

# LayerWise metal 3D printing helped rebuild motorbike crash survivor's face

**The Belgian company LayerWise produced patient-specific titanium implants as part of a pioneering facial reconstruction**

Motorcyclist Stephen Power was severely injured in an accident near Cardiff, UK. He broke both arms and his right leg was damaged so badly it required a bone graft. Stephen also suffered major injuries to his head and face. He regained consciousness after several months in the hospital.

## ***Treatment with computer-aided technologies***

Consultant maxillofacial surgeon Adrian Sugar explains that a specialist team at the Morriston Hospital in Swansea, UK, successfully dealt with all facial injuries, with the exception of his left cheek and eye socket. The patient's cheekbone was too far out and his eye was sunk in and dropped. Due to the close proximity of critical and sensitive anatomical structures, the team applied a more accurate expertise approach. This strategy ensured no further damage to his eye in order to maintain his eyesight. The expertise approach entailed the latest 3D computer-aided practices applied by **PDR** and innovative 3D printing of the titanium implant and fixation plate by **LayerWise**.

## ***Perfect-fit implants through 3D printing innovation***

LayerWise manufactured the implant and fixation plate in medical-grade titanium (Ti6Al4V ELI) in accordance with the ISO 13485 standard. "The 3D printing technology mastered by LayerWise is perfectly suited for producing this kind of ultra strong, precise and lightweight titanium implants," says Peter Mercelis, Managing Director of LayerWise.

"The reconstructive orbital floor plate plays an essential role in the repositioning of the eye in light of the targeted facial symmetry and eye alignment," explained Romy Ballieux from LayerWise's Medical Business Unit. "LayerWise produced the floor plate, and polished its upper surface to minimize friction with soft tissues. The floor plate was fixated to the zygomatic bone through the plate's dedicated slip with attachment holes. The digital 3D printing technology successfully maintained the accuracy of the precise medical imaging data, pre-operative planning and implant design. The 0.1 millimeter (4 mils) geometric accuracy of the floor plate's freeform surfaces could not be achieved using traditional manufacturing methods."

Accuracy is even more critical with regard to the fixation plate. This fairly long, slim, curved 3D printed plate requires precise positioning to be able to tie together many fractured bone pieces of the cheek region. A custom-fitting guide was used to fit securely around the anatomy, with slots located to guide the surgeon's movement when positioning the plate. The fixation plate restored the correct anatomical connection between the frontal, zygomatic and temporal bone. This connection contributed to the successful reconstruction of the patient's anatomy, providing the best possible facial symmetry.

Ballieux noted: "Dedicated medical engineering specialized in the production aspects of metal 3D printing were key in achieving the impressive facial reconstruction in such a short timespan. The digital process resulted in the 3D printed implant and fixation plate produced in a single manufacturing step in only a couple of hours."

### ***Life-changing patient experience***

After his recovery, Stephan Power experiences the results of the surgery as 'totally life changing'. Instead of using a hat and glasses to mask his injuries, he is now able to do day-to-day things, go and see people, walk in the street, and even go to any public areas. The improved facial symmetry and alignment of his eyes, achieved with the LayerWise implant and fixation plate, clearly made a big difference to the patient. "We are confident that our metal 3D printing technology is capable of improving the quality of life of many more patients," Ballieux concluded. "The fast-turnaround digital process, from medical imaging up to the finalized 3D printed implants, delivers the required implant geometry and precision to obtain such great facial reconstructions."

These implants were the result of a close collaboration between LayerWise specialists and PDR design experts Sean Peel and Dr. Dominic Eggbeer.

PDR has a formal collaboration with the Maxillofacial Unit at Middelheim Hospital: cartis (Centre for Applied Reconstructive Technologies in Surgery).

Movie: [http://www.youtube.com/watch?feature=player\\_embedded&v=aKEE4HhubDY](http://www.youtube.com/watch?feature=player_embedded&v=aKEE4HhubDY)

### **ABOUT LAYERWISE**

LayerWise is a worldwide leading production center exclusively focusing on Metal 3D Printing with business units in medical, dental and industrial applications. LayerWise's Medical Business Unit aims at providing maximum patient comfort through serial and patient-specific implant manufacturing. The metal Additive Manufacturing (AM) process mastered by LayerWise yields fully anatomic implant shapes offering increased functionality and esthetics as well as improved osseointegration. LayerWise offers cost-effective manufacturing of orthopedic, cranio-maxillofacial, spinal and dental implants and instruments.

LayerWise also built the world's first patient-specific lower jaw using metal 3D printing.

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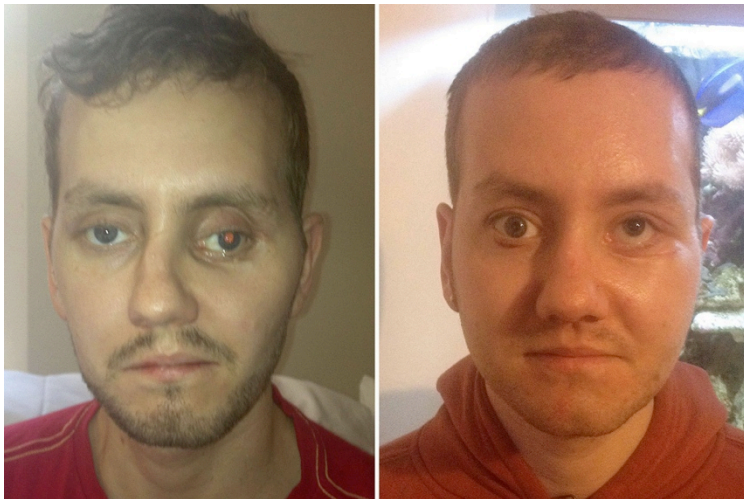
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Custom-fitting guide holding the LayerWise titanium fixation plate in the correct position, and the polished orbital implant



Patient before and after facial reconstruction



Reconstructive titanium orbital floor plate, produced by LayerWise

Pictures courtesy PDR