plusmedica OT

Facts

Challenge

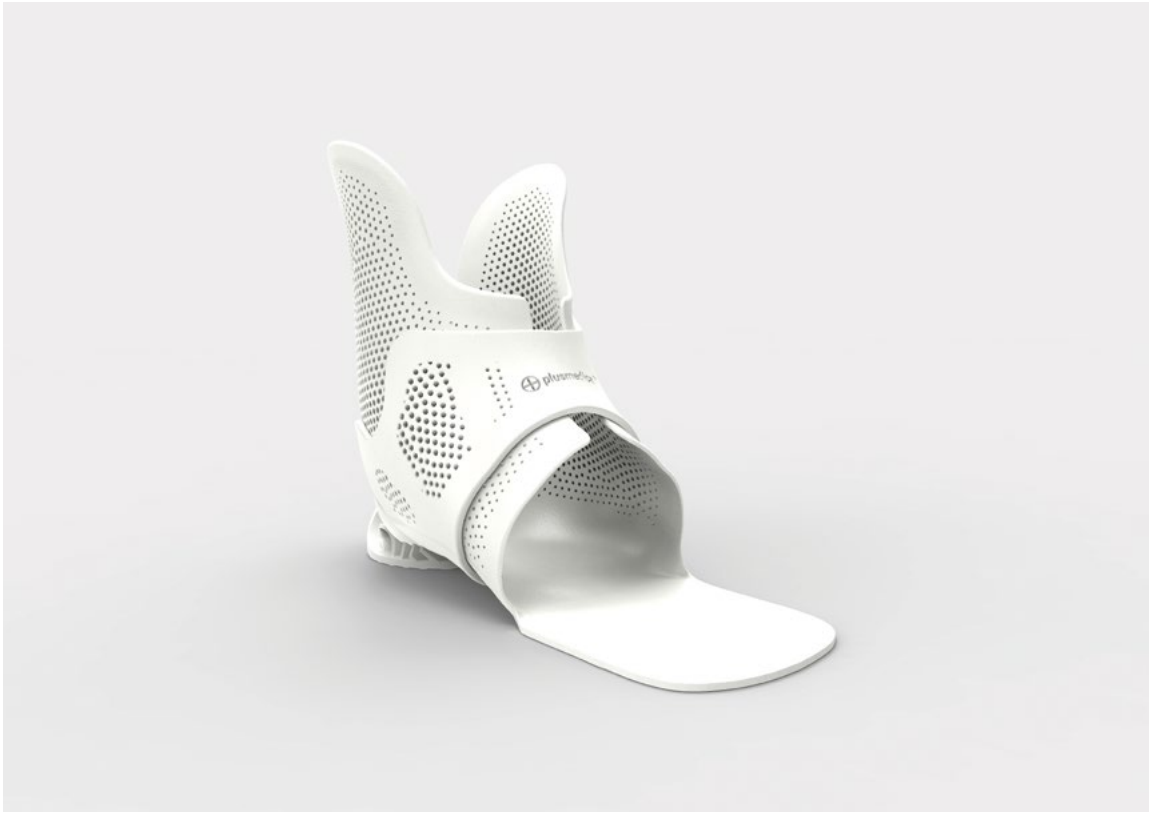
Design, CAD engineering and production of orthoses that combine several functions, optimally tailored to the needs of the patient

Solution

Construction of individually tailored orthoses for patients, using industrial 3D printing performed with the EOS P 396

Results

- Functional: complete freedom of design for structures, functions and material thicknesses
- Comfortable: low weight and breathability enhance wearer comfort
- Reproducible: once developed, any particular orthosis can be produced again at any time with the same structure
- Standardised: consistent and repeatable production quality with no dependence on manual production quality factors, personnel qualification and technical facilities



Pleasant breathability: the perforations in this ankle/foot orthosis with a ring closure system cover virtually the entire surface, preventing excessive sweating. (source: plus medica OT)

Maximum Flexibility and Design Freedom in the Production of Orthoses

EOS

Complex structures and custom design – how additive manufacturing is revolutionising orthopaedic technology

Short profile

plus medica OT is a supplier of medical aids produced by 3D printing. The company combines traditional orthopaedic technology process with the possibilities afforded by additive manufacturing. This results in patient-tailored orthoses of the highest quality, based on a fully new approach to design.

Further information

www.plusmedicaot.com

When it comes to support orthoses, orthopaedic technicians are generally restricted to individual constructions, as forms, functions and material thicknesses must be configured to suit each individual patient's needs. When complex structures are required, traditional processes are often operating at their limits. Moreover, as they are very costly and time-consuming to produce, they are not readily available. To address these issues, plus medica OT employs industrial 3D printing. With the aid of production systems and consultancy services from EOS GmbH, the company produces orthoses tailored to the individual patient's needs that are virtually impossible to realise using traditional processes.

