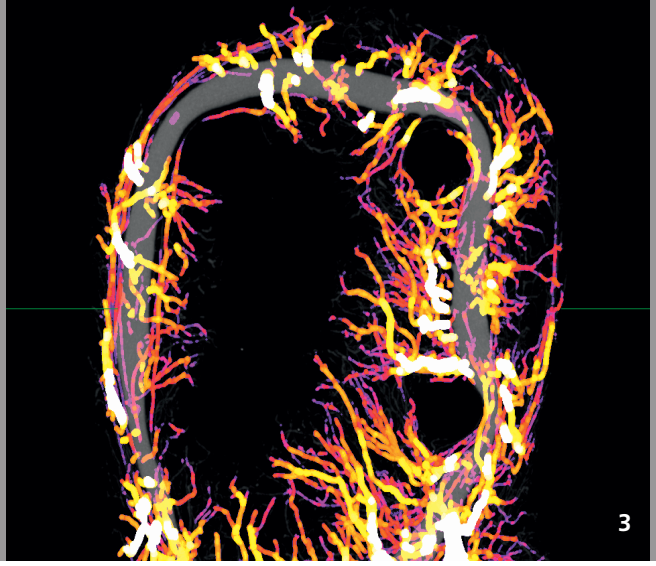

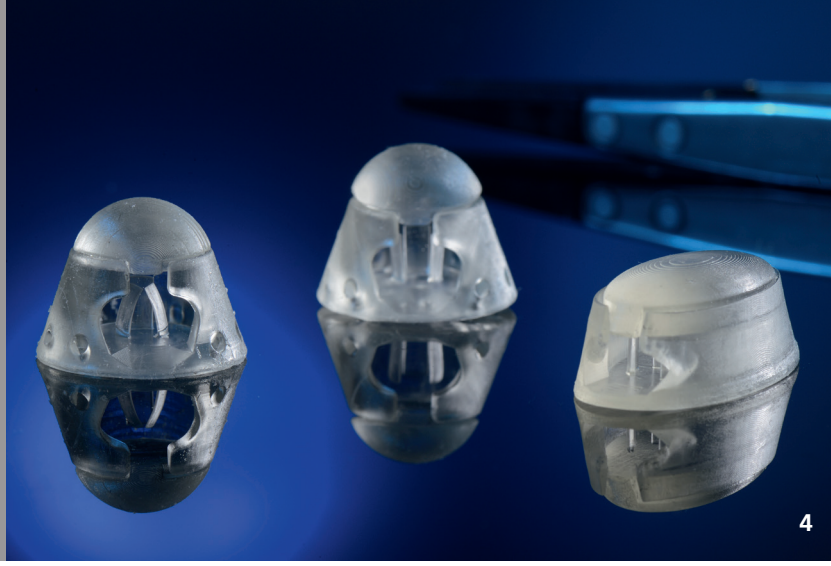

# GENERATION OF PATIENT-SPECIFIC AND TRANSPLANTABLE CONNECTIVE TISSUE FLAPS

## Task

In reconstructive surgery, flap plasty is used to reconstruct larger defects, but this technique reaches its limits if no autologous material is available. One approach to compensate for this problem is the cultivation of patient-specific and transplantable tissue flaps, using the so-called AV loop technique. Here, perfused tissue flaps can be grown from the patient's own cells in implantable plastic chambers. To ensure that defects are reconstructed specific to a patient, individualized plastic chambers are to be produced by means of 3D printing, thereby generating customized flap plasties.

## Method

Fraunhofer ILT is developing a process to additively manufacture these plastic chambers, which should be flexible and biocompatible. Various combinations of photo resins and lithography-based 3D printers have been tested for this purpose and verified by in vitro cell tests. Fraunhofer IAP helped by analyzing the mechanical properties of these chambers and how well the flaps can be sewn. In addition, ILT is continuing to develop the chamber design. The process is being validated with in vivo test at the BG Klinik Ludwigshafen.

## Results

The project has identified conditions the chambers need so that all requirements for mechanical, optical and cell biological properties are taken into account. The material is based on (meth)acrylated monomers with a high polyurethane content. The printer uses LCD technology. The original chamber design was iteratively refined to create a chamber that closes flush, can be sewn well, and results in minimal friction with the patient's skin during implantation.

## Applications

In the future, the production of more complex vascularized tissue flaps is envisaged. Complex skin models could be produced to test active substances or also for implantation, in combination with methods for making skin replacement tissue.

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*3 µCT of angiogenesis.*

*4 Individualized chambers with different closure mechanisms and geometries.*