Creation of a 3D Model of the Heart on the Basis of Data of Magnetic Resonant Tomography in a Patient with Postinfarct Aneurysm of the Left Ventricle (Literature Review and Own Observations)

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Abstract

The article presents a clinical case of the creation and preoperative planning of a surgical manual on a personified biventricular 3D model of the heart. A technique has been developed for MR scanning of a patient and obtaining DICOM images suitable for creating a 3D model. Algorithms for segmentation of MR images, obtaining a digital 3D model, its processing and preparation for printing on a printer are also described. The obtained biventricular 3D model of the heart was used by the medical team to select the method of plastic surgery, to plan the stages of surgical intervention and to develop appropriate skills. The patient underwent coronary artery bypass grafting and resection of the left ventricular aneurysm under cardiopulmonary bypass. The total operation time was 3 hours 40 minutes, cardiopulmonary bypass — 92 minutes, aortic clamping time — 66 minutes. Pathological changes in the manufactured 3D model visually coincided with intraoperative results.

On the basis of MR images it is possible to create 3D model of the heart in patients with post-infarction left ventricular aneurysm for preoperative plastic surgery planning.

Key words: Magnetic Resonance Imaging, Postinfarction left Ventricular Aneurysm, 3D Model of the Heart, Preoperative Planning, Segmentation.

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