



CASTING OF THE LOWER EXTREMITIES

General information

Casting is a known and scientifically confirmed procedure performed in children with, e.g., cerebral palsy, brain injury or Duchenne muscular dystrophy. As early as in the 1970s, casts were used as part of neurological therapy to stretch contracted structures.

During the course of a neurological disease, children may experience increased muscle tone, limited range of motion, as well as stiffness in the area of some groups of muscles. If a particular muscle is too short, too weak and too little elastic to allow for a free movement of a bone, e.g. in the ankle joint, the child's range of motion is limited.

If dynamic contractures developing in the first stage are not appropriately managed and treated, a fixed contracture may develop. Its occurrence in the lower extremities impairs or even prevents independent mobility.



Casting types

There are two types of casting: serial and inhibitive. Inhibitive casting is usually performed only once and aims at reducing muscle tone, which results in the improvement of muscle function. Following the efficacy assessment of the upper extremity casting for 48 hours, scientists have found that spasticity was temporarily reduced. As a result of casting, decreased wrist flexors tone allowed for active wrist extensors strengthening and thus increased wrist stability during activities such as grasping and releasing.

If the cast is periodically exchanged and the correction is increased, then it is called serial casting: a series of progressive casting used to increase muscle length. As casts are replaced, the tissue can react to increasing range of motion.



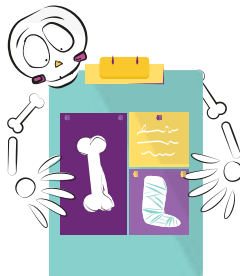
What is the purpose of casting?

Casts are used to improve muscle strength, as well as elongate and stretch shortened muscles and increase their elasticity. To be effective and improve the gait, stretching must be submaximal (unaggressive, not causing pain) and long-lasting (minimum 6 hours).

If any of these apply to your child:

- tiptoeing,
- limited range of motion in the ankle joint,
- muscle stiffness,
- disturbed gait pattern,
- spasticity/hypertonia,
- joint linear alignment disorder,
- shortened muscles, nerves and ligaments,
- risk of secondary deformations,
- the lack of possibility to properly fit the orthosis,

***talk to your doctor or physiotherapist
about using the casting procedure.***



Contraindications:

- allergy or adverse reaction to casting material;
- sensory disturbances;
- communication problems;
- open wounds, scrapes, pressure ulcers;
- increased sweating;
- bone fractures and cracks;
- advanced osteoporosis in the limb to be casted;
- fixed contracture;
- sensory disorders (such as negative and emotional reactions to touch stimuli, low tolerance to touch etc.);
- necessity to use the limb to monitor vital functions;
- limited skeletal mobility in the limb to be casted;
- significant edema and/or fracture without osteosynthesis in the limb to be casted;
- high blood pressure;
- circulatory failure in the limb to be casted;
- disturbances of the autonomous system function (storing);
- heterotopic osteogenesis (bone overgrowth) in the limb to be casted.

The listed recommendations and contraindications should always be consulted with the treating physiotherapist or physician. Ultimately, they decide on the implementation of a casting therapy.

What does the casting procedure look like?

A physiotherapist or doctor applies the cast in a neutral position when the muscle tone is minimal (the most dorsiflexion possible with preserved foot deformity correction). This allows to build on additional muscle cells, which results in an elongated and more elastic muscle.

At Paley European Institute, we always put both lower extremities in casts in order to preserve symmetry. Due to the fact that each child is different, experiences different disorders and presents a different gait pattern, it is impossible to precisely determine how much casting will be sufficient.

The expected period of wearing casts is 8–14 days but might be longer.

How to prepare your child for casting?

Once all necessary information is gathered and questions answered by a physiotherapist, explain to your child in details what will be performed.

Try to present this form of therapy to the child in the most positive and comprehensive way possible.

The physiotherapist will share with you images and videos presenting the casting process and the way other children deal with everyday activities. Prepare your child for the situation in which they would not be able to do some things for several days.

For the lower extremity casting procedure visit, the child should wear loose trousers and wide socks so that they are able to easily put them on after the casting procedure is completed.

Benefits from casting:

- pain reduction or relieve,
- increased muscle elasticity and length,
- reduction of muscle hypertonia,
- improved ankle joint alignment,
- gait pattern change,
- increased tolerance to lower extremity orthoses,
- improved base of support,
- may be repeated multiple times.

Limitations resulting from casting:

- usual bath is difficult as the cast cannot get wet;
- temporary and local muscle weakness may occur;
- skin bruising, chafes or scrapes may develop;
- in extreme cases, disruption of skin continuity, pressure ulcer formation, or blood flow limitation may occur.

Examinations performed before and after casting

The decision regarding of therapy with the use of inhibitive or serial casting is made by the treating physiotherapist or doctor. They assess indications on the basis of medical history, observations, physical examination and gait analysis based on video recordings. Before and after casting, the physiotherapist is obliged to measure spasticity angle and the range of motion in the ankle joint, as well as to assess the condition of skin.

What should be taken into consideration when wearing casts?

Circulation

It is very important to regularly check circulation. Upon squeezing, toe tips should become pale and then, after approximately 2 seconds, return to pink. Consult the physiotherapist if toes remain pale, become blue, or are cold or swollen for a longer period of time. The cast can be too tight and may need to be removed due to restricted circulation. To improve circulation, the child should be laid in the supine position and their lower extremities should be raised on pillows. In such a position, the blood backflow is significantly facilitated.



