



Clubfoot (pes equinovarus)

Section of Children's Orthopaedics and Reconstructive Surgery
Division of Orthopaedic Surgery



Clubfoot (pes equinovarus) is a relatively rare, congenital foot deformity where the bones of the foot are in an abnormal position in relation to each other. Some tendons and ligaments are too short and tight, and the calf muscles are less developed than normal. The child's foot is in a pointed position: the heel is pulled up and the foot points downwards while the forefoot is turned inwards. A crease above the heel and on the inside of the foot can often be seen. The foot is stiff and cannot be corrected into a normal position without treatment. The treatment method used yields optimal results in the vast majority of patients.

Cause

The cause of clubfoot is unknown, but a certain hereditary tendency exists. Occurrence is approx. 1.4 per 1,000 children born. In 50 percent of cases, both feet are affected. There are twice as many boys as girls with clubfoot. The diagnosis is usually made at birth, but can often be seen on the routine ultrasound examination at 18 weeks. The foot deformity can vary from very mild to very stiff.

Treatment

In Norway, the Ponseti method is used, and is considered the most recognized treatment method worldwide. The treatment is based on serial casting, achillotomy - cutting of the heel tendon, and use of a bilateral foot abduction brace. Alongside the Ponseti method, parents are instructed in daily stretches and exercises.

Treatment usually begins during the first week of life. The foot is casted weekly until the deformities are corrected - approximately five - six casts. The vast majority of children also require a small operation to release the Achilles tendon – achillotomy - to allow the heel down into a normal position. After the achillotomy, the child receives a new cast. This stays on for three weeks before the child starts using the foot abduction brace. At the same time, stretching and exercises are initiated. Your physiotherapist at the hospital will teach you how to perform the exercises on your child.



Foot Abduction Brace (FAB)

Purpose

The purpose of the brace is to ensure the bones of the foot develop in the correct position. This greatly reduces the risk of relapse. The brace is available in different models: Dennis-Brown / Alfaflex / Dobbs / Ponseti/ Mitchell, and is adapted by an orthopedic engineer. The brace incorporates both feet regardless of whether the child has a clubfoot on one or both feet. Research has proven this type of brace, in contrast to those manipulating only one foot, provide superior long term results.

Use

It is essential to use the brace as recommended so the foot maintains the corrected position for optimal results. The absence of systematic use significantly increases the chance of relapse. The brace should initially be used day and night, 21-23 hours a day, for three months. After that, only at night and when sleeping during the day, 12-14 hours a day, until five years of age.

Settings

The shoe on the brace of the affected foot is set at 60-70 degrees outwards, at 10 degrees upwards, and on the shoe of the unaffected foot at 40 degrees. The width of the brace corresponds to the child's shoulder width. It is important that the heel of the foot is firmly down in the shoe and that the middle strap is securely tightened. This way the foot is locked in the optimal position.



Beginning with the brace

Some find that the transition from casts to using the orthosis can be challenging. For both the child and parents, emotional upset and interrupted sleep can occur due to this new and unfamiliar situation. Be reassured the first week is for gradually increasing acceptance and familiarity. For parents, persistence is vitally important in this phase, keeping the brace on even if the child finds it uncomfortable and unfamiliar. If the brace is taken off whenever the child cries it will learn that crying is a way of having the brace removed. For most, the initial challenges are temporary and the child will come to accept the brace as a natural part of everyday life.

Wounds

To avoid the development of any wounds and discomfort, it is important to have the right size of shoes, have the foot firmly in place in the shoe, and the straps securely tightened. Initial parental monitoring of the skin is necessary, to prevent wounds from occurring. It is important to address skin changes as soon as they are detected to avoid wounds. If wounds occur, the use of the brace is stopped until the wound has healed. If in doubt, contact your doctor or physiotherapist at the hospital.

