A Review of Five Common Types of AFOs

For each type the author offers a specific set of clinical indications, biomechanical functions, and casting recommendations.

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Disclaimer: *Dr. Stess is President of the STS Company, which manufactures the STS casting sock line.*

The methodologies of obtaining the appropriate type of negative cast for the various ankle foot orthotics (AFOs) often leads to some confusion. Commonly, the preferred method of casting and the position of the lower extremity in obtaining a negative cast that will be used during the fabrication of an AFO can differ dependent on a variety of factors, a few of which may include the following:

1) The profession (podiatric physician, physical therapist, orthotist/prosthetist, pedorthist, orthopedic surgeon)
2) Purpose of the orthosis
3) Education
4) A central fabrication facility
5) Designer or patent holder of a particular AFO (Richie Brace, Arizona Brace, CROW, etc.
6) Facilities' capabilities

To simplify the choices and assist a podiatrist in making a determination regarding the more common AFOs, it is the intention of this review to clarify the various considerations. Presented here are only a few of the ankle foot orthotic devices that are currently being prescribed by podiatric physicians. Some of the orthotic laboratories that provide each AFO type are highlighted; these lists, however, are not meant in any way to be comprehensive—the companies listed are simply examples, and there are many other laboratories that provide similar devices.

Regarding casting methods, it is my opinion that scanning may be useful for custom AFO fabrication but as a relatively new technology it will not be discussed in this article.

Ankle Gauntlets

Some manufacturers: Arizona AFO, Richie Brace Labs, Marathon, Trumold, JSB, Pine Tree, Hersco, ACOR, ProLab

This is a custom molded leather ankle brace that provides support and control for both the ankle and foot. Ankle gauntlets can be solid or can be dynamic with the fabrication of hinges to allow and control ankle joint motion.

The clinical indications for use are the following:
PTTD (Posterior tibial tendon dysfunction)
Talocalcaneal varus or valgus
Tibialis tendonitis (posterior or anterior)
Severe pronation or pes planus
Ankle arthritis or degenerative joint disease (DJD)
Charcot foot
Ankle, subtalar or midtarsal trauma
Chronic Achilles tendonitis

The brace stabilizes the ankle area, the talocalcaneal, midtarsal and subtalar joints. It provides medial and lateral stability to minimize sinus tarsi impingement and reduces either forefoot abduction or adduction.

The position of casting should be in semi-weight bearing on a padded footboard in a corrected position with the ankle at 90°. All boney prominences and/or plantar wounds should be marked with an indelible pencil or lipstick.

Companies frequently request that either an STS Mid-Leg casting sock or plaster bandage be used to obtain the negative mold. Most labs that fabricate this type of AFO request that fiberglass tape not be used because of its lack of detail and deforming effects upon the soft tissue of the foot.

Balance Bracing

Some manufacturers: Moore Balance Brace (OHI), Air Balance (Rybo), KLM, Trumold, JSB, Solo, ACOR

The Moore Balance Brace (OHI) was introduced as a custom-made AFO designed to reduce the risk and incidence of falls in the elderly and high-risk populations. According to the published articles, the clinical indications are ankle instability, peripheral neuropathy, ankle osteo-

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The Clinical Forum

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arthritis, mild foot drop, vestibular disease, and a history of fall or near fall. After its introduction, several other podiatric laboratories introduced similar braces (e.g., Rybo, KLM). Balance braces are best utilized in conjunction with a comprehensive fall prevention protocol which may include strength training, certain environmental changes in the home, physical therapy, and other related supplementary adjuncts.

The patient should be seated during casting in a semi-weight bearing position, with the hip, knee, and ankle all at 90°. The STS Mid-Leg sock, plaster or fiberglass tape can also be used for fabrication.

In order to achieve a satisfactory clinical outcome, the practitioner must establish a good dialogue with the laboratory of their choice in order to obtain the most appropriate device.