Sensation

Contact the physiotherapist or doctor as soon as possible if your child complains about numbness, tingling or pain in the lower extremities. It may indicate that the cast is pressing the nerves and must be removed immediately.

Pain

If your child complains about persistent pain located precisely around the ankle or heel, it may indicate that the cast is pressing this site. Contact the physiotherapist or doctor to minimize the risk of callus or blister formation. If the symptoms are not resolving or the child is not able to weight-bear the limb, the cast has to be removed.

Sweating

Increased sweating of the child's feet (especially in summer, when the temperature is high) is normal. The skin may then be more pale and wet. This should not be worrying unless pain appears. If it does, however, contact the physiotherapist or doctor who will assess the situation and take further actions.

Itching

One of the most common complaints occurring after casting is skin itching. Tap the cast gently to relieve the itch. Allergic reactions to any of the materials used for casting occur very rarely. However, if the child's skin is sensitive and allergy is suspected, contact the treating physiotherapist or doctor to discuss the situation in details, as it may be necessary to remove the cast.

How to take care of the cast and how to take a bath?

In order to maximize the child's comfort and safety during serial casting, follow these instructions:

- avoid sand, gravel, pebbles, loose bark, scobs, new-mown grass, dust – these may enter the gap between the skin and cast, which will cause grazing or pressing and result in irritation, and even pressure ulcer or wound formation;
- do not put any objects into the cast as these may damage or tear the skin;
- always put a shoe on the child's casted leg – the cast is smooth and slick, so the child can slip on some surfaces; this can result in the cast getting cracked, damaging the child's skin and disturbing the gait pattern (appropriate shoes may be borrowed at Paley European Institute);
- do not immerse the cast in water (even if it is secured with foil) – preferably legs should remain outside the bathtub during a bath.
- the cast can be additionally secured by double layer of foil.



What activities can be performed by a child wearing casts?

The child must not weight-bear the lower extremities within an hour following cast application. Only lying down or sitting is allowed. Standing up or walking is absolutely prohibited, as early weight-bearing of an incompletely dried cast may lead to breaking it. And this will surely result in the therapy failure.

In the first phase, during which standing up and walking is permitted, the child can and even should perform their own activities (play, walk). This will allow them to get used to additional weight and shoe size. The adaptation period should not exceed one day. Then, additional daily activities which the child performed earlier should be introduced.

If you are careful, will always wear non-skid shoes, there should be no restriction. The stretching process can be facilitated by playing in a standing or sitting position. We strongly recommend avoiding any activities on the floor. Your physiotherapist will help choose and adjust appropriate activities and exercises for your child. The child can attend school or preschool without problems while wearing casts.





Casting therapy

The therapy involves intensive physiotherapy including gait training and gradually introduced treadmill training, stretching and strengthening of weakened groups of muscles and verticalization.

For children functioning at lower levels, problems related to musculoskeletal contractures are very challenging. Therapy with casting will help control muscle tone and facilitate the stimulation of a more active posture during physiotherapy. In such a case, sitting, standing, training with robots and standing frames mobilize and activate the child's muscles, enabling better motoric control.

For children functioning at higher levels, it is especially important to practice feeling new movements and full inflexion during active movement.

It is very important that the child use the acquired muscle functions during everyday activities. This will allow for making new moves more automatically, ensuring the transfer effect.

The dynamic approach and diversity of tasks performed as part of everyday activities will become more attractive for the child and will prevent returning to the previous posture and movement pattern.

A condition for cast application is the initiation of an intensive therapy. Without it, the casting alone will not provide long-term and satisfying results.

What if there is a problem with the cast?

During therapy with casting, the treating physiotherapist stays in regular phone contact. You should contact them with any questions or concerns. If worrying symptoms or situations threatening the child's safety occur that require removing the cast, the physiotherapist must be informed immediately. Under no circumstances should the cast be removed on one's own without previous consultation.

How to remove a cast?

The cast should be removed within 8–14 days from application. The decision is made by the treating physiotherapist. Only they are authorized to remove casts, as they possess appropriate knowledge and experience to perform this procedure in a safe manner.

Independent cast removal without consulting the physiotherapist can be dangerous for you and your child.

Before cutting, all edge protections and cotton wool at the edges need to be peeled away. The casts are removed with the use of bandage scissors and a rotary saw.



Casting removal – what's next?

Following the cast removal, orthoses should be worn on the lower extremities for up to 10 hours per day. Night orthoses are also recommended to help maintain joint flexibility, and enhance and secure the effect achieved during casting.

The key element of treatment with casts is the initiation of an intensive physiotherapy. Since children are not able to independently develop a new gait pattern, they need to undergo therapy under the supervision of an experienced physiotherapist. Despite the fact that muscle and joint flexibility will improve after casting, it is necessary to teach the child new skills and train with them.

In the initial phase after cast removal, muscular weakness in the lower extremities is observed. This stage is very short and should not last more than a few hours. If the child's condition is worrying, and the weakness lasts longer than one day, the treating physiotherapist should be contacted immediately.

It is important to thoroughly wash and dry the legs after cast removal. Ensure there are no scrapes, calluses, scratches or pressure ulcers. If everything is all right, the child may be allowed a few minutes of their own activities to let them get used to new sensations and changes resulting from long-lasting stretching. Then, the next therapy stage may be initiated with all exercise techniques and types.

It is recommended to implement intensive exercises to strengthen the triceps surae muscles, as well as sensory stimulations. The parent may perform a gentle sensory massage of the calf and foot area.

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