PROLAB ORTHOTICS
Evidence-Based Medicine

Biomechanics & Orthotic Therapy Newsletter
July 2023

TIPS AND PEARLS WHEN USING THE MEDIAL HEEL SKIVE ORTHOSIS TECHNIQUE

As described in last month's ProLab Biomechanics and Orthotic Therapy Newsletter, the medial heel skive technique was developed in 1990 in order to create an orthosis technique that would increase the subtalar joint (STJ) supination moments acting on a patient's foot to better treat pronation-related foot and/or lower extremity pathologies. In over three decades since I published the first description of the medial heel skive technique in the literature, I have learned a great deal about the biomechanics of the medial heel skive and how it can be used with a minimum of negative effects (Kirby KA: The medial heel skive technique: improving pronation control in foot orthoses. JAPMA, 82: 177-188, 1992). In this newsletter, I will review some tips and clinical pearls that have allowed the medial heel skive to become one of the most useful and effective orthosis techniques in my clinical practice.

Since the medial heel skive orthosis technique effectively increases the varus slope within the heel cup of the orthosis, ground reaction force (GRF) acting on the plantar heel is shifted more medial which, in turn, will increase the STJ supination moment acting on the foot during weightbearing activities. If milder increases in STJ supination moment are required, then a 2 mm medial heel skive is prescribed. A 4 mm skive is prescribed if moderate increases in STJ moment are required, and if the most intense increase in STJ moment is required within the patient's orthoses, a 6 mm skive is prescribed. In effect, the increase in depth of medial heel skive will increase the percentage of the orthosis heel cup which has a varus slope, with a 2 mm skive having a relatively slight varus slope only in the medial aspect of the heel cup and a 6 mm skive creating a prominent varus shape from medial to lateral across the whole plantar heel cup of the orthosis.

Even though the increase in varus heel cup slope from a medial heel skive can be positive for the patient, it can also have the negative effect of causing the heel of the foot to slide laterally on the orthosis during weightbearing activities. If the heel cup of the orthosis is made too shallow when ordering the medial heel skive, then the potential for lateral heel cup edge irritation is increased (Fig 1.). For this reason, it is important to use deeper orthosis heel cups when a medial heel skive is ordered to prevent the lateral aspect of the patient's heel from being irritated by the lateral edge of the orthosis heel cup. In general, I recommend using at least a 16 mm heel cup height for medial heel skives of 2 mm depth and at least an 18 mm heel cup height for medial heel skives between 4-6 mm. The deeper heel cup will help prevent lateral heel cup edge irritation when the patient's heel slides laterally on the varus-sloped heel cup of a medial heel skive orthosis.

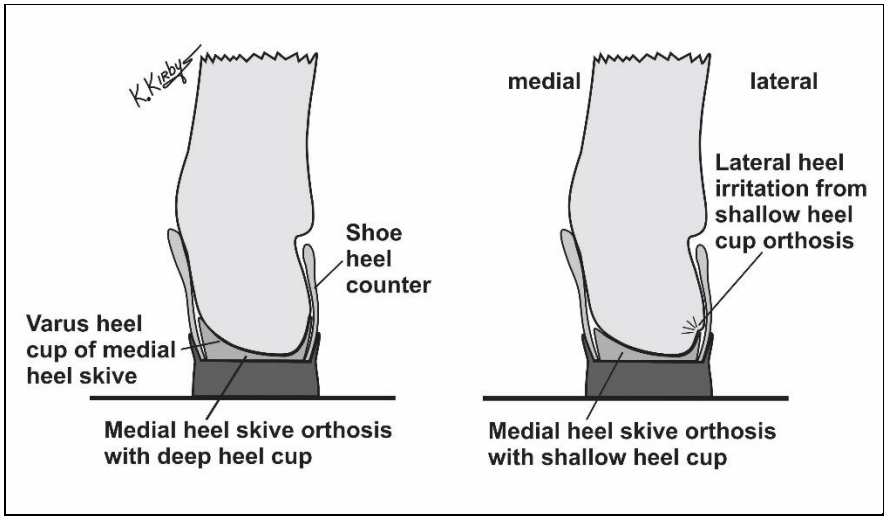

Figure 1. When a medial heel skive is ordered into a custom foot orthosis, a deep heel cup should be included to ensure that lateral heel cup irritation does not occur (left). Due to the tendency for lateral heel sliding on the orthosis during weightbearing activities, a shallow heel cup ordered along with a medial heel skive will likely cause lateral heel cup irritation (right).

