during the stance aspect of the individual's gait pattern and forefoot pressure increases," Marzano explains. "Decreased walking stability is another inescapable, unintended consequence created by the rocker sole shoe modification."

The decision to add a rocker bottom to a shoe should, therefore, be made

judiciously. The rocker bottom is designed to limit range of motion at the metatarsals and offload the heel. As such, it may be used to limit the motion of a foot more seriously damaged by an ulcer, skin breakdown, joint dislocations or bone fractures. It is best added to orthopedic shoes, which are offered in a variety of widths, depths and lasts (sole shapes), or, if indicated, to a custom-molded shoe. Sometimes a common, off-the-shelf walking shoe will lend itself to such a modification. In the latter case, the shoe's original sole is taken off and material is tapered off the shoe's forefoot and hindfoot area to create a rocker on the midfoot. The sole is then reattached.

Sometimes, wedge sandals and negative-heel sandals are also used to treat forefoot and hindfoot wounds. The wedge sandal keeps the patient's weight off the forefoot by using a half-soled sandal that incorporates a backward-tilting footplate that places an increasing load on the patient's midfoot to hindfoot area. A heelless or

negative-heel sandal has the opposite purpose: It increases the load on the forefoot by not providing any support for the hindfoot. Both sandals take some practice to master, and the wedge sandal will often create a leg length discrepancy.

"If I get an order for a negative-heel sandal, I will physically check to see if my patient can handle it by putting the knee on the affected side in full extension and then I will dorsiflex their foot and ankle as much as possible," Marzano says. "If they don't have 10 degrees of dorsiflexion, they aren't getting a negative-heel sandal. It is just too difficult for a person with impaired stability, endurance or strength to get very far when they have to walk almost tiptoed with their ankle and knee slightly flexed forward and their body weight on the forefoot.

"If necessary, I will tell the prescribing physician to include a heel lift or a shoe lift for those needing a wedge shoe, because its use will leave one leg shorter than the

other, and that can lead to back trouble by the time the foot heals."

The techniques described here are just a few examples of the many possible solutions pedorthists have at their disposal to help amputees with diabetes. One of these might look to you like a solution to a problem you are having. If so, talk to your podiatrist or a pedorthist about it. It could very well help you save your foot. ■

### About the Author



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