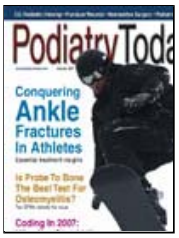


Orthotics Q&A: A Closer Look At Orthotic Technologies And Modifications

- Guest Clinical Editor: Lawrence Huppin, DPM

The development of new materials and technologies has had an impact on orthotics and biomechanics. These expert panelists discuss the technologies they have found helpful. In particular, they assess the impact of pressure analysis and how it can influence the writing of effective orthotic prescriptions. They also discuss common orthotic modifications and which orthotic materials they use in their practices.

Q: How have new materials and technology changed the state of podiatric biomechanics and orthotic therapy?

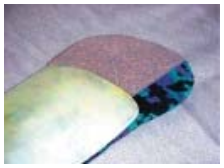
A: Russell Volpe, DPM, calls new materials a "largely positive" development. He notes that employing thinner, more durable materials that resist deformation enables DPMs to utilize more streamlined devices which work with patients' shoes.

"The constant development of something that can do the job better than the materials before has allowed those who work with the best labs and the best products to deliver an increasingly sophisticated device to our patients," says Dr. Volpe.

The frame of reference of podiatrists in biomechanics is moving away from traditional theories of biomechanics, as espoused 30 years ago by Merton Root, DPM, and colleagues, and focusing more on the forces and moments that occur across the foot's joint axes, according to Kevin Kirby, DPM. Dr. Kirby says the change from "foot deformities" to "foot kinetics" provides podiatrists with a much better comprehension of the mechanical nature of foot and lower extremity biomechanical pathologies that one sees every day in practice.

"The major changes in the state of podiatric biomechanics and foot orthosis therapy have not come from new materials and technology but have instead come from gaining a better understanding of foot and lower extremity biomechanics through better research and better podiatric biomechanics theories," opines Dr. Kirby.

Dr. Volpe points out a



Lawrence Huppin, DPM, says the reverse Morton's extension (as seen above) is the most common orthotic modification he uses in practice.

downside to new technologies, noting that new, technologically advanced materials can increase the cost of the product and subsequently drive up fees. He notes that insurance companies consider these factors and if they do reimburse orthotics, they do so with an attitude of "any device will do," which leaves DPMs "squeezed between choosing quality and maintaining profit margin."

Although new technology in scanning feet and negative casts can potentially make office and lab operations more efficient and cheaper in the long run, Dr. Volpe notes concerns that such products may cause a loss of quality. He acknowledges DPMs must be assured of the quality of technology before embracing new options.

Q: What is your most common in-office orthotic modification?

A: Dr. Kirby's most common modification is grinding a plantar fascial accommodation into the dorsal aspect of the orthosis plate.[1] To perform this modification, he says one should grind a very precisely shaped and precisely located furrow into the dorsal orthosis plate that extends along a line from the medial calcaneal tubercle to the first intermetatarsal space area of the orthosis. Dr. Kirby says such a modification can make the difference between orthosis failure and success in many patients.

Lawrence Huppin, DPM, says the reverse Morton's extension is the most common modification he uses in practice. For the most part, he uses 1/8-inch Korex for the extension, which facilitates first ray plantarflexion, decreases first MPJ compression and reduces tension on the plantar fascia. He also commonly employs metatarsal pads, which transfer force off the metatarsal heads. When using metatarsal pads, he suggests gluing top covers only on the posterior half of the orthotic. Doing so allows one to add or adjust the metatarsal pad easily, according to Dr. Huppin. Once the patient is comfortable, he says one can easily glue the cover down the rest of the way.

Dr. Volpe does heat molding for prominences and also performs occasional gluing or top cover modifications. However, he does few modifications in the office aside from quick, minor adjustments. He also feels there is better quality control if an orthotic lab makes the modification.

Q: What materials and equipment do you keep in the office for orthotic modifications?

A: In his office, Dr. Kirby uses 1/8- and 1/4-inch of adhesive felt, 1/4-inch of Korex and neoprene insole material for foot orthosis modifications. Drs. Kirby and Volpe use grinders, barge cement and several sizes of metatarsal pads. In addition, Dr. Volpe keeps a heat gun, some top covers and soft

tissue supplements, basic add-ons and metatarsal pads in his office.

Dr. Huppin uses 1/8-inch of soft ethylene vinyl acetate (EVA), a long-lasting cover material which he says is easy to work with, conforms to the deepest heel cups and cuts cleanly to provide a professional look to the orthosis. He also uses the FumeBuster fume filtration system (Purex), which he says vacuums fumes into a charcoal filter, eliminating barge odors.

