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Podiatry Today

Orthotics Q&A: Secrets To Fabricating Effective Custom Orthotics

- [Guest Clinical Editor: Nicholas Romansky, DPM](#)

March 3, 2007



There is no shortage of issues to consider when you are prescribing custom orthotics for different types of patients, whether it's knowing what to look for during the biomechanical exam or understanding the keys to proper casting. With these things in mind, our expert panelists explore various issues from prescribing orthotics for athletes to altering orthotics in case of improper fit.

Q: What keys do you look for in your biomechanical exam?

A: Patrick Nunan, DPM, starts his biomechanical exam by having the patient sit on an exam table while he evaluates the joints' range of motion, muscle strength, limb length, forefoot to rearfoot and rearfoot to leg. When the patient is standing, Dr. Nunan examines his or her calcaneal position, tibial varum, abduction of the forefoot and neutral subtalar joint position. He also observes front, rear and side views of the patient walking or running. Dr. Nunan says he will schedule an F-Scan evaluation if he has concerns that go beyond the initial exam.

In addition to observing patients while they are in sitting, standing and prone positions, Nicholas Romansky, DPM, says he listens to his patients' observations. He checks out the patient's type and wear of sneaker or shoe, and also suggests looking at any old orthotics the patient may have worn.

Whether you or an assistant cast the orthotic, he advises you to examine the finished cast and make sure the cast captures what you want it to capture.



Direct milled polypropylene (as seen above) and vacuum formed polypropylene are "the most effective and versatile materials for

While Larry Hupp, DPM, performs a complete biomechanical examination on each patient, he says the exam tends to be focused on the patient's presenting pathology. For example, when a patient presents with functional hallux limitus, Dr. Hupp says you will usually note excessive ground reactive force (GRF) under the

functional orthoses for athletes," notes Larry Huppin, DPM. medial column. The increased GRF prevents the first ray from plantarflexing during propulsion, which leads to increased compression in the first MPJ.

In that case, the primary focus of Dr. Huppin's biomechanical exam is to determine the cause of the increased GRF. He examines the location of the axis of the subtalar joint and calcaneal eversion to see if rearfoot eversion is the cause. He proceeds to evaluate the first ray position and the forefoot-to-rearfoot relationship in order to determine whether a plantarflexed first ray or an everted forefoot position is leading to the increased force.

"Our biomechanical evaluation is not focused on determining specific degrees of angulations, but rather on identifying pathological forces so that we can prescribe an orthosis to mitigate those forces," says Dr. Huppin.

Q: What are your key parameters when fabricating custom orthotic devices?

A: Dr. Nunan first considers if a custom orthotic will improve his patients' symptoms or if he needs to address other factors like the patient's shoes, muscle imbalance, training, intensity and surface.

When you decide that a custom orthotic can be helpful for the patient, Drs. Nunan and Romansky say it's important to tailor the prescription to address the patient's symptoms. Dr. Romansky notes DPMs and other health professionals sometimes will fabricate the same type of orthotic routinely regardless of their problem. Basically, all patients would get the same type of orthotic, which he says should not happen.

"Pick soft goods/materials appropriately," emphasizes Dr. Romansky. "These are just as important as the plate material."

Drs. Nunan and Romansky say custom orthotics should also address the needs of each patient's level of activity and activity type. Dr. Nunan also takes the patient's body weight, biomechanics and foot type into account and looks at the patient's shoes.

Dr. Huppin bases the orthotic prescription on the patient's presenting pathology and etiology. When a patient has first MPJ pain due to functional hallux limitus, Dr. Huppin says you want to decrease compression within the first MPJ. If the pain is due to an everted heel, Dr. Huppin might employ a deep heel cup and a medial skive. For an everted forefoot, he says a reverse Morton's extension may be appropriate.

Q: What do you do when the patient states the orthotic "feels like it is too far back"?

A: Dr. Nunan checks the orthotic against the patient's foot while the patient is weightbearing and nonweightbearing. Since the narrow width of the heel can displace the orthotic, Dr. Nunan examines how the orthotic sets in the shoe when the patient stands. He asks the patient to try to point out the precise area of pressure. If that fails, Dr. Nunan schedules an F-Scan evaluation to

determine the cause of pressure.

When dispensing an orthotic, Dr. Romansky advises you to personally check the fit in stance and in the shoe. Ensure your patient is tying his or her laces tightly. Dr. Romansky says it's a good idea to remind patients to tie their shoes with the foot flat on the floor and ensure the orthotic is seating itself properly in the shoe.

Dr. Romansky says you should send casts and orthotics back to the lab if necessary.

Q: What type of orthotic do you prescribe for a highly athletic individual who needs maximum control?

A: Dr. Nunan says the prescription varies according to the sport, playing position and surface, and the shoes of the athlete. He often utilizes polypropylene and uses EVA or Korex to reinforce the arch. Dr. Huppin has also found success with vacuum formed and direct milled polypropylene, calling them "the most effective and versatile materials for functional orthoses for athletes." He emphasizes that you can mold polypropylene to nearly any shape and it can be produced with almost any flexibility. He says the material "is nearly indestructible, has a long life span, and can be made to fit most any shoe."