Challenge

Every person is unique. And this is particularly true in orthopaedics, where the goal is to individually support or restore a person's mobility. For treatment to be a complete success, orthoses must be designed to precisely match the patient's anatomy and therapeutic needs. This explains why they are produced as custom constructions or in customised small series, as until now, orthopaedic technicians have been guided by the possibilities of traditional production methods such as casting, forming, modelling and milling for constructing orthoses. But complex structures and varying material thicknesses put established processes at the limits of their capabilities.
If it is necessary to combine several functions in one product, individual parts must be combined manually to build the finished orthosis, which is a very time-consuming process. At the same time, orthoses need to be available as quickly as possible to support the mobility of patients with underlying neurological disorders, such as paralysis, stroke or multiple sclerosis.
A further factor when treating children is that they quickly grow, which means that aids have to be replaced frequently.
plus medica OT has recognised these challenges and set itself the goal of optimising patient care by employing industrial 3D printing. „We combine manual orthopaedic craft with the benefits of additive manufacturing," says Alexander Hülk, CPO at plus medica OT.

Solution

plus medica OT has been developing, constructing, producing and selling orthoses made using additive manufacturing since 2015. Its key priority is to use the potential offered by the technology to improve patient care and to make it available for orthopaedic technicians. For this purpose, the company specialises in the economic and technical optimisation of such components, with special attention placed on the aspects of form and function. Which is why plus medica OT, as the first 3D print provider in the world for orthopaedic technology, works in close cooperation with local orthopaedic technicians. Only by coordinating all the processes in construction and additive manufacturing to the

All-round concept: integrated velcro holders on the lower leg (top), monolithic joint system, motion stopper with logo, integrated heel plate for stableness and connection of inner foot component (DAFO) via tab locks (from left to right). (source: plus medica OT)

requirements of orthopaedic technology is it possible to realise the best-possible results.

To this end, the company is cooperating with EOS, the technology leader in the field of 3D printing. Not only does the company supply the necessary systems and materials, but it also supports users during the development and production process. „We have benefited from the highly competent and partner-based consultancy available from EOS, for instance when it came to choosing the most suitable material," explains Alexander Hülk. Application specialists with experience in medical engineering helped him to build up his own know-how and showed him how to fully exploit the possibilities of the technology. And even now, they remain available at any time for assistance on matters of design optimisation and functional integration.

When plus medica OT makes an orthosis, it starts with the patient's plaster cast made by an orthopaedic technician. The planning of the orthosis is done directly on the plaster cast. The orthopaedic technician then sends the plaster model together with an order form to plus medica OT. The plaster model is subsequently digitalised using a 3D scanner. The orthosis is then designed by plus medica OT using a CAD program, and the construction data is transferred to the production system, an EOS P 396. The part is then built up layer by layer from a fine powder material using a laser beam. This makes it possible to create a part of any shape imaginable, without the need for special tools. The material used is a nylon-based polymer with a high level of stiffness and impact strength, which neither splinters nor breaks under heavy loads. This lowers the risk of injury to the patient.

Results

Additive manufacturing enables plus medica OT to produce aids of the highest quality using a new approach. Complex structures can be accommodated without problem. It is also possible to incorporate varying material thicknesses within an orthosis, for instance to allow certain areas to be either flexible or stiff. Standard parts such as joints and closures or velcro holders can be integrated at any point in the orthosis. This also applies to perforations, which serve to improve its breathability. „There are several geometries, low wall thicknesses and integrated functions that we would not have been able to realise so easily using traditional production methods," explains a clearly pleased Alexander Hülk. Orthoses can be better matched to the patient's needs than was previously the case.

The aid is also relatively easy and inexpensive to customise from a visual perspective. If the patient so wishes, a pattern can be reproduced on the surface of the workpiece without extending the production process. Colour variations can be created by subsequent dyeing or lacquering. For Alexander Hülk, optimisations in weight and integrated functions, high breathability and attractive design are all decisive factors of a treatment's success: "Nobody likes to wear an orthosis. But if you hardly notice it in your everyday life and it even looks good, it can significantly increase the wearing duration and in turn the therapeutic success of the orthosis."

A further advantage of EOS technology is that parts are easy to reproduce: once developed, the orthosis can be produced again at any time and in the same quality. This is of relevance, for instance, with children's orthoses, which have to be replaced in a different size but with the same functionality and structure. If orthopaedic technicians also employ their own 3D scanners, the design process is also shorter.

„Once a patient has worn an orthosis made by Additive Manufacturing, he usually sticks with it. They are clearly superior to traditionally made orthoses, in terms of fit, wearing comfort and appearance."

Alexander Hülk,
CPO at plus medica OT

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