



ANKLE FOOT ORTHOSES

Children with hemiplegia may be offered ankle foot orthoses. This information sheet aims to answer your questions about ankle foot orthoses (AFOs). We explain what they are, what they do and what the differences are between different types of AFO your child may be offered.

WHAT ARE ANKLE FOOT ORTHOSES?

Ankle Foot Orthoses (AFOs) or splints, are external devices that are fitted to the body which are used to:

- *improve or prevent a physical impairment*
- *stabilise a joint or joints*
- *reduce pain*
- *improve mobility or performance*
- *reduce the risk of tripping over*
- *reduce the risk of injury.*

They have been used for many years to help manage the gait (walking pattern) of children with hemiplegia. They are used to reduce unwanted and uncontrolled movements associated with muscle imbalances, weakness or increased tone (tightness) in the lower leg and the foot and ankle.

WHY A CHILD MIGHT NEED AN AFO

Dorsiflexion and why is it important?

Ankle dorsiflexion is the movement of the foot at the ankle joint in an upward direction. Hemiplegia can affect a child's ability to achieve ankle dorsiflexion, resulting in a foot which points down which impedes walking.

Dorsiflexion is important as it allows many functions to be achieved easily without overstressing other joints. Without dorsiflexion, gait can appear jerky, as it is difficult for the body and leg to pass over the affected foot and ankle, and the energy needed to walk increases.

Dorsiflexion also occurs in many other daily activities, such as standing from sitting, sitting from standing, crouching, going up and down stairs, walking up hill and walking backwards.

If your child has problems with ankle dorsiflexion their development can be held back.



Posture problems in children with hemiplegia

Awkward movement in children with hemiplegia often means a tip-toe walking pattern with the added complication of the ankle leaning outwards (varus ankle) or collapsing inwards (valgus ankle). If your child starts to walk on their toes this leads to secondary problems:

- The knee joint tends to be pushed backwards further than it would normally (hyperextension or back kneeling).
- Hyperextension of the knee in turn has a harmful effect on hip position, pelvic stability and symmetry. This can affect a child's balance and general posture.
- The arm on the affected side will also react as the child fights to maintain their balance when walking.

Toe-walking gait not only affects a child's posture, but also increases the potential risk of developing contractures (shortening) of tendons and muscles, leading to permanent stiffening of the ankle and knee in later life.

"I am aware that when I walk, my arm comes up. It is almost a balance thing, and it has got worse as my walking got worse, if that makes any sense. It's not as bad when I have a splint on my leg doing its job properly."

Adult with hemiplegia

HOW CAN ANKLE FOOT ORTHOSES HELP?

One way to help ankle dorsiflexion and/or to prevent toe walking is to fit an AFO, which can help control any awkward movement of the foot and ankle during walking, play or rest.

A well-made and close-fitting AFO will help stabilise the foot and ankle to bring about ankle stability and improve balance, posture and confidence. It can help lift the foot, preventing tripping, reducing accidents and making walking easier and less tiring.

Controlling the foot and ankle will also influence hip and knee position in a positive manner and, in turn, lead to potential improvements in gait, balance and posture.

The goal of orthoses is to provide the least amount of restriction as possible while still encouraging and promoting your child's own abilities and long-term development.

HOW WILL MY CHILD GET AN AFO?

Your child will be invited for an assessment. It is important that a full assessment is carried out in a relaxed environment to ensure that the correct orthotic prescription is made. A quick 10–15 minute consultation in a busy clinic will most probably not lead to the best outcome.

When choosing the best splint to prescribe, your orthotist and therapist should consider:

- ***the biomechanical issues presented (how muscles, tendons and bones works together to provide movement)***
- ***Your child's age and developmental level***
- ***your child's activity levels.***

This will determine which orthotic prescription will best achieve the aims which have been identified, along with how the orthosis will need to be worn and how easy it is to get on and off.

For older children, a larger, more cumbersome orthosis may not be tolerated because of its appearance – this should be considered carefully and discussed in order to ensure acceptance of the prescription before it is supplied.

Information should be given about when to wear the orthotic prescription, how to look after it and what to do if there are problems.

A time frame to review the orthosis should be agreed, which will ensure it remains a good fit and continues to be useful during development and growth.

After you have received the AFO

Small, post-supply adjustments can increase the effectiveness of the AFO; this is most commonly carried out to adjust heel height, which changes the angle of the lower leg in relation to the ground when walking.