Q: When writing an orthotic prescription, what are the most important concepts to consider to achieve the best clinical outcomes?

A: Dr. Huppin says the most important factor is the patient's presenting pathology. First, one should determine the etiology of the pathology and base the orthotic prescription on those findings. For example, if the patient has plantar fasciitis, Dr. Huppin says the goal with functional orthotic therapy is decreasing tension in the plantar fascia. Plantar fascial tension increases when the foot lengthens, whether it is due to an everted heel or an everted forefoot, according to Dr. Huppin. If the plantar fasciitis appears to be caused by an everted heel, Dr. Huppin says he might use a deep heel cup and a medial skive. If it is due to an everted forefoot, he may prescribe a reverse Morton's extension.

Likewise, Dr. Kirby emphasizes the importance of tailoring orthotics to individual foot types, taking into account differing structure and function.

"Far too many podiatrists are lazy in their orthosis prescribing habits. They basically order the same orthosis design for each patient, somehow expecting that the arch support they are creating for their patient will 'magically' have an effect on their patient's foot so his or her symptoms will improve," says Dr. Kirby.

Dr. Volpe initially performs a static biomechanical evaluation and follows this with a dynamic gait assessment. After making a diagnosis, he suggests DPMs should weigh the diagnosis, the existence of biomechanical and other comorbidities, consider what they want the orthotic to accomplish, and then write a prescription that will best meet that patient's goals. Dr. Volpe emphasizes considering the patient's shoe gear as well.

Q: What is the role of computerized foot pressure analysis systems in prescribing foot orthoses?

A: Dr. Huppin cautions DPMs to take a critical look at pressure analysis products and carefully evaluate the claims of the companies that sell them. He says pressure analysis can play a vital role in prescribing orthotics. Systems like the F-Scan (Tekscan) provide information on pressure distribution and force/time curves that can help an experienced practitioner write orthotic prescriptions and adjust orthoses, according to Dr. Huppin.

Dr. Kirby cites the best pressure analysis

devices as the F-Scan, RSscan (RSscan) and Emed (Novel) systems. He says each system has advantages and disadvantages as far as sensor accuracy, software for computer analysis, ease of setup and price. Although he does not use those particular systems, he has followed technological advances in the pressure analysis area and believes those devices improve every year. Dr. Kirby says those who use such products can utilize the devices' objective data to enhance their outcomes with orthotics.

Dr. Volpe concurs. He notes a computerized pressure and gait analysis can provide objective information about pathological structure and function, and also clarify the goal in prescribing a particular patient's orthosis. Computerized systems offer another advantage since they permit the testing of patients after prescribing therapy to determine if the desired changes or goals are really occurring, notes Dr. Volpe. Otherwise, practitioners tend to depend on the subjective reduction of symptoms to determine the efficacy of therapy.

"While this is perhaps the first and foremost goal in this era of outcomes medicine, it is valuable to be able to document objectively that desired changes are occurring," comments Dr. Volpe.

He adds that objective gait assessment often clearly identifies asymmetries in patients. Objective, pressurized analysis can reveal significant left/right differences in feet, gait and pathologies, and can permit DPMs to tailor therapy to yield a better result, according to Dr. Volpe.

However, Dr. Huppin does not think analyzing weightbearing via a pressure analysis device can provide enough information to make a functional orthotic. He says using pressure analysis instead of a negative cast for this purpose "compromises the quality of orthoses." As he argues, one cannot use a two-dimensional shape of a foot produced by a pressure map to determine the three-dimensional shape of the foot.

"Don't confuse a colorful 3-D pressure map of the foot with the ability to determine morphology," cautions Dr. Huppin. "Pressure analysis can tell you nothing of the shape of the foot. It is doubtful that a system that uses that technology can produce anything but a 'customized' OTC orthotic."

On the other hand, Dr. Huppin does think computerization can allow one to capture the image of the foot. As he notes, technologies such as the Bergman Scanner (Bergman Orthotics) use a laser to scan the foot and produce a "digital negative cast." Systems such as the Bergman Scanner and newer products that use 3-D digital photography to capture the foot in a neutral position are likely the future of orthotic casting, according to Dr. Huppin.

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Editor's Note: For related articles, see "Inside Insights On Orthotic Modifications For Sports" in the Orthotics Q&A column in the October 2004 issue or "Orthotic Modifications And Shoewear For Specific Jobs" in the Orthotics Q&A column in the October 2002 issue of Podiatry Today.

Also check out the archives at www.podiatrytoday.com.

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Podiatry Today - ISSN: 1045-7860 - Volume 18 - Issue 10 - October 2005 - Pages: 22 - 26