PROLAB ORTHOTICS
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TROUBLESHOOTING ANTERIOR EDGE IRRITATION IN FOOT ORTHOSES

Irritation to the metatarsal head region of the plantar foot at the anterior edge of a custom foot orthosis is not only a common problem seen with custom foot orthosis therapy but is also a problem that can be very frustrating for the prescribing podiatrist. Anterior orthosis edge irritation can be caused by numerous issues with either the orthosis, or with the shoe the orthosis is being worn in. In this newsletter, I will discuss, in detail, how best to diagnose the cause of anterior orthosis edge irritation and how to fix the problem so that the patient can wear their custom foot orthoses on a daily basis without complaint.

Anterior orthosis edge irritation is nearly always caused by one or both of two factors, 1) problems with the fit of the orthosis to the patient's plantar foot, and/or 2) problems with the fit of the orthosis within the patient's shoe. In other words, either the custom orthosis is too long or too thick at its anterior edge so that it will be a problem when it is worn in any type of shoe or the orthosis simply doesn't fit into the shoe correctly, resulting in the anterior edge of the orthosis digging into the plantar forefoot and causing pain.

The anterior edge of an orthosis shell should end at the level of the metatarsal necks of all five metatarsals so that the patient's plantar metatarsal heads, or sesamoids, are not bearing significant weight onto the firm anterior edge of the orthosis. The bony plantar metatarsal heads, and sesamoids, are much more susceptible to plantar irritation when they are required to bear weight onto any localized irregularities in the orthosis shell compared to when the orthosis anterior edge ends at the level of the metatarsal necks where there is a thicker soft-tissue layer to cushion the anterior orthosis edge. Therefore, during the orthosis dispensing appointment, while the patient is seated, the orthosis is placed onto the plantar foot and inspected carefully to ensure that the anterior orthosis edge ends properly at the metatarsal necks.

One of the more common areas of anterior edge irritation is at the level of the sesamoids. Invariably, in these cases where the patient complains of pain or irritation of the anterior orthosis edge at the proximal aspect of the plantar sesamoids, it is found that the patient has an abnormally short first metatarsal and the orthosis is too long only in the region of the first metatarsal and sesamoids. This problem can be corrected by grinding the orthosis anterior edge a few millimeters (mm) shorter at the area of the sesamoids so that the patient's sesamoids are no longer bearing any weight onto the anterior orthosis edge.

However, a much more common cause of anterior orthosis edge irritation is not that the orthosis is made incorrectly, but rather that the orthosis does not fit properly into the patient's shoe. One clinical test that I have been using for the past four decades is what I call the *Barefoot Standing Orthosis Test*. In this test, the patient is asked to stand barefoot on both of their orthoses to see how they feel compared to when they are worn inside their shoes. If, during the Barefoot Standing Orthosis Test, the patient has no sensation of anterior edge pressure, irritation, or pain, then it is likely that the mechanical interaction of the orthosis with the shoe is the cause of the anterior edge irritation, and not an improperly-made orthosis.

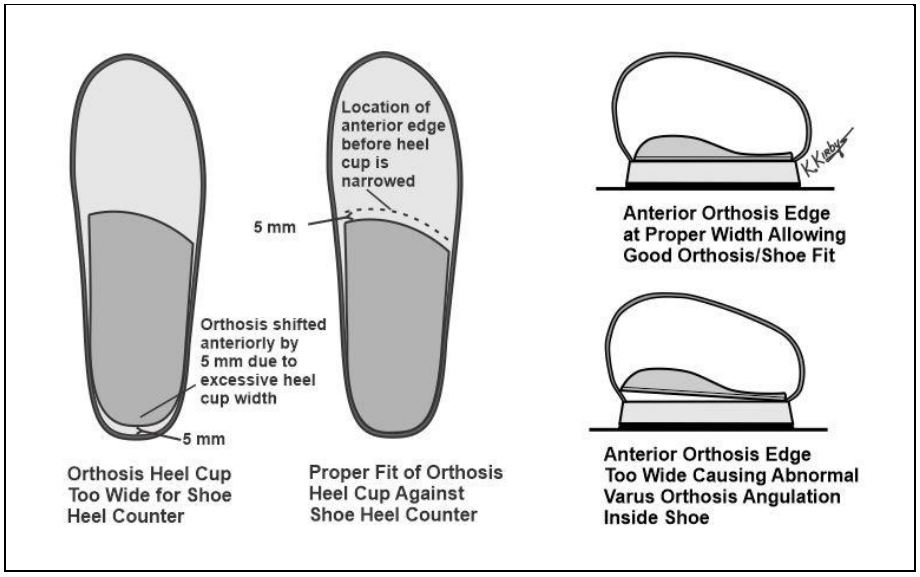

Figure 1. If the orthosis heel cup is too wide for the shoe (left), the heel cup may need to be lowered and narrowed to prevent orthosis anterior edge irritation. If the orthosis is too wide anteriorly to fit flat on the shoe insole, the anterior orthosis edge may rest in an abnormal varus angulation relative to the shoe insole, increasing the risk of anterior orthosis edge irritation (right).