The foot plate of the AFO can be flat or contoured depending on the presentation/requirements. Insoles can be incorporated into the AFO to help maintain a good foot posture. Modifications can also be made to the outside of the AFO or the footwear, in order to 'fine tune' the prescription.

How is it worn?

An AFO should be able to fit into high-street footwear (not always problem-free but usually possible), which means greater acceptance to wearing it. Some parents have reported that wider and/or larger shoes have been necessary to accommodate an AFO. It should never be uncomfortable for a child to wear and should be able to be worn for most of their active day.

Problems with AFOs

Sometimes AFOs can rub on pressure points and create 'sore spots', especially with growth or if joining in sporting activities, so it is important to monitor your child's foot, especially the heel and ankle and attend regular review appointments.



DO ALL CHILDREN PEOPLE WITH HEMIPLEGIA NEED AN AFO?

Not all children will need an AFO. However those who do not have the problems of a toe-walking gait may still have general weakness or some instability of the ankle joint, which can lead to problems with balance, and a general loss of confidence.

The ankle may tend to collapse into an inwards or outwards position. When the rear foot and ankle collapses inwards (a valgus position), the arch of the foot tends to flatten along with it (pronation). Leaning outwards (a varus position) tends to create a high-arched foot (supination).

In cases like this, foot orthoses can be incorporated into footwear to improve foot stability. Foot orthotic prescriptions which can help reduce ankle and foot instability range from simple supportive footwear, to footwear with adaptations, to complex multi-material biomechanical and functional insoles.

"I was upset when H was given her first pair of Piedros, she was so dainty and was going to have to wear great big clumpy boots. But she loved them, and we made them pretty with frilly ankle socks. She only took them off for bed, they were her special boots"

Parent of a child with hemiplegia

Supportive footwear

Supportive footwear alone has little effect on severe foot instability, but can be useful for improving stability in an unstable ankle when a child starts to walk. They have a wide, flat, good-gripping sole with increased stiffness around the ankle. This can help to provide a greater sense of balance, however the foot itself may still move within the boot, therefore accurate measuring and careful fitting of this type of footwear is essential.

Adaptations to footwear

Adaptations to footwear, such as wedges to the inside or outside of the boot, can also help increase control over unstable ankles and reduce unwanted movement. These may have special wedging fitted during manufacture. The wedging works to produce a correcting force on the heel during standing or walking.

Insoles

Insoles usually come with good arch moulding/support and good cupping about the heel, finishing below the ankle. These can be helpful in reducing unwanted foot and ankle positions and improve balance and posture.

Foot orthoses are usually constructed of lightweight thermoplastics and can be made from a cast of the feet taken in a corrected position.

"I am currently using a specially made insole which has had fantastic results. Before getting it I was told I would have to have an operation as that was the only option left. But since getting it my foot has dramatically improved – my ankle used to roll outwards and my foot would turn in, and now the ankle is completely central."

Adult with hemiplegia

TYPES OF AFOS

There are different types of AFOs which may be suitable depending on how your child is affected, which we look at below.

SOLID AFOS

Solid AFOs are made with a solid, or 'fixed', ankle complex which holds the foot and ankle at a set angle. This is usually around 90 degrees, if the child can achieve this position easily. This stops the foot and ankle from being pushed down (plantarflexed) and prevents the development of a toe-walking gait as well as sideways movements of the ankle. The sole plates are also contoured to assist in foot stabilisation (tone reduction).

Why might a child have a solid AFO?

Solid AFOs can be used very effectively in providing stability and encouraging a good base of support in people with hemiplegia. They can be a good option to provide support and give confidence when a child starts to pull to stand and move around furniture.

Solid AFOs are also used where an existing contracture (muscle or tendon shortening) exists or where ankle movement is not present.

While the use of a solid AFO can be helpful in certain circumstances, it is not just the incorrect, or unwanted, movement that is restricted – all movement of the foot and ankle is lost, meaning that it is not suitable for everyone.

HINGED AFOS

The hinged, or articulated, AFO is similar to the fixed ankle type in many ways, however a simple mechanical joint is fitted at the level of the ankle joint and incorporated into the moulding during manufacture.

A hinged AFO allows dorsiflexion to occur while limiting plantarflexion (toe walking) past an agreed angle (commonly but not always around 90 degrees) with the use of a backstop. It provides the same medial (inside) and lateral (outside) stability for the ankle as a solid ankle AFO.

