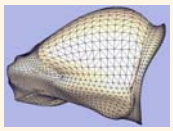
Bona Forma®

Customized 3D planning of aesthetic surgery

www.bonaforma.com

Bona Forma is a high-tech enterprise specializing in the prediction and optimization of aesthetic surgery. Our area of expertise includes breast augmentation, cranio-maxillofacial surgery and design of bespoke implants.





Aesthetic surgery helps to maintain and enhance visual appearance. However, until now, patients and surgeons did not have a common blueprint to discuss complex issues of 3D body shape and different potential scenarios for applying corrections. In the absence of a visual language and reliable tools for simulation of post-surgery changes, patients and surgeons cannot be assured that they both agree on the prospective surgery outcome.

In distinction to some simplified morphing tools, we provide a service for customized surgery planning that enables not only realistic predictions of post-surgery outcomes, but also implementation of virtual simulations in the real OP using precise quantitative data. Accurate simulation results are achieved by individual analysis of surgical cases on the basis of 3D imaging and biomechanics. In the last 10 years, this technology was successfully evaluated in a number of clinical studies.

Our service consists of providing realistic prediction of the patient's post-OP appearance for different surgery scenarios, offering 3D visualization and corresponding quantitative data with all simulations (such as bone displacements, implant types and placements, custom implant prototypes etc). Individual surgery simulation comprises the following basic steps:

I. Generation of virtual patient models from 3D data, e.g. CT, MRI or optical surface scans (*).

II. Simulation of different surgical intervention scenarios, including soft tissue prediction.

III. Presentation and discussion of simulation results (i.e. the patient's postoperative appearance) on the basis of interactive 3D models and quantitative data.

IV. Selection of the surgery plan with an optimal aesthetic outcome.

(*): Surgery simulations require individual 3D data. Virtual models of the patient's anatomy are typically generated from CT data. For aesthetic surgery that deals with correction of soft tissue, routine application of CT is not always possible. For simulation of breast augmentation, we developed a modeling approach that is based on 3D surface scanning. Surface scanning is performed in a few minutes using optical cameras and absolutely free of any adverse health effects. For surgeons specializing in breast augmentation, we provide an All-in-One solution for 3D surgery planning including all necessary facilities.

Augmentation mammaplasty is designed to reestablish proportional breast appearance. The aesthetic results of breast augmentation are basically determined by the type of applied implant and its placement. Our simulations are based on 3D body scans and modeling physical interaction between implants and soft tissue. Typically, 2-3 alternative implants are selected by the surgeon for each simulation. Simulation results display the 3D photo-realistic appearance of the patient's post-surgery breast. The figure below shows the simulated result of breast augmentation using implants Allergan 410MF255 vs pre-OP vs post-OP scans as well as the color mapping of differences between simulated and post-OP breast surfaces.

Cranio-maxillofacial surgery corrects facial appearance. While reestablishment of bone structures is well defined from a surgical point of view, the resulting deformation of facial tissue is not easy to predict. CMF surgery planning is performed on the basis of individual tomographic data. Our technology simulates soft tissue deformation that is induced by relocation of bone structures or the application of implants, and provides precise quantitative data for optimization of aesthetic surgery outcomes. The figure below shows the simulated correction of hemihyperplasia vs pre-OP and post-OP pictures.

Design of custom-tailored implants with predictable impact on soft tissue layer implies an *inverse problem* - that is, the implant shape has to be derived from the desired result of the aesthetic correction. Our technology for inverse implant design has been successfully tested in real-life surgeries. The figure below provides an example of custom implant design for a patient with bilateral asymmetric enophtalmia.

From left to right: pre-OP picture, lithographic model of the patient's skull with implants produced on the basis of our simulations, 6-month post-OP result.