

# SAAFO for Tibialis Posterior Tendon Dysfunction

**Conceptualization:** The objective was to develop a device that was less encompassing of the leg, but provide the same mechanical effect as a longer version. It also had to be lightweight, easy to apply and wear, and could incorporate a molded foot orthosis for forefoot to hindfoot alignment correction if needed. The first prototype consisted of a UCBL with independent proximal uprights connected circumferentially with a strap. Although helpful, the short proximal plastic extensions provided insufficient frontal plane control. To eliminate this problem, the proximal struts were bridged anteriorly producing a design concept similar to a rear entry ski boot. The intimate fit of the anterior shell to the tibial crest, held firmly in place by a posterior strap, eliminated the pistoning of the independent uprights and provided excellent inversion/eversion control while maintaining a low profile. The short proximal anterior shell reduces the tibial rotational component of pronation in the closed chain, which translates into reduced longitudinal arch collapse and eversion of the calcaneus. This total contact anterior tibial component design has proven to be most effective while still maintaining a low profile for comfort and cosmesis.

**Clinical Application:** Tibialis posterior tendon dysfunction has several clinical presentations of symptoms from pain along the course of the tendon to subfibular pain laterally due to impingement. Later stage patients that have tried foot orthoses previously without much relief from their symptoms have received the biggest benefit from the short articulated AFO. These patients include those that have severely abducted forefeet and or have developed significant varus or hypermobility of the first ray.

We have incorporated a total contact distal interface within the AFO in order to mechanically post the forefoot for varus or valgus positions that may be found when the subtalar joint is neutralized. This also works to absorb shock and softens the feel of the thermoplastic footplate as well as protecting bony prominences. This total contact interface can be fabricated from multiple materials to meet the soft tissue requirements of the particular patient. It is strongly recommended for use with tibialis posterior tendon dysfunction to the many clinical features with which this pathology presents.

**Evaluation and Impression Technique:** It is extremely important to determine, prior to casting the patient, the alignment that would best benefit the patient. Often in the late stages of the pathology, subtalar neutral is difficult, if not impossible to achieve due to the longstanding effects of this disorder. Many patients present with a contracture of the gastrocnemius - soleus complex which contributes to the collapse of the midfoot and hindfoot eversion. Often, as stated previously, an acquired forefoot varus is noted at subtalar neutral and must also be taken into consideration prior to casting. We have found that obtaining subtalar neutral position in the casting may be an unrealistic position to hold a severely involved foot and ankle due to the difficulty one may have in maintaining this position within the orthosis. It is best stated that the orthotist's ability to assess the flexibility of the disorder is our best clinical tool. We have found through multiple clinical trials that pain can be eliminated through just stabilizing a significant deformity versus total alignment correction. After performing the mechanical evaluation to

determine the optimum position of the foot, an impression must be obtained.

A circumferential plaster or fiberglass wrap starting four to six inches proximal to the medial malleolus (height determined by size of patient and magnitude of deformity) and moving distal to the toes. A small surgical tube is used for removal anteriorly over the apex of the tibial crest. Then impression is then removed, sealed and filled as any impression would be.

**Fabrication Considerations:** Modification of the positive model is determined by the bony prominences present, and the significance of the deformity. Common areas of added plaster for relief over prominences are the medial malleolus, medial head of talus, navicular, cuneiform, base of the fifth metatarsal, and tibial crest if prominent.

Once the cast is modified, we then fabricate the distal interface correcting for any forefoot to hindfoot malalignment captured in the impression. A heel lift can be incorporated at this time if an Achilles contracture is noted. A prefabricated thermoplastic hinge is added to the cast for the ankle articulation of the clinician's choice. A normal drape molding process is used with the seam running anteriorly. If copolymer is used, this seam can be sanded and buffed, and need not be welded. If polypropylene is used, the seam can be welded for integrity. The plastic footplate is commonly trimmed proximal to the metatarsal heads while the soft interface remains full length. A posterior calf strap is added at the proximal border of the orthosis to keep the anterior shell secure to the tibia.

**Fitting Criteria:** Fitting of the short articulated AFO can often require patience exercised by both the practitioner as well as the patient. The rear entry design allows the patient to keep the device in the shoe of their choice, preferably some sort of depth inlay shoe with a full-length removable sock liner. Shoes that have a wider midfoot type last will serve best to provide stability to the orthosis. In some severe cases, the use of external shoe modifications have been necessary to assist mechanical support of the foot and ankle. Common shoe modifications that have been successfully used in conjunction with the AFO have been medial heel and sole flares and/or wedges. If a patient presents with a prominent tibial crest and/or navicular, cuneiform, or medial malleolar prominences, then selective padding may be required for comfort. In cases of unilateral use, an internal heel elevation may be required for the uninvolved side. Often that patient has already been wearing some type of foot orthosis that may serve the purpose of equalizing leg lengths. A conservative break in period is recommended for the patient, with follow up visits highly emphasized.

**Clinical Outcome Study:** A clinical outcome study was performed in 1992 and presented to the American Orthopaedic Foot & Ankle Society's Summer Meeting with the following summary of results: out of 93 patients fit, 79% of the patients were completely satisfied with the AFO and the relief they obtained by continued use of the orthosis. The average wear time was over 9 hours daily with over 90% stating that it was easy to wear and allowed more normal activity with less discomfort. Since completing the follow up study, over 500 orthoses have been dispensed with

approximately the same level of success.

The device has also been used for the treatment of other pathologies affecting the subtalar joint and associated articulations such as tarsal coalitions, calcaneal fractures, subtalar and talonavicular osteoarthritis, peroneal tendonitis, and some cases of mild charcot changes of the midfoot.

**Summary:** Treatment of tibialis posterior tendon dysfunction can require multiple modalities due to the varying levels of clinical presentation. The use of pedorthic intervention has been a successful tool, and in most cases is quite effective, but in later stages of this pathology it is almost imperative to cross the ankle. Crossing the ankle increases the leverage for better control of the severe hindfoot instability and deformity, which is, unfortunately, part of this pathology. Finally, this author would like to recognize Dr. Ian Alexander for the design ideas as well as the inspiration to make a very successful clinical tool in the management of tibialis posterior tendon dysfunction.

Written by: Roger Marzano, C.P.O., C.Ped.