

Feature: Assessing Orthotic Quality

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Chances are, you've seen more than your share of patients who come in with failed orthotics from another provider. This author offers a primer of what to look for in assessing the quality of orthotics and what you can do to facilitate better treatment outcomes.

Numerous patients use orthotics and have improved foot function as a result of wearing them. Not only do they experience relief from previous pain and symptoms, but wearing orthotics also helps to prevent recurrence of foot, leg and other skeletal pains and conditions. Unfortunately, there are also numbers of patients who are either unable to tolerate their orthotics or are not getting symptomatic relief. We are often asked to evaluate many of these patients and assist them in getting better results from their orthotics.

People may hear about orthotics in different ways, whether it's through their doctor, advertising, sports reports of famous orthotic users or word-of-mouth from friends. As the public becomes more aware of orthotic devices for their feet, it is our responsibility as podiatrists to be able to evaluate the quality and accuracy of their fabrication.

However, as we know, the field surrounding orthotics and their application can be highly subjective. In order to keep the evaluation as productive and helpful as possible, I've found that a system of criteria to check allows more objectivity and helps ensure more consistency and reproducibility in working with patients who have new or old orthotics.

Often patients come into our practice with a foot complaint that has strong implications of foot or leg biomechanical abnormality. After getting the history, examining the foot, performing gait analysis, etc., we may recommend foot orthotics. Often, the patient will announce, "I already have orthotics."

Conveying The Importance Of Properly Made Orthotics

At this point, we owe it to the patient to properly evaluate that orthotic. If it is made incorrectly, we need to let the patient know and offer to remake it properly before he or she considers invasive treatment options. Patients may decide to go ahead with the next step in treatment, but at the very least, we can let patients know the status of the orthotic.

If the orthotic is made correctly, then we must evaluate their shoes, activities, etc., even when patients elect more invasive treatment, such as surgery. We should let the patient know how important it is for the orthotics to be made correctly and accurately in order to prevent acceleration of the problem and/or recurrence.

Does The Device Meet Orthotic Goals?

When evaluating orthotics for a specific patient, we are essentially checking multiple processes. We are checking to see if the original cast or image was done accurately. Did the lab do the correct work on the cast or image sent to it prior to fabrication? Was the final orthotic plate or shell or module made properly from that final positive cast? Our basic premise in fabricating orthotics is trying to position the patient's foot in or near subtalar neutral position with the midtarsal joints(s) fully pronated. This allows optimal shock absorption at contact phase by allowing subtalar joint pronation (with its associated internal tibial rotation and subsequent knee flexion), which is where the main shock is absorbed. Then in late heel contact and through midstance, the midtarsal joint is pronating and adapting to the terrain. After midstance, the pronation stops and resupination of the subtalar joint begins with external tibial rotation, which is caused by rotation of the axial skeleton and hips. Then there is reduced range of motion of the midtarsal joints, converting to a "rigid lever" that allows patients to push off from a stable support.

If any of the following three criterion for proper orthotic fabrication is violated or inaccurate, you will have compromised the "correction" of the patient's walking. When evaluating a patient's orthotic, be sure to evaluate for strength, contour and balance.

Assessing Orthotic Strength And Contour

1. Strength. The orthotics must be strong enough to withstand the patient's body weight and foot deformity or correction. In evaluating the strength of the orthotic, if the material in the module is too flexible, it will not be able to adequately resist abnormal motions and will therefore be ineffective in influencing foot function.

Also keep in mind that flexible materials will function differently in different shanked shoes as they change shape to conform to the internal structure of the shoe (shank dependency).

2. Contour. The contour of the orthotic is critical to proper performance of the orthotic. To check contour, hold the patient's foot in subtalar neutral and the midtarsal joints pronated (casting position). Then softly hold the orthotic plate up to the foot. You should see close contour between the bottom of the foot and the top of the orthotic. In cases of varus forefoot balance, you should see a qualitative flare of the plate from the foot medially. For valgus, the opposite is the case as you should look for flare laterally under the 4th and 5th metatarsal necks. In zero balance, you should see close contact in the entire plate to the foot.

