



## 3D PRINTED RIB IMPLANTED IN THE HUMAN BODY

### CLINIC

Tokuda Hospital in Sofia is the largest medical facility in Bulgaria employing about 1000 medical specialists.

### PATIENT

A 35-year-old patient was diagnosed with a deformity around the fifth, right rib accompanied by swelling and pain.

### DIAGNOSIS

Studies have shown that the best solution would be to remove the deformed rib and replace it with an implant, because of the risk that the patient's disease will expand.

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#### Why 3D printing?

Physicians decided on 3D printing technology because it guarantees perfect reproduction of the shape of the original rib in terms of its thickness and bending.

In this case, the absolute dimensional accuracy of the implant was required. The use of a 3D printer as a tool allowed the reconstruction of the rib.

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#### Implantation of a 3D print in the human body

The basis for implant placement was that the rib was anatomically fitted to other chest wall structures to ensure proper restoration.

Before the operation, 3 mm holes were drilled in the 3D printing to facilitate regeneration and rapid renewal of the connective tissue.

3

#### Rib sterilization process

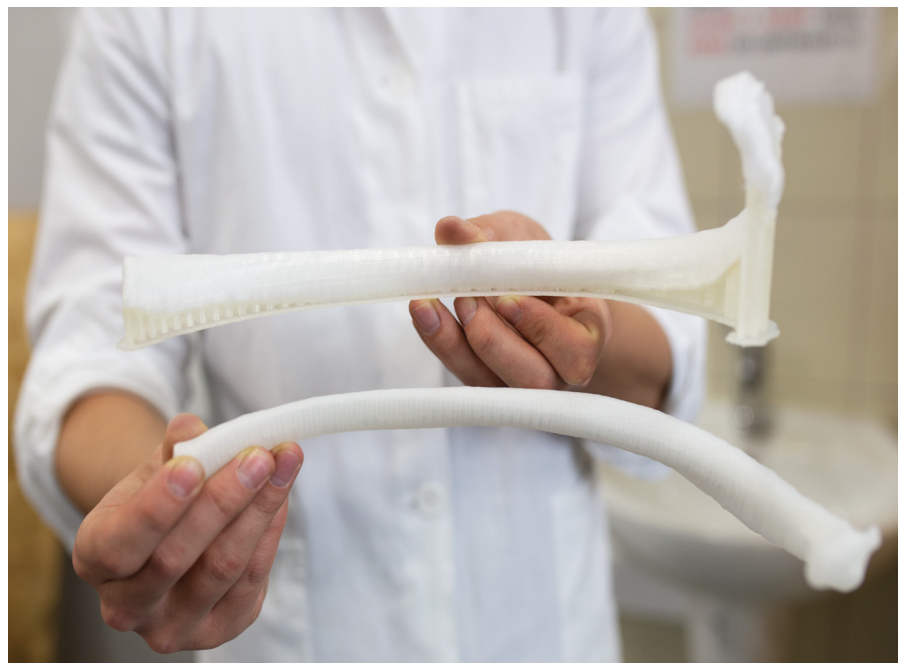
The rib implant made with the use of 3D printing technology was properly sterilized in ethylene oxide.

The 3D printout was also subjected to sterilization using gamma radiation and steam at 140 °C.

### PROJECT DATA

<b>3D print</b>	Rib implant
<b>Description</b>	Execution with the use of 3D printing technology of the rib implant in the 1:1 scale based on a scan of the deformed bone of the patient
<b>Material</b>	Nylon 680 Taulman
<b>3D printer</b>	3DGence DOUBLE P255

The 3D printed rib implant was implanted in a patient in Bulgaria.



On the left: prof. Minchev, doctor. On the right side: Ivaylo Josifov, patient.

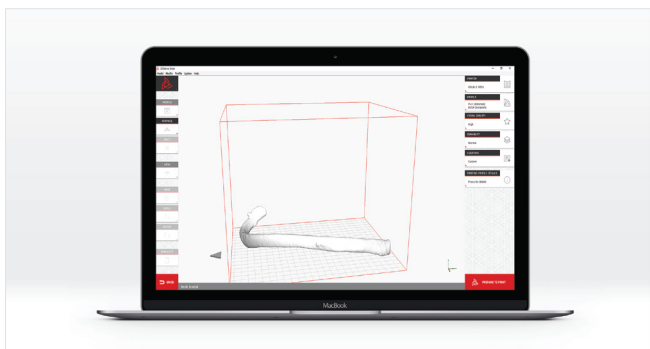


Work on the rib implant began with the initial 3D visualization, the bone was scanned in the hospital, and then the scan was passed to a team of experts who developed a digital rib model and prepared it for printing in 3D technology.

The individually designed rib implant is made of flexible and durable polyamide.



Rib implant visualization in 3DGence Slicer software.



The process of sterilization of a printed rib implant.



X-ray image of a patient's bone suffering from cystic dystrophy of the rib.



*An individually designed rib model and its faithful reproduction in printing allowed for the implantation of a new element in place of the removed bone.*

*Replacing the missing rib with a 3D printed segment of the same shape, curve, width, and thickness was possible using a 3DGence 3D printer.*

Prof. Minchev



### 3DGence

3DGence is a Polish manufacturer of 3D printers specializing in the development of new technological solutions and the implementation of 3D printing in industrial enterprises.

3DGence Sp. z o.o.  
Przyszwice Office  
ul. Graniczna 66  
44-178 Przyszwice

Sales department: +48 32 438 98 91  
Support: +48 32 438 98 64  
E-mail: [cs@3dgence.com](mailto:cs@3dgence.com)  
Services: [3dservices@3dgence.com](mailto:3dservices@3dgence.com)