COMPANY
CEIT-KE

LOCATION
Žilina, Slovakia

SOFTWARE
Autodesk® Within Medical

CEIT-KE

Achieving ground breaking results in the world of custom implants with the help of Autodesk Within Medical software

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—**Prof. Radovan Hudak**
Owner
CEIT Biomedical Engineering

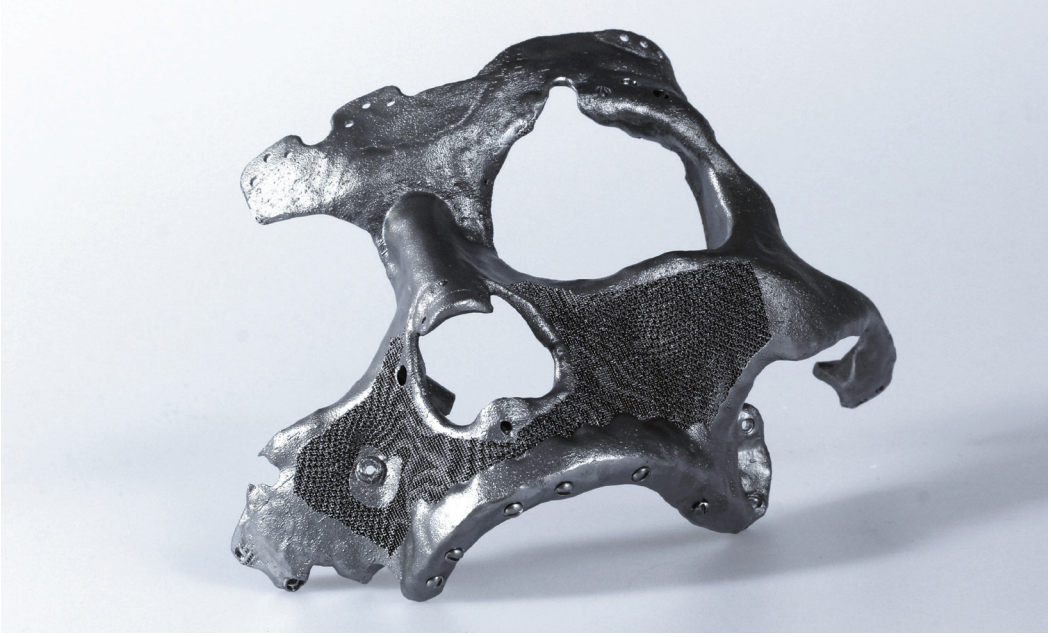

Image courtesy of Autodesk®

CEIT Biomedical Engineering was founded as a member of CEIT (Central European Institute of Technology) emerging from the Technical University of Košice in Slovakia.

The company is dedicated to a single goal of developing innovative solutions and is focused on activities in the field of biomedical engineering. The primary focus of CEIT Biomedical Engineering is the design and manufacture of 3D printed custom implants made of titanium alloy.

CEIT are able to produce these customized implants for patients based on the requirements set by the surgeon. For example, a hospital may have a request for facial surgery that will require a titanium implant and, together with CEIT Biomedical Engineering, they can collaborate on patient data to develop a solution; the hospital will provide data from CT scans of the skull, as well as information on the current state of the bone. CEIT Biomedical Engineering will then use the data to reconstruct a 3D model of the skull to create a customized implant.

One of the company's most recent projects was to create a custom implant for a patient with defects in 34% of their cranium. The surgical team from the L. Pasteur University Hospital in Košice inserted the custom implant to repair the defects and as early as three months after the surgery, the patient began to regain lost communication skills and increased mobility after nine years in a wheelchair. The patient is now leading an independent, full and happy life.

The implant, like all CEIT Biomedical Engineering's implants, was created using additive manufacturing.

"My background is in biomedical engineering and when I was first introduced to additive manufacturing I was excited by the potential for how this technology could transform the world of custom implants," explains Assoc. Prof. Radovan Hudak, PhD, one of the owners of CEIT Biomedical Engineering. "The use of subtractive methods using CNC machines was very complicated - it is impossible to make the thin walls needed to create porous structures in different shapes

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Within Medical software enables CEIT-KE to produce things that would not have been conceivable just a few years ago

using traditional milling machines. With additive manufacturing you can create completely free form shapes and surfaces."

However, the shift to additive manufacturing was not without its challenges and it wasn't until CEIT adopted Autodesk® Within Medical software that it was truly able to achieve its goals.

"Using Within Medical was a real game-changer for us. The software enables us to create lattice structures which allow for a more lightweight implant and provide improved osseointegration, meaning not only that they 'take' better but that they last a lot longer than other implants," says Hudak. "Designing different shaped implants was so complicated only as recently as three years ago, but now it is a question not whether we can produce a shape, but just how quickly we can scale up production."

CEIT Biomedical Engineering is currently working on one of the most extensive maxillofacial and cranial reconstructions ever attempted.

In October 2013 the team began designing an implant for a patient that had lost more than 86% of the maxillofacial bone tissue as the result of a car accident. Due to the extent of the damage it was impossible to use normal facial mirroring techniques so the team had to create a model based on a different patient with similar facial features. Having looked at 60 different skulls the team ultimately found the three that most closely matched the patient's skull and used them, alongside the patient's own skull to create a model from which to build the implant. While there is still some way to go, the hope is that the reconstruction will be a success and represent a major milestone in the application of customized implants.

"While a major reconstruction like this has many challenges, it shows us that thanks to the technological capabilities we now possess we can attempt things that would not even have been conceivable just a few years ago," says Hudak. "The world is changing quickly with new materials, techniques and machines being developed all the time and this is a truly exciting time for medical implant development and innovation."

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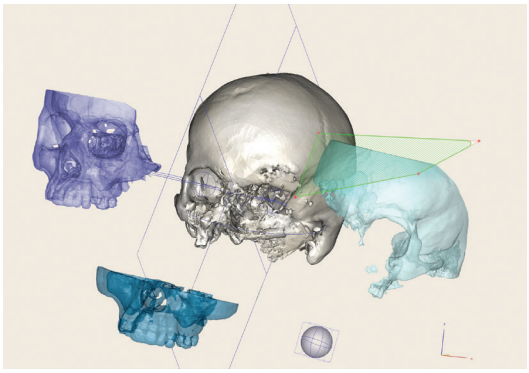

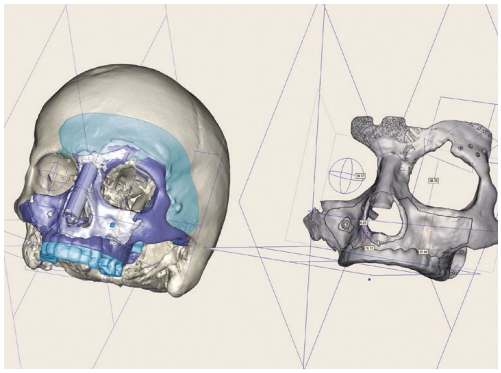

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