Charcot Restraint Orthotic Walker (CROW)

Some manufacturers: Hersco, ACOR, Arizona AFO, Orthomerica

The CROW is an excellent alternative to total contact casting when maintaining and caring for the diabetic foot. The boot is a custom-made bivalve thermoplastic shell lined with a soft foam. This allows for a rigid outer shell to resist unwanted ankle motion and a foam liner to provide a comfortable interface that is easy to clean and helps to reduce tissue breakdown. A CROW AFO minimizes the forces going through the foot. The rocker bottom and custom molded insert enhance healing and off-loading of the affected area.

The Clinical Indications:

Diabetic plantar foot ulcerations

Charcot deterioration of the foot and/or ankle

Calcaneal or toe amputations

Pre or post-surgical intervention of mid-, rear, or hind foot

The position of casting should be in semi-weight bearing on padded footboard in a corrected position with the ankle at 90°. Plaster, STS Bermuda Sock or fiberglass tape can all be used for obtaining the negative model. The entire foot and leg, just below the knee, should be casted. All boney prominences and/or plantar wounds should be marked with an indelible pencil or lipstick.

Posterior Leaf Spring Orthotic (PLSO)

Some manufacturers: Richie Brace labs, Hersco, ACOR

The clinical indication for a posterior leaf spring orthotic (PLSO) is weakness or absence of dorsiflexors resulting in foot drop. This thermoplastic AFO features a custom-made polypropylene design. This AFO supports, assists, and controls the joints of the foot and ankle.

A posterior leaf spring AFO prevents foot slap at heel strike and assists in toe clearance in the swing phase of gait. A PLSO is a rigid AFO trimmed behind both malleoli to provide flexibility at the ankle and allow passive ankle dorsiflexion during the stance phase. A PLSO provides smoother knee-ankle motion during walking while preventing excessive ankle dorsiflexion. Varus-valgus control is also poor because it is repeatedly deformed during weight bearing. A PLSO is an ideal choice in mild spastic equinus. The Posterior Leaf Spring AFO is deemed a swing phase orthosis in that it is effective during swing phase only. It is suitable for children who present with isolated dorsiflexor weakness or paralysis.

The position of casting can be either semi-weight bearing on a plastic covered padded footboard with the foot at 90° or non-weight bearing with the foot being maintained at 90°. Plaster, STS Mid-Leg casting sock or fiberglass tape can all be used to obtain the negative cast.

Supra Malleolar Orthotic Device

Some manufacturers: Richie Brace Labs, Hersco, ACOR

The Richie Brace® was introduced in 1996 as an alternative to the custom ankle brace (ankle foot orthosis), designed to treat chronic conditions of the foot and ankle including drop foot, PTTD, ankle sprains, chronic ankle instability, and other causes of foot and ankle pain. Additionally, there have been a variety of modifications that are now available that contribute to the stabilization and or function of the midtarsal, subtalar and ankle joints. Since the inception of the Richie Brace, similar braces have been introduced by other podiatric labs (PAL, KLM, ProLab, Arizona). What is quite unique to this type of brace is the molded balanced orthotic footplate that additionally attempts to control some of the abnormal biomechanical forces affecting the aforementioned joints.

The cast for this type of brace is obtained by placing the foot at 90° to the leg and then placing the subtalar joint in its neutral position, stabilizing (or locking) the midtarsal joint and plantarflexing the first ray as one would perform in a neutral suspension technique for a neutral suspension functional foot orthotic. Plaster or the STS ankle casting sock are the preferred methods for obtaining the negative mold. It is necessary, once the cast is dry, to carefully mark the inferior aspects of both malleoli in order that the hinges of the brace uprights are correctly oriented. Additionally, the first and fifth metatarsal heads should be identified and marked with an indelible pencil.

There are a variety of additional custom AFOs that are currently being prescribed and new ones are being developed. The purpose of this review is to provide a synopsis of the most common devices, clinical indications, casting positions, and materials for casting. In order to achieve a satisfactory clinical outcome, the practitioner must establish a good dialogue with the laboratory of their choice in order to obtain the most appropriate device. **PM**

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