Why might a child have a hinged AFO?

A hinged AFO can provide a more natural, fluent gait, allowing the foot and ankle to dorsiflex during daily activities, such as standing from sitting, sitting from standing, crouching, going up and down stairs, walking up hill and walking backwards.

Due to the presence of the joints, hinged AFOs are wider at the ankles which can create problems when it comes to fitting into regular footwear.

SMOS AND DAFOS

Unlike more traditional rigid orthoses, supramalleolar orthoses (SMOs – orthoses which finish just above the ankle) or dynamic ankle foot orthoses (DAFOs – a brand name) are thin and flexible. They come in a variety of designs and can be useful in improving inside and outside (medial and lateral) stability around the ankle.

Why might a child have an SMOs or DAFOs?

SMOs and DAFOs promote good weight bearing and this in turn can lead to reduced toe walking and also a reduction in muscle tightness. They are often used when a child is developing their skills and gait, where the need for an orthosis may gradually decrease

SMOs and DAFOs can be an interim option when little children are still crawling and pulling to stand as they are less restrictive but still offer some support.

ELASTICATED ORTHOSES

There are a number of alternative treatments (such as elasticated compression orthoses) available to children with hemiplegia. In some instances, these are provided via the NHS as well as being available via private health professionals.

Lycra orthoses are often used for arm/hand, however can be used on the foot/leg. Currently, there is no conclusive medical evidence of the benefits of these garments in children with hemiplegia, but there are families who have told HemiHelp that they have worked

for their children. They may be useful for children who have a type of muscle stiffness called dystonia, where the muscles pull in more than one direction, which can make rigid splints painful.

However, elasticated orthoses are not the answer for all children with hemiplegia, and we would advise parents to discuss any type of orthosis with the professionals closely involved in your child's care to make sure they are getting the right treatment.

"AFOs come in a range of colours and patterns, which gives your child some element of choice."

Parent of a child with hemiplegia

DESIGN CRITERIA

Whatever type of orthosis is recommended or fitted, they share many common design points and try to provide some or all of the elements below:

- **heel stability (close moulding around heel)**
- **mid and forefoot stability (medial and lateral extensions, good arch support)**
- **control of unwanted, exaggerated and awkward movements**
- **reduction of the effects of increased tone and reduction of the effects of tightness and stiffness of muscles**
- **promotion of a stable base for weight bearing**
- **encouragement of good standing position with equal weight-bearing on both feet**
- **toe and metatarsal support (tone management)**
- **to prevent scrunching the toes**
- **contoured sole plates to assist in foot stabilisation (tone reduction)**
- **construction from semi-flexible or rigid materials (polypropylene, polythene, or others).**

A FEW FINAL WORDS

Orthoses are not a stand-alone solution to balance, posture and gait difficulties caused by hemiplegia, and are commonly used with other interventions as part of an overall management programme. It is also true that all children are not the same, and what works for one might not work for another.

When your child grows out of their orthosis always ask yourself the question: is my child still getting some benefit from this type of orthosis? A full assessment must be carried out again to review the type of orthotic management the child needs.

The charity Hemihelp has lots of information, advice and support for families living with a child with hemiplegia. Our closed Facebook page is a place where parents can find support from each other, and get hints and tips on all types of aids and adaptations their child may be offered. Please see box below.



HOW HEMIHELP CAN HELP

HemiHelp offers vital support, advice and information to families living with hemiplegia. Our services include a closed, moderated Facebook group, information resources, and events such as workshops and Meet Up and Try It Days. HemiHelp is part of the Contact family.


www.contact.org.uk/hemiplegia


HOW CONTACT CAN HELP

We can support you with any issue about raising your disabled child: help in the early years, diagnosis, benefits, education and local support. Please visit our website. You can also contact us on our Live Chat service.

 www.contact.org.uk

If you can't find what you're looking for on our website, give our helpline a call:


 **0808 808 3555**

 helpline@contact.org.uk

Guides for parents

We have a range of free guides for parents. A full list of our guides is at the link below. All our guides are free to parents who call our helpline, and are free to download.

 www.contact.org.uk/publicationslist

 **0808 808 3555**

This guide was updated by Chris Cody, Clinical Lead and Head of Regional Orthotic Services.



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