

Introduction

Clubfoot is a deformity in which an infant's foot is turned inward, oftentimes so severely that the bottom of the foot faces sideways or in extreme cases, upward. Approximately one out of every 1,000 newborns has clubfoot, making it one of the more common congenital foot deformities.

Clubfoot is caused by an abnormal length of the tendons that connect the leg muscles to the foot bones, causing the foot to twist inward.

Approximately 10-20% of individuals with prenatally diagnosed clubfoot may have a normal foot or positional foot deformity requiring minimal treatment.

Pathology: imaging technology

Plain radiograph

Assessment requires weightbearing dorsiplantar (DP) and lateral radiographs. Where weightbearing is not possible, it should be simulated. The weightbearing DP foot radiograph is a specialised projection of the foot. It is key to the assessment of foot alignment and the diagnosis of abnormalities that cause malalignment and foot pain.

Ultrasound

Sonographic features may vary depending on severity. Both the tibia and fibula may be in the same image as the medially deviated foot and the foot may additionally appear plantar flexed.

Classification

Clubfeet must be classified according to severity to obtain reference points, assess the efficacy of orthopaedic treatment, and analyze the operative results objectively. A scale of 0-20 was established on

the basis of four essential parameters:

- equinus in the sagittal plane
- varus deviation in the frontal plane
- derotation around the talus of the calcaneo-forefoot (CFF) block
- adduction of forefoot on hindfoot in the horizontal plane



Old school solution

At least 50% of diagnosed clubfoot require orthopaedic intervention. The most commonly used technique is the Poncheti technique. Which uses gentle stretching and casting to gradually correct the deformity.

The Poncheti technique is performed in two steps:

1. the casting step, which gradually bends the foot into the correct position
2. the bracing phase, which makes sure it remains where it's been bent

Casting phase

Casting usually starts when a baby is a week or two old. The baby will wear a series of 5 to 7 casts over a few weeks or months. When the foot is in its final, correct position, the baby is fitted with a brace. Usually a percutaneous surgical release of the tendon occurs before the final brace.

Bracing phase

After the casting, the patient should adhere to the equally important bracing phase. The clubfoot brace is an orthotic that has 2 parts. It contains a bar out of metal and special boots that are attached to each other at the ends. The metal bar between the feet of the baby is the same length as the distance between the shoulders. It can slide or click into the bottoms of the shoes. This bracing phase can last for 2 to 5 years, then only during naps and at night after that. The parents of the baby should comply to the recommended criteria of compliance in order to avoid recurrence

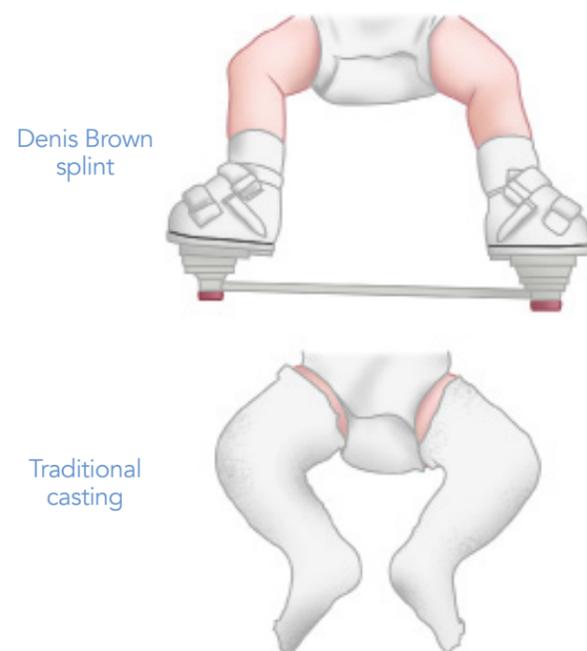
AFO's

The patients have to wear AFO's (ankle-foot orthoses) at night or during naps. This device is a hard rigid molded plastic splint with velcro strips and is designed to be worn on the lower leg. Its purpose is to support the ankle, hold the foot and ankle in the correct position and rectify foot-drop. This AFO works especially well on children whose feet do not fit into a shoe or sandal brace.