The only area of "gap" should be approximately 6mm medial at the first metatarsal shaft to account for soft tissue expansion which occurs on weightbearing. If there is too much gap, it will allow overpronation as the plantar foot attempts to become plantigrade and there will be a lack of contact as the foot falls to the floor. The only danger of inadequate gap in the medial arch may be irritation. To prevent this problem,

you can either heat-adjust the device or grind it down to allow expansion to occur.

Contour is influenced by numerous factors. The first is the shape of the original cast taken by the doctor. If the patient's foot was supinated at the subtalar joint, the forefoot measurement will be more varus than the patient requires and will "pronate off" the orthotic.

If the patient's foot was supinated at the midtarsal joint long axis, there will be excess varus balance as well as a gap in the medial arch. Oversupination of the oblique axis will cause flaring of the plate from the foot medially and laterally, since the oversupination caused the original foot shape to be overly exaggerated in the sagittal plane. Excess pronation of the subtalar joint in casting the foot will show too much valgus balance or inadequate valgus, depending on the neutral measurements of the patient's foot.

You can detect these different criteria or findings by determining the difference in the shape of the plantar foot as well as the frontal plane relationships of the fore- and rearfoot in different joint positionings.

What About Orthotic Balance?

3. Balance. The orthotics must have the correct amount of correction or tilt based upon your foot measurements. Checking orthotic balance is similar to measuring the forefoot and rearfoot. With the patient in a prone position, we position the subtalar joint neutral with the midtarsal joint(s) locked/pronated. The leg should be in or close to simulating the base of gait in relation to the long axis of the patient's spine. Holding the orthotic softly against the plantar surface of the foot, look at the plantar surface of the orthotic. Think of the orthotic's plantar surface as a plane, using the distal medial, distal lateral and plantar heel contact points to define that plane. We visually compare the plane to the horizon or anticipated walking surface for that patient. The two planes should be parallel. This shows that when the patient stands on the orthotic, his or her subtalar and midtarsal joints will be in proper positions. This concept can be best understood by recalling the concepts of 2-D versus 3-D surfaces. You can view the plantar surface of the foot as a 3-D surface, which is mobile and can change based on pressures and forces. With the top of the orthotic, you're aiming to mimic the 3D shape of the plantar surface of the foot in the desired functional position (STJ neutral and MTJ pronated). The 2D surface of the plantar orthotic, represented as a plane using the three points mentioned above, should mimic or parallel the horizon or surface the patient will walk upon.

Other Pearls For Ensuring Orthotic Success

Here are some other key considerations to keep in mind when you're evaluating orthotics.

Lesion accommodations must be accurately placed and deep enough. Sometimes, the location will be slightly different in weightbearing compared to off-weightbearing. Using a pen with transferrable ink, mark the patient's foot and then have him or her step barefooted onto the orthotic in the shoe. Compare the mark to the lesion accommodation.

Metatarsal pads, neuroma pads, etc., have their ideal locations anatomically, but you may need to move them to help facilitate patient comfort.

It is critical to evaluate length and width in order to ensure proper fit, comfort and control. The distal end of the orthotic must be just proximal to the metatarsal necks. The width covers the extreme lateral side of the foot and extends to the midshaft of the first metatarsal. Wider orthotics will accomplish more control, but may pose a possible fitting problem for the shoes. Orthotics that are too narrow will lead to movement of the plate within the shoe and lack of control as well.

When treating pediatric patients, often the doctor will prescribe a longer orthotic to allow for growth. If there is no discomfort, it will be acceptable. The common areas of outgrowth occur in the length and heel width.

After surgery, patients can often use the same orthotic. However, be careful to evaluate post-op patients, especially those who have had surgical procedures on the metatarsals which change the sagittal plane position. You should also re-evaluate orthotics after patients have undergone procedures (such as midfoot rotation osteotomies, etc.) which affect the frontal plane. Surgeries which change the plantar contour of the foot can require recasting of the foot.

Medial or lateral flanges can help with increased frontal or transverse plane control, but may be difficult to fit into the shoe.

Carefully evaluate limb length difference or equinus conditions in order to ensure proper heel lift(s).

Check plantar fascia grooves closely for accurate placement. They can also greatly reduce the control of foot function as they often cause excess gapping between the foot and the plate.

Final Notes

When performing the orthotic evaluation, you can check the aforementioned criteria in moments. Develop your own system to keep on track and don't miss some of the items which can be replaced or repaired in the interest of your patient's optimum care.

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