Stretching

After the cast period, alongside starting brace use, you will receive training in stretching and exercises. Parents need to stretch the foot on a daily basis. While stretches are not originally part of the Ponseti method, they are widely used by many treatment facilities, as the benefits are numerous. Their purpose is to keep the foot soft and maintain the achieved correction, supplementing to the brace. Additionally, you become familiar with the child's feet and will be in a better position to know if the foot is about to retract into the original deformity.

Depending on the function and appearance of the foot, the need for each stretch is continuously assessed when the child comes to regular check ups at the hospital. This occurs in agreement with your physiotherapist in the out-patient clinic. The stretches are usually performed over several years. When the child reaches school age, they are usually capable of doing the stretches independently.

Ceasing stretching exercises should always occur in agreement with the treating doctor or physiotherapist at the hospital.



Original deformity



Corrected deformity

DYNAMIC STRETCHING (especially important during the first three months of brace treatment)

Principles of dynamic stretching / passive movement:

» Repeated repetitions: 30-40

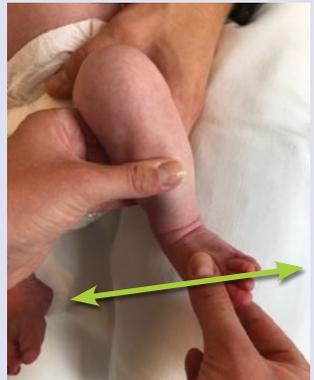
Ankle dorsal flexion and plantar flexion

- Place the child in a supine position. Stabilize the calf with one hand below the knee. With the other hand grasp the child's foot with the index finger around the heel.
- Move the ankle up and down. Remember to pull the heel down firmly when making the stretch.



Ankle outwards/inwards movement

- Place the child in a supine position. Stabilize the calf with one hand just above the ankle. The heel must be able to move freely. With the other hand grip around the forefoot.
- The forefoot is moved outwards and back inwards.



Stimulation of muscles on the outside of the foot/leg

- Light strokes along the outer edge of the foot, up behind the ankle bone and continue further up along the outside of the calf.



STATIC STRETCHING

Principles of static stretching

- » Daily x 3
- » Effective stretching time 3 minutes for each grip
- » 30 seconds x 6 repetitions / 1 minute x 3 repetitions

Stretching of the Achilles tendon

- Place the child in a supine position. Knees slightly bent.
- Grasp the heel and pull it downwards in the longitudinal direction. To be able to hold the heel down, place the other hand gently underneath the forefoot (just for stabilizing).



Stretching the inside of the foot

- Place the child in a supine position.
- Grasp the inside of the heel with one hand / thumb and hold within the big toe joint with the other hand/thumb.
- Stretch the inside of the foot between the two fixation held points.



Stretching the foot outwards - «Ponseti»-Grip Alternative A

- Place the child in a supine position.
- Grasp the calf from the outside and let the calf rest in your hand. The heel should not be touched. The thumb of the same hand is placed on the head of the Talus - the small bone that sits between the heel bone and the two bones of the lower leg. The opposite hand's index finger and thumb grab the inside of the foot below the base of the big toe.
- Stretching: The foot moves outwards while the thumb maintains a slight counter pressure on the Talus.



Alternative B

- Place the child in a supine position.
- Grasp the calf from the inside and let it rest in your hand. The heel should not be touched and be able to move freely.
- The index finger of the other hand is placed on the head of the Talus.
- Stretching: The thumb moves the forefoot outwards while the index finger maintains a slight counter pressure on the Talus.



Alternative C

- Place the child in a prone «frog position».
- Hold the calf down on the surface. The heel should not be touched and be able to move freely. The thumb of the other hand is placed on the head of the Talus. The index finger grabs along the inside of the midfoot.
- Stretching: The forefoot moves outwards while the thumb maintains a slight counter pressure on the Talus.



Softening of the foot

- **Width:** Place both thumbs in the middle of the forefoot and perform gentle strokes out to the sides. Repeat several times.
- **Length:** Place both thumbs at the heel and perform gentle strokes forward towards the little toe and big toe.



