

Section: Visualisierung

ID: 101

Abstract-Title:

3D-RAPID PROTOTYPING OF CARDIAC STRUCTURES FOR GUIDANCE IN HEART SURGERY

Authors:

S. Jacobs^{1,2}, D. Holzhey¹, R. Grunert², O. Burgert², W. Korb², V. Falk^{1,2}

¹Herzzentrum Leipzig

²ICCAS

Abstract-Text:

Background:

Aim of the study was to create an anatomical correct 3D Rapid Prototyping Model (RPT) for patients with complex heart disease and altered geometry of the atria or ventricles to facilitate planning and execution of the surgical procedure.

Methods:

Based on computer tomography (CT) - and magnetic resonance imaging (MRI) images, regions of interests were segmented using the Mimics 9.0 software (Materialise, Leuven, Belgium). The segmented regions were the target volume (left ventricular aneurysm or tumor), structures at risk (left anterior descending artery, papillar muscles) and discriminate functional from non-functional tissue (viable myocardium versus scar). After the segmented area of the original patient dataset was transferred into an STL-file (Fig 1), the file was sent to the 3D printer Zä510 (4D Concepts, Gross-Gerau, Germany) to print out a 3D plaster model (Fig 2). The patient individual 3D printed RPT-models were used to guide the resection of a left ventricular aneurysm and right ventricular tumor on the arrested heart.

Results:

The comparison of the 3D heart model with the native heart during the surgical procedure facilitated these operations. The surgeon was able to identify risk structures, assess the ideal resection lines and determine the residual shape after a reconstructive procedure (LV remodelling, infiltrating tumor resection). Using a 3D-print of the LV-aneurysm reshaping of the left ventricle ensuring sufficient LV volume was easily accomplished. Postoperatively, results were confirmed by CT or echocardiography.

Conclusion:

The use of the 3D Rapid Prototyping Model (RPT-model) during resection of ventricular aneurysm and malignant cardiac tumors facilitates the surgical procedure due to better planning and improved orientation.

Bild 1/JPG

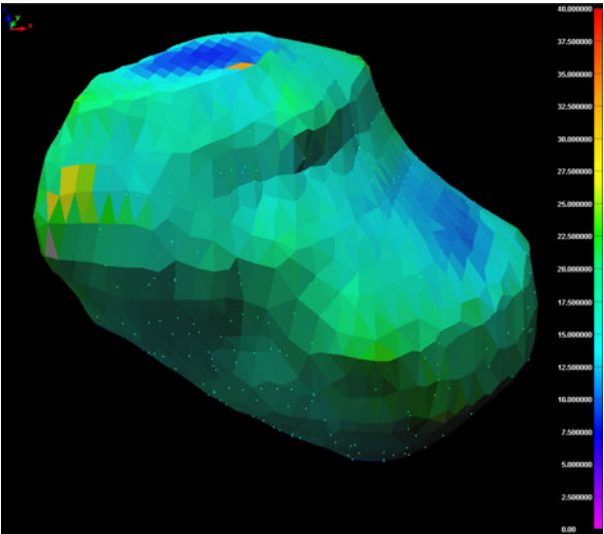


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