Known shortfalls of old school solution

Because of the heavy materials used, these traditional methods often impose unnecessary patient suffering. While not offering the correct treatment for clubfoot, it's also apparent that the comfort level of the particularly young patients is set back severely by these plaster braces. A traditional plaster can cause pressure spots on the skin sometimes so severe that the plaster treatment must be temporarily interrupted for recovery.

There is also a chance that the plaster slips, the toes disappear into the plaster. The plaster must then be removed, before risking of pressure spots on the heel and instep.



vs.



3D Printing as a solution for clubfoot

While traditional methods offer rather limited solutions, 3D printing has proven to be a rapid, highly customisable and secure solution for clubfoot.

Advantages:

The Spentys PolyCast is used to improve, on one hand the bandagists' daily work and on the other hand the quality of life of patient.

Implement the bandagist's expertise:

Thanks to the 3D scan of the patient's limb, Spentys is able to replace and recreate the articulations of the limb. These virtual articulations can then gradually be adapted throughout the healing process. It makes the healing process more precise and stable. It also helps to gather more accurate anatomical data.

Improve the patient's quality of life:

The PolyCast is comfortable thanks to high printing quality (production). It is X-Ray transparent, easy to apply alone (strap-on system), aerated and waterproof. The splint is hygienic and can be washed to keep it clean and pleasant. The PolyCast is thin (3.5mm width) and lightweight (~100gr), while being rigid and resistant enough to immobilize and support the patient's limb.

Those advantages aim to help the child to use the splint during the night, and avoid the recursion of the limb. It also does not impact child mobility, allowing it to move freely & wear the brace during nighttime, which in turn improves the rehabilitation speed.

How to develop your own cast?

1. Scan the injured limb

Simply install our app on your iPad and take a 3D scan of the patient's limb, you will obtain its perfect dimensions, considering all specific morphologies.

2. Digital modeling of the brace

Thanks to our algorithms and the expertise of medical professionals, Spentys' solution will automatically 3D model the tailor-made immobilization device.

3. 3D printing of the brace

Our 3D printing facility receives the scan & other patient parameters. The 3D printers are set up & print the custom cast.

About Spentys

Spentys is recognized as a trusted clinical partner and full solution provider for all non-invasive immobilization and functional orthopedic treatments. The European Spentys® network brings together, paediatricians, orthopaedists, surgeons, neurologists, physical therapists and osteopathologists to provide a perfect interdisciplinary care for the youngest of patients.

Close cooperation with renowned university hospitals both nationally and internationally provides easy access to the latest research and scientific findings which are constantly being integrated into Spentys® development work.

"I believe that 3D technologies represent opportunities for the orthopedic world and Spentys develops tools that we as medical professional can use to make a difference."

Dr. Marc Elbaum, orthopedic surgeon - Chirec, Belgium



Recyclable



Waterproof



Lighter



Adaptable



Less hindering



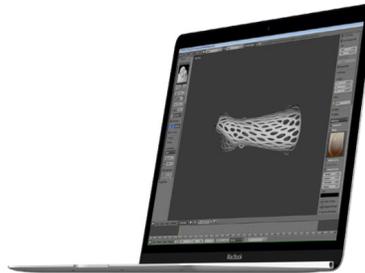
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Step-by-step methodology:



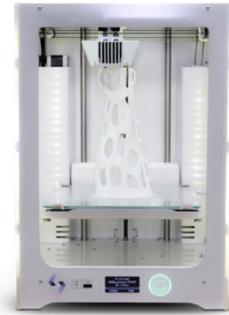
1 Scan the injured limb

By 3D scanning the patient's limb, you will obtain its perfect dimensions, considering all specific morphologies.



2 Digital modeling of the brace

Thanks to our algorithms and the expertise of medical professionals, Spentys' solution will automatically 3D model the tailor-made immobilization device.



3 3D printing of the brace

Our reliable and efficient 3D printers are then used to produce your tailor-made orthopaedic device.

Set up a proof-of-principle with us:

Step 1: Submit your design request

Step 2: Our project team sets up a meeting to discuss

Step 3: We develop and 3D print the design request

Step 4: We send you the 3D printed cast

Submit design request here or book a demonstration
at www.spentys.com