In addition, the podiatrist must also be aware that the increase in varus slope within the heel cup of a medial heel skive orthosis can cause an increase in medial-plantar heel pain in certain patients. Before I order a medial heel skive into the orthosis of any patient, I will first evaluate the thickness of plantar heel fat pad to determine how much "natural cushioning" the patient has on their plantar heels. In children, since they tend to have a relatively thick plantar heel fat pad for their body weight, medial-plantar heel pain is rarely a problem when using the medial heel skive in children. However, if, for example, an older adult patient is found to have significant plantar heel fat pad atrophy, the risk of medial calcaneal

irritation is increased due to lack of adequate heel "natural cushioning" in the patient's foot. In these cases of plantar heel fat pad atrophy, I will not prescribe any more than a 2 mm medial heel skive so that the risk of plantar-medial calcaneal irritation is minimized in these patients.

Another important biomechanical consideration in the use of the medial heel skive orthosis technique is that it should never be used as the only "anti-pronation" orthosis modification when treating patients with significant pronation-related pathologies. Pronation-related pathologies such as posterior tibial tendon dysfunction (PTTD), patellofemoral syndrome, medial tibial stress syndrome and moderate to severe flatfoot deformity will require orthosis treatment that involves not only a medial heel skive, but will also require other custom foot orthosis modifications in order to optimize the biomechanical function of the custom foot orthosis in improving the comfort and function of the patient's foot and lower extremities.

When I first started developing the medial heel skive orthosis technique in 1990, I underestimated the powerful effect that the medial heel skive had in improving the "pronation-control" of the orthosis. This became quite evident when I found that the incidence of medial longitudinal arch (MLA) irritation from my orthoses was reduced by at least half when I included the medial heel skive in the orthosis. Two important factors likely explain this consistent clinical observation. First of all, when the medial heel skive is added into the orthosis, the plantar thickness of the orthosis heel cup is increased creating an "internal heel-lift" effect which lessens the MLA pressure from the orthosis on the MLA of the patient's foot, all other factors being equal. Second, and more importantly, since the medial heel skive increases STJ supination and/or decreases STJ pronation due to its varus heel cup shape, this biomechanical effect of the medial heel skive orthosis technique will invert the foot away from the orthosis MLA, lessening MLA pressure on the foot.

How the medial heel skive technique biomechanically interacts with the shape and stiffness of the MLA of the orthosis is a very important consideration for the podiatrist who regularly treats pronation-related foot and lower extremity pathologies with custom foot orthoses. In other words, the podiatrist should not just prescribe a medial heel skive into a custom foot orthosis without also considering how the inclusion of the medial heel skive will modify the forces acting on the MLA of the patient's foot and also considering how the medial heel skive and orthosis MLA can work synergistically to increase the overall supination effect from the custom orthosis on the patient's foot. The medial heel skive acts on the plantar heel of the foot with its varus heel cup shape to shift GRF medially, while a stiffer and higher MLA in an orthosis acts on the plantar aspect of the patient's MLA to also shift GRF more medially. With this knowledge, the podiatrist can then use both the medial heel skive and the stiffness and shape of the MLA of the orthosis in order to achieve optimal "pronation-control" and comfort from the custom foot orthosis for their patients.

For example, if the podiatrist wants to most effectively treat a patient with Stage 2 PTTD with custom foot orthoses, they will achieve the greatest overall increase in STJ supination moment and best therapeutic effect by not only ordering a 2-4 mm medial heel skive to shift GRF more medially in the plantar heel but also by ordering an orthosis which is stiff enough (i.e. at least a 4 mm thick polypropylene shell) and high enough in the MLA to shift GRF more medially on the plantar aspect of the MLA of the foot. In this example of a patient with Stage 2 PTTD, I will either order the orthosis to be inverted 2-3^0 with a "Standard Cast Fill" on the orthosis prescription form, or I will order the orthosis to be vertically balanced with a "Minimum Cast Fill". Both of these variations of orthosis prescription for treating Stage 2 PTTD will produce a custom foot orthosis that not only adds STJ supination forces at the plantar heel (i.e. from the medial heel skive), but will also add STJ supination forces at the plantar MLA of the patient's foot (i.e. from the stiffer plate and well-formed MLA shape of the orthosis). When the prescribing podiatrist becomes comfortable with these tips and clinical pearls in the use of the medial heel skive in treating pronation-related foot and lower extremity pathologies, they will be well on their way to becoming experts in custom foot orthosis therapy.

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