Making the negative cast with e-Cast

The plaster impression is the basis for producing a custom-made orthosis. The more precisely the negative cast is made, the better is the final result.

This production technique describes how to make the negative cast by using the digital casting aid e-Cast. Transferring the mechanical pivot points at ankle and knee height is an important factor in this process.

An application example shows which effect the patient's leg position while making the negative cast has on the final orthosis and therefore on the patient's gait.

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1 – Preparing the workplace

Step 1/4

The number of sensors depends on the orthosis type. For the chosen example of a KAFO you need all three sensors (KAFO = red/yellow/green, AFO = green/yellow, KO = yellow/red). The operator device offers different display, language, sound and saving options. You will find further information in the manual.

Set the h-Cast to the correct height to compensate the last pitch of the shoe and a possible leg length discrepancy. Write down the height. It is important for further work steps.

You need appropriate callipers to measure the joint widths. We also recommend to use a device for checking the line of gravity. Insulate the patient's leg with compression film in order to be able to attach the e-Cast sensors.

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Connect the sensors to the operator device. Remove the protective foil on one side of the glue dots to attach them to the sensors' centre.

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If the patient needs an orthotic fitting on **both legs**, proceed as follows: First, cast and insulate only one leg as the operator device cannot be connected to more than **three** sensors at a time. We recommend to use **two sensor sets** so that you can start with the second plaster impression immediately after finishing the first one.

Wrap the patient's leg loosely into compression film from distally to proximally. Then wrap it from proximally to distally under tension. While doing so, the patient should keep the leg extended as much as possible. Avoid furrows and do not let the film end in areas where you want to place markings or sensors later.

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Feel the medial tibial plateau. **Note:** It is easier to feel if you rotate and abduct the lower leg outwards while slightly flexing the knee. Like this, you open the medial tibial plateau which can now be felt easier. (For an AFO you can skip this and the following corresponding steps.)

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Mark the felt medial tibial plateau.

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You can find the position of the mechanical pivot point in the configuration result and mark it on the leg. Mark the y measurement by using the printed configuration result.

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You can mark the position of the mechanical pivot point in ap direction with the callipers. Mark the x measurement by using the printed configuration result.

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The **mechanical pivot point** can be transferred from the film to the negative cast by using the delivered self-adhesive washer. Later, it serves as guidance for the point of the alignment aid.

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Feel the distal tip of the fibula and mark it. **Attention!** Do not feel the tibia. **Feel laterally**. (For a KO you can skip this and the following corresponding steps.)

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Place a washer on the **mechanical pivot point**. In ap direction, take the later run of the side bar as guidance. It should run through the centre of the ankle area. **Note:** Shifting the pivot point backwards shortens the rear foot lever, extends the forefoot lever and vice versa.

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Attach the sensors to the leg insulated with film (AFO = green/yellow, KO = red/yellow). Pay attention to the colour of the sensors (traffic light colours). Place the sensors anterolaterally on the leg so that you have enough room for the cutting aid and the e-Cast works optimally. **Attention!** Do not attach the sensors to loose film pieces. If you only insulate the leg with a sock or oil, the e-Cast sensors do not stick optimally on the leg.

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Put the prepared longuettes under the sensors for stabilisation purposes. For a positive fit between sensor and leg, it is necessary to fill out the space completely with plaster. Make sure not to push the sensors away from the leg because otherwise they do not stick optimally on the film.

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Form the plaster and embed the sensors in it. Repeat this procedure for all required sensors.

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Bring the patient's leg in a nearly horizontal position. Follow the instructions on the operator device's display.

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Place the standing patient on the h-Cast. Make sure that the feet are rotated externally and the heel is placed completely on the h-Cast.

Check the patient's whole posture while standing. Make sure the posture is upright, the patient is looking ahead and the ideal position is set on all levels. In the course of the process, the dorsiflexion stop is determined by the angle position between foot and lower leg on the positive cast. Save this position with the operator device. Meanwhile, the patient should hold the ideal position, if necessary with your support.

Note: Use a laser plumb bob to evaluate the posture.

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Form the sole of the foot with a plaster longuette of at least four layers. (For a KO you can skip this and the following corresponding steps.)

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Place the cutting aid. Cast loosely over foot and ankle joint to the calf. At first, do not cast over the sensors. Then use only one layer of plaster to fix them and thus ensure an easy removal afterwards. Make sure the plaster is **thick enough** at the ankle area to secure the desired position of the ankle joint.

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Bring the patient's foot again into the previously determined position of the ankle joint by using the h-Cast. Make sure that the external rotation is correct and adjust possible deviations in direction of supination or pronation. **Note:** Shifting the foot with the h-Cast to the front or back changes the lower leg-foot-angle (plantar flexion and dorsiflexion).

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The operator device indicates when the current position differs from the saved one. The dot on the display moves towards plantar flexion (P) or dorsiflexion (D) if the position differs into the corresponding direction. When the dot is in the **middle**, the position matches the saved one. If you have activated the display of pronation and supination in the menu Settings, you can reconstruct this position by shifting the knee in mediolateral direction.

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Cast loosely to the desired height. If necessary, integrate a dorsal reinforcement. Minimise the number of layers over the sensor by leaving it out in the beginning. Bring the patient's knee again into the previously determined position of the knee joint.

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The operator device indicates when the current position differs from the saved one. The dot moves towards extension (E) or flexion (F) if the position differs into the corresponding direction. When the dot is in the **middle**, the position matches the saved one. If you have activated the display of varus and valgus in the menu Settings, you can reconstruct this position.

Draw guiding lines and carefully remove the cutting aid.

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Cut open the negative cast with plaster shears. Open the negative cast by using your fingers and not your thumbs, to avoid unnecessary deformations of the edges. Remove the negative cast from the patient's leg.

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The cast surface is level on the inside and you can only see the glue dot from the sensor. Like this, you avoid that the cast loses its form.

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The washer can clearly be seen in the cast. It marks the mechanical pivot point.

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Join the cutting edges and check the position with the operator device. It indicates if the current position differs from the saved one. After possible corrections, the negative cast is finished in the desired position.

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