In order for a foot orthosis to function well and not cause foot

irritation, the two basic orthosis-shoe fit requirements are that the posterior edge of the orthosis heel cup must seat firmly against the posterior heel counter of the shoe and the anterior edge of the orthosis needs to fit flat on the shoe insole. In all cases of suspected anterior edge irritation, I first visually inspect the shoe to make sure that the posterior heel cup is seated properly against the posterior heel counter. Next, I will use my hand to feel inside the shoe to determine whether the anterior edge is sitting flat on the shoe insole as it normally should, or whether the anterior orthosis edge is tilted or lifted abnormally away from the shoe insole creating a "gapping" of the orthosis anterior edge away from the shoe insole.

The most common cause for a custom foot orthosis to not be seated properly against the posterior heel counter of a shoe is that the orthosis heel cup is too wide or too deep and/or the heel portion of the shoe insole is too narrow to allow the orthosis heel cup to seat properly against the back of the shoe (Figure 1). When the orthosis heel cup is too wide/deep or the shoe insole is too narrow at the heel, the orthosis will be forced anteriorly inside the shoe and, effectively, make the orthosis longer inside the shoe, increasing the risk of anterior orthosis edge irritation. This problem may be solved by grinding the heel cup of the orthosis so that it is less wide, which can be easily done with an in-office grinder by lowering and narrowing the orthosis heel cup. Once this in-office orthosis modification is accomplished, the orthosis will then be able to sit more posteriorly inside the shoe so that the anterior edge of the orthosis is in the proper location under the plantar foot which should eliminate the irritation to the plantar foot at the anterior edge of the orthosis.

A more troublesome cause of anterior orthosis edge irritation is when the orthosis anterior edge is not sitting flat upon the insole of the patient's shoe (Figure 1). Due to the fact that it is sometimes difficult to see the anterior edge of the orthosis inside a shoe, I will often use my hand, as mentioned earlier, to feel the anterior edge of orthosis relative to the patient's shoe insole to determine if the orthosis is lying flat inside the shoe. Nearly always, if the orthosis is abnormally tilted within the shoe, the orthosis will be inverted due to the medial aspect of the anterior orthosis edge resting on top of the medial aspect of the upper of the shoe instead of resting in its proper position flat upon the shoe insole.

If the orthosis is found to be too wide anteriorly and causing it to be abnormally inverted inside the shoe, the usual result will be irritation to the plantar foot at the medial aspect of the orthosis anterior edge. To solve this issue, either the orthosis will need to be ground more narrow, or the patient will need to purchase, or use, another shoe which is wider that will better accommodate the orthosis. If I have determined that the orthosis must be wide in order to function properly for the patient and relieve their foot and/or lower extremity pathologies, then I will recommend the patient purchase or use a wider shoe so that the orthosis can work properly. However, if the width of the orthosis is not critical to allow proper orthosis function and proper therapeutic benefit for the patient, then I will grind the orthosis narrower at its medial edge. [Narrowing the orthosis at its lateral edge is not recommended since this will increase the risk of lateral orthosis edge irritation.] By grinding the orthosis more narrow, the orthosis will sit properly inside the shoe, with its anterior edge flat on the insole, so that the patient has much less risk of experiencing anterior orthosis edge irritation.

Another cause of anterior edge irritation can occur in well-worn shoes that have developed a concave shape within the shoe insole which results in only the medial and lateral portions of the orthosis anterior edge actually resting on the shoe insole. Since a custom foot orthosis is always made with a flat anterior edge so it can sit in a congruous fashion onto a flat shoe insole, when the shoe insole has become deformed over time into a concave shape within the frontal plane, the central portion of the anterior edge of the orthosis can gap away from the shoe insole by up to 2-3 mm, increasing the risk of anterior edge irritation. Preferably, the patient should just buy a new shoe without a worn sole to solve the anterior edge irritation so that their orthoses may be worn in a shoe with a flat insole. However, in a pinch, the orthosis anterior edge may also be ground medially and laterally to fit the concave shoe sole shape better to eliminate the anterior orthosis edge irritation.

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