

PERSONALIZED APPROACH TO OSTEOSUBSTITUTION WITH CERAMIC IMPLANTS

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Personalized approach to medical care – one of the strategies of scientific and technological development of the Russian Federation objectives. Such approach becomes particularly important in the provision of constructive medical care for patients with bone defects as a result of cancer, genetic disorders or complex injuries. In these cases, required an exclusively individual approach, not only to the osteoprosthesis tactic, but also to the design of osteoimplants.

Reconstruction of bone tissue emerging defects is a complex clinical task. Patients who have received medical assistance, have to overcome social and psychological barriers associated with disease. Mostly this applies to patients who underwent prosthetics. Great importance in this case have the aesthetic side of prosthesis, especially in the face area.

The solution to the Existing problem solution can be find in the osteoimplant high-precision formation according to the 3D model of the planned for resection bone site. Class of oxide ceramics [1, 2] is the most preferable as a material of an implant, in case of the lack of polymers and metals risks of causing an acute inflammatory reaction due to their low biocompatibility and integrating capacity with bone tissue. The identity of chemical bonding type and the mechanical parameters of ceramics to natural bone tissue prevents the potential possibility of disrupting bone physiological functionality and structural and phase changes in the bone tissue [3].

This work is the result of the consolidated scientific work of materials scientists, biologists, physicians and engineers and consists in developing a technological approach to the bone defects reconstruction in the skull visceral region by personalized implants based on porous ceramic osteosubstitution material. The technology consists in individual 3D-modeling of endoprosthesis based on a patient computer tomogram, with subsequent constructed model reproduction in ceramic material by methods of additive production.

At present time, the first microsurgical reconstruction of the face left middle zone with the ceramic implant has been carried out, figure 1. Using of this technology is not limited by the skull visceral region and can be extrapolated to other skeleton areas [4].

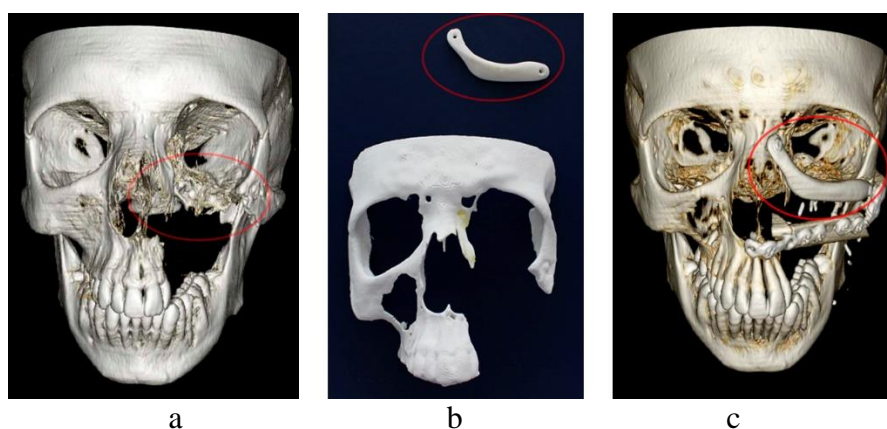


Figure 1. a) Computer tomogram with a marked area of prosthetics; b) Ceramic osteoimplant and stereolithographic model of the skull made of plastic, obtained by the additive prototyping techniques; c) Postoperative computer tomography with a marked implanted ceramic endoprosthesis.

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