Treatment Duration/Follow-Ups

Treatment and follow-up of clubfeet spans several years. Essentially, until the feet are fully grown. The need for follow-up is assessed individually for each child.

Check-ups are frequent in the beginning, and gradually occur at longer intervals.

Your physiotherapist will be present at most check-ups and can also schedule intermediate check-ups. It is recommended that you contact your community physiotherapist for follow-up in your area.

In addition to the use of the brace and stretching, balance training, stability and muscle strength in the legs and feet are important for the best result.

Relapse

All clubfeet have a tendency to retreat to the original deformity. This is often seen alongside growth spurts. In these cases, or where the foot is stiff and has not been properly corrected, a renewed period of casting and intensive physiotherapy is often necessary. It may also be necessary to have surgery on tendons / soft tissues or bones in the foot for beneficial correction and a well-functioning foot. Positive treatment results are also promising under these circumstances.

It is important to contact the treating physiotherapist or doctor at your hospital if the foot/feet become stiffer again or you experience other problems in relation to treatment.

Complex Clubfoot

Some feet are extra stiff and classified as complex clubfeet. This applies to a small number of patients. The foot is in a more pronounced pointed position and the crease over the heel bone is often deeper. There is also a groove running directly over the entire sole of the foot. The big toe is also shorter.

The complex clubfoot requires a more gentle treatment approach and the brace settings are also different. As long as the recommended treatment is followed, the prognosis remains positive. Research shows the number of casts and the treatment time is increased.



Follow-Up and Results

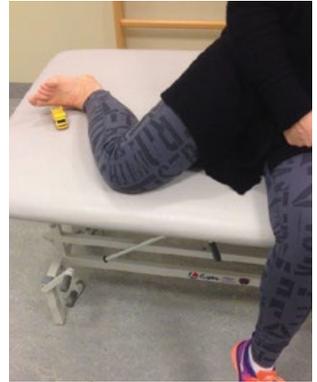
The prognosis for a positive outcome is generally high with the right treatment and follow-up. The foot will, in most cases, have a normal appearance, a normal load surface, satisfactory mobility in the ankle joint and good function. Some may experience a slightly stiffer and shorter foot. The calf muscles also become slimmer in these children. The vast majority of children live full, normal lives equal to their peers.

Further Training/Physical Activity

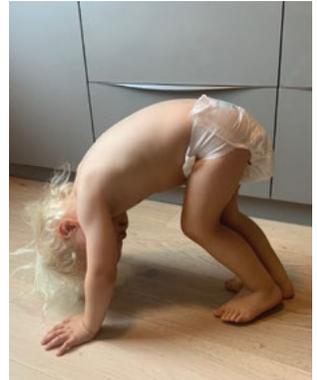
As the child gets older, it is beneficial to stretch the Achilles tendon in a weight-bearing position. This is done with a stretched and bent knee, on a slant board or a staircase, as shown below:



Stimulation of weak muscles - (lifting of the outside of the foot):



Balance training and bear walks:



General Activity

Children are encouraged to be as active as their peers. Many activities stimulate and challenge the feet in a beneficial way:

- Football
- Cross-country skiing
- Skates/rollerblades
- Climbing
- Trampoline

Shoes

The child can usually wear regular shoes with a supportive heel cap. Where the differences in shoe size are greater than two sizes, the child is entitled to a «split pair» covered by NAV. In some cases, corrective insoles or special shoes may be needed.

Kindergarten

The child can go to a regular kindergarten. Some children may also be given a priority placement. Check with the kindergarten if they have the ability to voluntarily assist with stretching exercises. In cases where the child is being followed up by the community physiotherapist, they can be asked to help arrange exercising and stretching in the kindergarten, and verify if the staff has the resources to do so.

Hints and Tips:

- Woollen hand-knitted socks over the brace shoes
- Stroller baby sleeping bag, with good width, fitting the brace
- Baby sleeping bag
- Padding on the brace between the shoes

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