Dr. Huppin says he tends to avoid using carbon graphite or fiberglass devices for athletic activities since they tend to fatigue and crack under stress. However, Dr. Nunan notes some of the newer graphite composites are useful for shoes with little depth such as soccer shoes.

Dr. Nunan also has used multidensity EVA or leather and EVA combinations for athletes who want more lightweight devices. However, he cautions that these do not last as long.

Dr. Romansky says you can use graphite or polypropylene subortholene with a deep heel cup of 15 to 16 mm, depending on the type of sneaker or cleat of the athlete. According to Dr. Romansky, using a full-length orthotic helps decrease movement of the orthotic and adds forefoot cushioning.

Dr. Huppin says there is no panacea when it comes to orthotic materials for highly athletic individuals.

"There is no perfect orthosis material," explains Dr. Huppin. "Every material has advantages and disadvantages. Given that, I find it is logical to use polypropylene for a majority of orthoses — including those designed for athletic activities — and graphite and fiberglass materials for smaller shoes and less stressful activities."

Q: What topcovers do you use with the orthotic for hyperhidrosis and chronic recurrent blister formation?

A: For hyperhidrosis, Dr. Romansky will use Drilex, padded fabric, Neolon, Spenco, R-lyte, Sky and EVA.

When dealing with this condition, Dr. Nunan will usually order orthotics with a Spenco or EVA topcover. All things being equal, Dr. Huppin says he would also use a material such as EVA that does not absorb moisture.

However, all the panelists agree that it is far more important to address the use of socks and provide direct treatment of the condition when dealing with hyperhidrosis.

One should take advantage of the various soaks, powders or lotions that are available for treating hyperhidrosis, notes Dr. Nunan. Dr. Huppin concurs and emphasizes the use of antiperspirants in treating the condition.

Dr. Nunan points out that most athletes wear cotton socks because of availability and cost. When treating patients who have chronic blisters and hyperhidrosis, he recommends they wear athletic socks, usually those of an acrylic blend. Other socks that may be effective include double layer socks or socks with extra padding. Drs. Huppin and Nunan say it is important to emphasize socks that wick the moisture away from the skin and to the outer layers.

Dr. Romansky adds that excessive wear of socks can be a problem with blisters. He also cites insoles not being removed from shoes and laces being tied too tightly during an athletic event.

How To Prevent Heel Irritation When Using A Medial Heel Skive

-By Larry Huppin, DPM

The medial heel skive is an effective technique for providing greater control in an orthoses. It incorporates an interior varus wedge into the medial aspect of the heel cup of the orthosis. In order for this to be effective, the heel cup must be high enough to apply force medial to the subtalar joint axis.

As this technique becomes more popular, it becomes increasingly important to understand how to prescribe properly. Keep in mind that medial heel skive can lead to heel irritation at the edge of the orthosis in two instances: when the heel cup is too narrow and when the heel cup is too shallow.

Since the medial heel skive puts greater pressure on the heel fat pad, it widens the heel fat pad. Using a deeper heel cup can help contain the heel fat pad and prevent lateral edge irritation. Also make sure you provide caliper measurements of the heel width on weightbearing to your lab in order to ensure proper width in the orthoses.

Since a medial skive shifts the foot laterally, the heel cup must be deep enough to contain the heel and provide control without causing edge irritation. The minimum heel cup depth when using a medial heel skive is 14 mm. The heel cup depth should increase as the amount of skive increases. Therefore, you cannot use a medial skive with a dress orthoses since the heel cup

depth is generally less than 14 mm.

When you are combining a medial skive with inversion, the slope you create can cause the foot to slide into the upper lateral edge of the heel cup. Using a deeper heel cup will prevent this problem. To avoid lateral heel cup edge irritation, use a 20-mm or 22-mm heel cup when the amount of skive plus the amount of inversion is greater than 5. To give you an example, 4mm skive plus two degrees of inversion = 6. Therefore, you would prescribe a 22-mm heel cup.

Dr. Huppin is an Adjunct Associate Professor in the Department of Applied Biomechanics at the California School of Podiatric Medicine at Samuel Merritt College. He is also the Medical Director for ProLab Orthotics. Dr. Huppin can be reached at lhuppin@prolab-usa.com.

Dr. Nunan is a Fellow and Past President of the American Academy of Podiatric Sports Medicine. He is also a Fellow of the American College of Foot And Ankle Orthopedics And Medicine, and the American College of Foot and Ankle Surgeons. Dr. Nunan has a private practice in West Chester, Ohio.

Dr. Romansky (shown at the right) is a Fellow of the American College of Foot and Ankle Surgeons and is a Diplomate of the American Board of Podiatric Surgery. He is a team physician for the United States Olympic and World Cup Men's and Women's soccer teams. Dr. Romansky is in private practice in Media and Phoenixville, Pa.



Podiatry Today - ISSN: 1045-7860 - Volume 17 -
Issue 6 - June 2004 - Pages: 28 - 34

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